April, 1947
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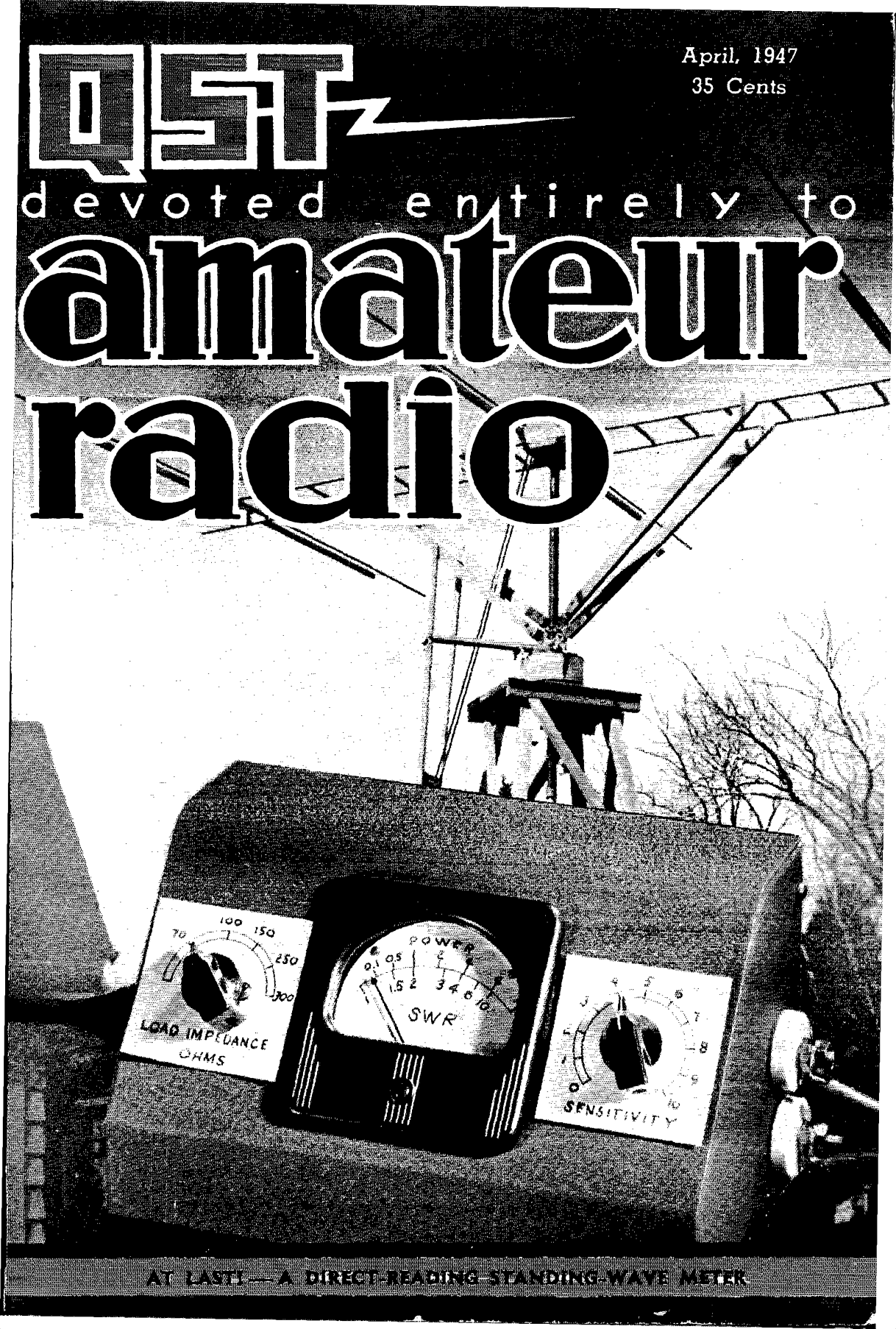
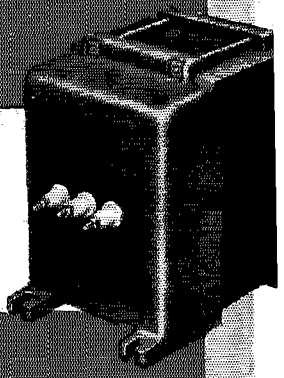


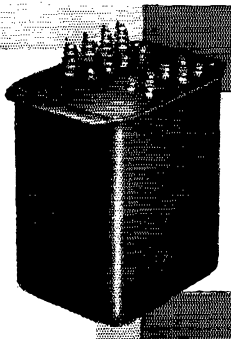
AT LAST! — A DIRECT-READING STANDING-WAVE METER

FOR *SPECIAL TRANSFORMERS*

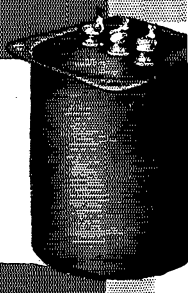
It is significant that, on the whole, difficult transformer jobs find their way to UTC. A few recent illustrations of accomplishment through engineering ingenuity are shown below.



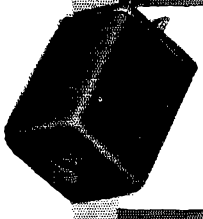
This transformer was designed for laboratory apparatus requiring a frequency range previously unheard of . . . flat within 2 DB 2 cycles to 20,000 cycles, this unit handles 25 watts output.



A manufacturer had the problem of changing his equipment from 400 cycle to 60 cycle power supply, but discovered that 60 cycle transformers are twice as large. UTC developed a unit, hermetically sealed, that fit his existing chassis, eliminating the need for a complete rebuilding of the equipment.



Narrow band filters are a common requirement for multiple channel telecontrol purposes. To effect a maximum number of channels in the audio range, filters made by UTC employ toroid high Q coils of unique structure. A typical special filter with 1500 cycle pass band is down 40DB at 1400 and 1600 cycles.



Low power 115 volt appliances such as electric razors, fluorescent desk lamps, etc. are sometimes required to operate on 220 volts. For simplicity of installation in the application of one manufacturer, a 15 watt plug-in unit was developed incorporating both plug and receptacle.

The UTC engineering department is available for consultation on your design problem.

United Transformer Corp.

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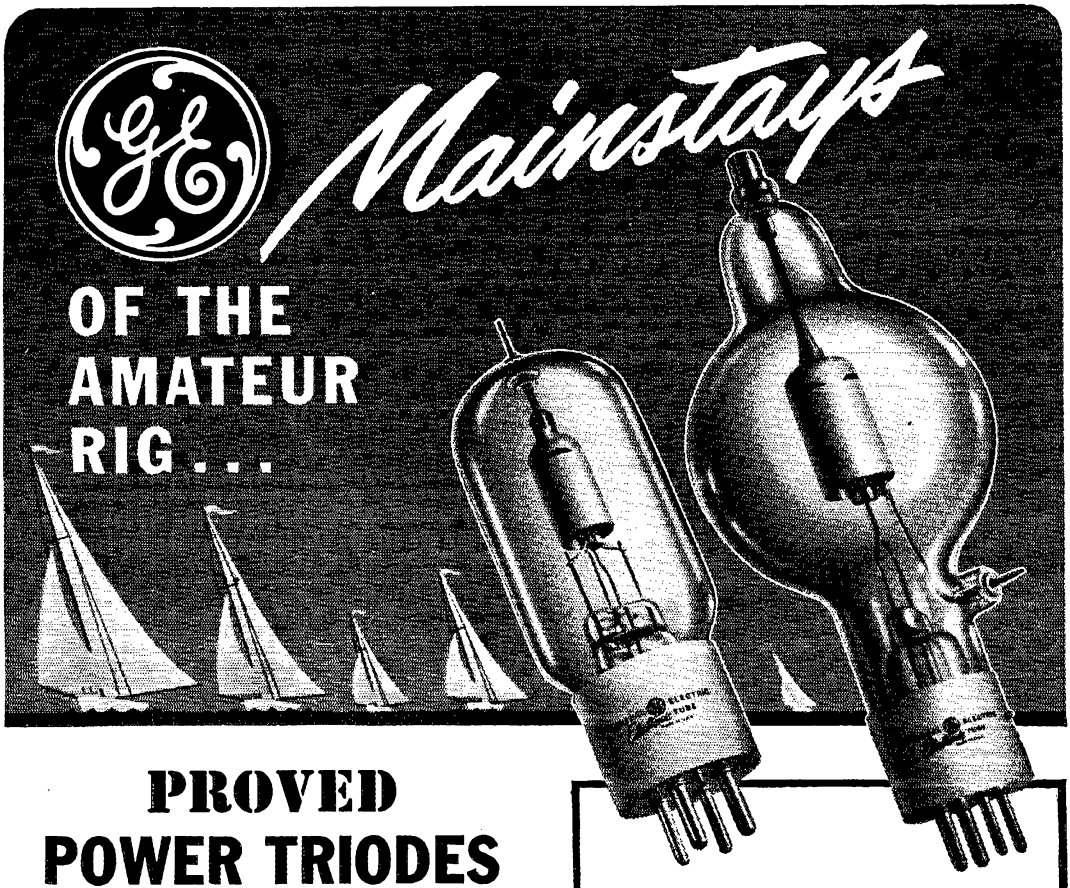

PROVED POWER TRIODES

YOU OLD-TIMERS have had thousands of QSO's as a result of the solid power-performance of triodes like these. Hams newly on the air, once they've plugged in a GL-35T or GL-100TH, soon will discover why both tubes are held in such high respect.

Being triodes, they do their job with no fuss or bother, and will stand up under plenty of punishment. Cleancut design helps to make the GL-35T and GL-100TH *dependable.* In addition, the tubes have certain outstanding design characteristics:

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GL-35T GL-100TH

ELECTRICAL CHARACTERISTICS

	GL-35T	GL-100TH
Filament voltage	5 v	5 v
current	4 amp	6.3 amp
Interelectrode capacitances:		
grid-plate	1.8 mmfd	2.0 mmfd
grid-filament	4.1 mmfd	2.9 mmfd
plate-filament	0.3 mmfd	0.4 mmfd

PLATE RATINGS, TYPICAL OPERATION, CLASS C TELEGRAPHY

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Current	125 ma	165 ma
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APRIL 1947

VOLUME XXXI • NUMBER 4

PUBLISHED, MONTHLY, AS ITS OFFICIAL ORGAN, BY THE AMERICAN RADIO RELAY LEAGUE, INC., AT WEST HARTFORD CONN., U. S. A.; OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

OFFICES

38 La Salle Road
West Hartford 7, Connecticut

Subscription rate in United States and Possessions, $2.50 per year, postpaid; $3.00 in the Dominion of Canada, $4.00 in all other countries. Single copies, 35 cents. Foreign remittances should be by International postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds.

Entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized September 9, 1922. Additional entry at Concord, N. H., authorized February 21, 1929, under the Act of February 28, 1925.

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Going places (again)

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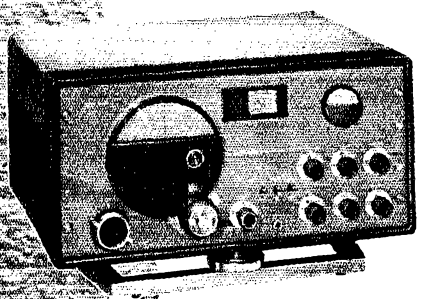
Hallicrafters famous radio equipment, sold and distributed around the world before the war and used with superb effectiveness in every theater during the war is once again on the move. Watch for latest details of the Gatti-Hallicrafters mobile radio equipped expedition to the Mountains of the Moon in deepest Africa—a new and exciting test for the ingenuity of hams and the performance of Hallicrafters equipment.

GREAT RECEIVERS
designed and priced for hams who are going places, too



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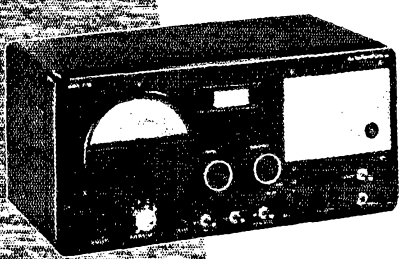

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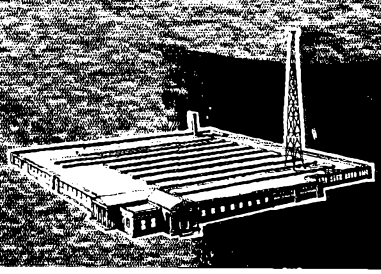

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Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio Club reports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

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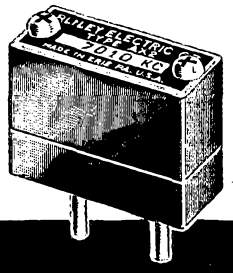

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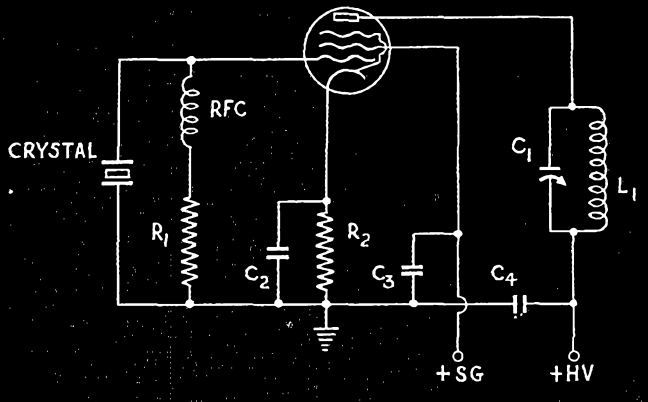
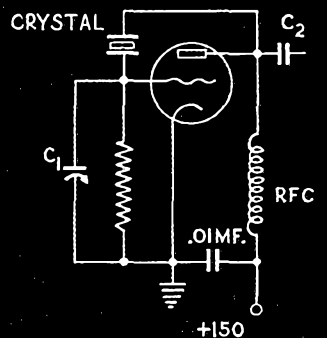


GRID CATHODE OSCILLATOR



GRID ANODE OSCILLATOR

Way back in the prewar era Bliley pioneered "harmonic" crystals for amateur frequencies in the 10 and 20-meter bands. Nowadays we know that such crystals should be correctly termed "overtone" oscillators because the crystal does not oscillate at the exact mathematical harmonic of its fundamental frequency. The present Bliley AX2 unit for 20-meter operation contains an overtone crystal designed to oscillate at approximately three times the fundamental mode.

When using overtone crystals the following considerations should govern circuit design:

1. *Grid Anode Crystal Oscillators*—In normal circuits of this kind crystals will usually oscillate at the fundamental mode instead of the overtone frequency desired because the plate impedance is usually capacitively reactive at the fundamental mode. To insure operation only at the overtone frequency the plate coil and the plate capacity must be selected so that the equivalent plate impedance is capacitively reactive at the overtone frequency of the crystal but not at its fundamental frequency.

   Optimum conditions should be such that the plate tank will be broadly resonant about half way between the fundamental and third overtone frequency. Since these conditions are sometimes difficult to establish when using choke coils the grid anode circuit is not recommended for use with overtone crystals.

2. *Grid Cathode Crystal Oscillators*—In most of these circuits the plate tank impedance must be inductively reactive and maximum output with good stability is obtained when the plate tank circuit is approximately tuned to the crystal frequency. Proper selection of the coil and condenser values for tuning to the desired overtone frequency is straight-forward procedure.

Bliley CRYSTALS

Write for Bulletin 31

BLILEY ELECTRIC COMPANY • UNION STATION BUILDING, ERIE, PENNSYLVANIA

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

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

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

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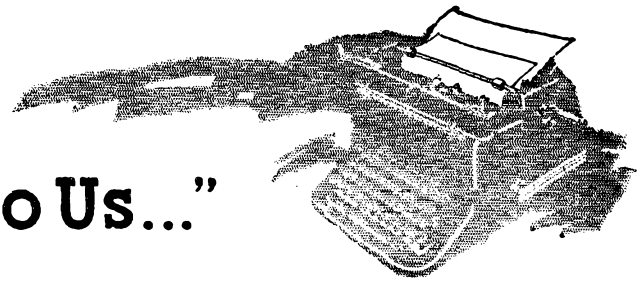


"It Seems to Us..."

THE WORLD CONFERENCE

It is early March as we write, in between the two halves of the DX Contest. On what otherwise could be relatively placid evenings, the 'phone bands have been resounding with rumors of the dire fate that is directly ahead of amateur radio because of the coming world telecommunications conference. If all the things we've heard these last few nights were true we'd have a very black world indeed, with our 10-meter band closed down a few days back, our 75-meter 'phone band being withdrawn until after the conference, the State Department conducting its U.S.S.R. programs in our 14-Mc. band, United Nations reaching for most of our bands for its communications and broadcasting needs, European amateurs already piped down on all useful frequencies, and the United States committed to close us down on all frequencies below 50 Mc. the day the conference ends! We would also judge from what we hear on the air that the coming conference is to be in Moscow or Cairo and that the sole voice of the United States is going to be a single FCC representative who doesn't know anything about amateurs. Let us say in plain words that there is no truth to any of these things and that there never has been. It is perhaps understandable that amateurs should be nervous and apprehensive about our privileges as a world conference approaches, somewhat in the position of an expectant father chewing his fingernails in the anteroom. But it is difficult to understand why 'phone operation, with its vaunted superiority in the quick exchange of intelligence, should have fallen such easy prey to such misapprehensions and misinterpretations.

It is the duty of members of the League to have a better understanding of these matters and of the place their organization has played and is playing in them. In this issue we begin a two-part article on the background of international radio conferences and how they work, which we commend to those who wish to learn something of the subject. DX radio is governed by agreements between nations, signed at world conferences. There have been several such: London in 1912, Washington 1927, Madrid 1932 and Cairo 1938. The next one is to begin at Atlantic City on May 15th, under the auspices of our own Government. It is not being held in Moscow. The United States will be represented by a bang-up Government delegation of about forty persons drawn from such agencies as FCC, the State, War, Navy and Commerce Departments, etc. It will be divided into teams or task forces each specially skilled and prepared on particular topics.

The United States preparation for this conference has been going on for a long time. The studies began in the middle of the war and have been extensively reported in *QST*: the IRAC postwar plan, the formation and work of RTPB with ARRL as one of its contributing sponsors, the comprehensive FCC hearings which lasted for months, the joint FCC-IRAC reviews and recommendations, the public meetings held by the State Department, the inter-American conference at Rio, the preliminary exchange of views between the major allies at Moscow, and the months of work by the select preparatory Government-industry committee at Washington. Those who wish to be informed on the development of the preparations for this conference will find the whole story displayed in frequent *QST* articles over these years, including the suggested allocation tables, the verbatim testimony of League officers at the hearings, the brief of the position of ARRL in the 160-meter matter, the reports of ARRL's representative at Rio and Moscow. For it is a fact that the League has been an active participant in all this work and has maintained constant contact with every facet of the scene, under the direction of its Board of Directors.

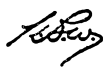
At this moment, and as reported elsewhere in this issue, the United States has transmitted to the Bern Bureau for distribution to the other nations of the world its proposals for frequencies, which include exclusive amateur bands at 3500–4000, 7000–7300, 14,000–14,400, 21,000–21,500, 28,000–29,700 kc. and in all the bands which are at present assigned to us above 50 Mc. Only the 160-meter band, still required for loran, is missing from our hopes. In an ac-

companying explanation of all its frequency proposals, the United States takes a very strong position in our protection. It wasn't easy to reach this decision. Despite the affection our country has for the amateur service, it is itself so great a user of the spectrum that it has immense difficulty finding places for all its services. Most of them have had to give up space rather frequently to permit the creation of needed new services. As it is well known that there have been no changes in the major amateur bands since 1929, there were frequent feelings that we too ought to share in the remaking of the world by giving up something, despite our great congestion. Even in a country as friendly as our own, there were great pressures and narrow escapes. In this long and careful preparation by our country the constant work of the League has brought us, through these many difficulties, to current U. S. decisions, supported by every U. S. interest in radio, including IRAC and FCC, that reflect the expectations and instructions of our Board.

Except for Canada, we do not yet know what the amateur proposals of any other country will be. None has been announced; we only speculate on their possible content. It will not be surprising if some of them propose some narrowing of amateur bands. That would be the traditional view of some countries. Any international conference of course is a hazard, since all the cards are on the table and you have to play to pick up your aces again, but there would be nothing new about hostile recommendations from some countries and no reason for becoming jittery over them; they always try it on. Proposals themselves mean very little. The United States naturally expects to have to fight, not only for amateurs but against similar attacks on practically every one of its services. That is why it is making such extensive and careful preparations.

Our country, for the nation as a whole, now takes the ball. The League goes along to Atlantic City to assist. There is little that the anxious expectant father in the anteroom can do at this stage. Since the attitude and announced intentions of our Government are satisfactory, all of us can have only applause for the currently-announced proposals; and as to urging our Government not to listen to foreign restrictive proposals, it isn't necessary. The preparatory phase is now successfully over. To review the work to date and to make any further plans that are found desirable, our Board of Directors is having a special meeting in middle March, to deal solely with this subject. We'll report it in our next issue, along with all available conference news.

Meanwhile don't let anybody tell you that the battle is lost before it starts and that your League — directors, committees, officers and headquarters — hasn't been in there pitching these many years. You have only to read the record and see the results to date.



New WWV Schedules

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

Mc.	*EST*	*Power Output (kw.)*	*Audio Freq. (cycles)*
2.5	7:00 P.M.–9:00 A.M.	1.0	440
5.0	7:00 P.M.–7:00 A.M.	10.0	440
5.0	7:00 A.M.–7:00 P.M.	10.0	440 and 4000
10.0	continuously	10.0	440 and 4000
15.0	continuously	10.0	440 and 4000
20.0	continuously	0.1	440 and 4000
25.0	continuously	0.1	440 and 4000
30.0	continuously	0.1	440
35.0	continuously	0.1	440

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

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided to give Eastern Standard Time in telegraphic code and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. Ionospheric disturbance warnings applicable to the North Atlantic path are given at 20 and 50 minutes past each hour. If a disturbance is in progress or is anticipated within 24 hours, the time announcement is followed by 6 Ws; if conditions are quiet or normal, the time announcement is followed by 8 Ns. The announcement of the station's services and of the station's call (WWV) is given by voice at the hour and half hour.

The accuracy of all the frequencies, radio and audio, as transmitted, is now better than a part in 50,000,000. Transmission effects in the medium may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000001 second. The beginnings of the periods when the audio frequencies are off are synchronized with the basic time service of the U. S. Naval Observatory.

The "Micromatch"

A Device for Measuring Standing Waves and R.F. Power

BY MACK C. JONES,* W1PNX, AND CARL SONTHEIMER**

ONE of the difficult and important problems in any amateur station is that of properly terminating r.f. transmission lines. This problem comes up in the adjustment of a fixed or rotary beam, of an antenna tuner, in the adjustment of interstage link-coupled circuits, and in many other places around the ham station. The Micromatch is a new and very valuable tool in the adjustment of transmission-line terminations. When connected in a transmission line of any impedance from 70 to 300 ohms and properly calibrated it will read the standing-wave ratio (s.w.r.) of the transmission line beyond it, and when its terminals are reversed it will read the r.f. power being fed down the transmission line. It will operate on any frequency, 3 to 30 Mc., and with any power from 10 to 1000 watts.

Using the Micromatch indicator it is possible to adjust any impedance-matching network far more rapidly than with existing methods. Tuning an impedance-matching network by this means is no more complicated than adjusting the final-tank tuning condenser for minimum plate current by means of a plate milliammeter.

Proper adjustment of any matching device or load to the correct value free of all reactance is not possible without some means for measuring the standing-wave ratio along the transmission line connecting to the transmitter. Improper termination of the transmission line connecting the antenna or tuner results in the poor performances with which we all are familiar. The following advantages result from correct matching:

1) Losses in the transmission line are minimized.

2) Voltage on the transmission line is reduced, thereby reducing danger of voltage break-down.

3) The antenna system may be operated over a much wider band of frequencies without retuning.

4) Receiver sensitivity is increased, if the receiver operates from the same antenna.

Another of the problems which the Micromatch helps to solve is that of proper adjustment of interstage link-coupling circuits. By adjusting the loading and coupling on the grid circuit of an r.f. amplifier it is possible to produce a perfect match to the link line connecting to the driver tank circuit. This results in all but the last of the above advantages.

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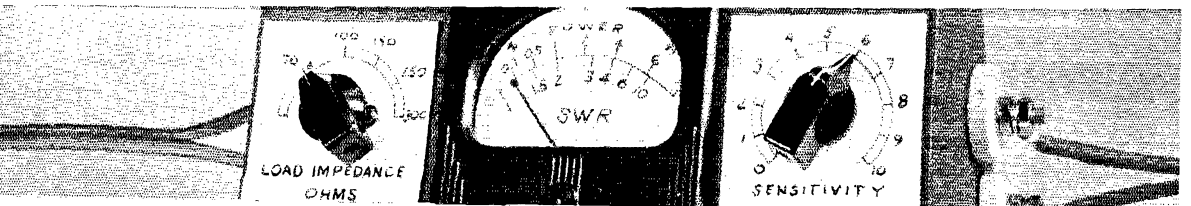
OUR COVER

• It has been a long time since the *QST* technical staff has been so enthusiastic about a new device as it is about the "Micromatch" pictured (W1EER-W1JKQ beam in background) this month. Here is an article describing the simply *astonishing* "little *black* box" that can be inserted in a transmission line at any point to read directly the standing-wave ratio! For the thousands of amateurs who have played with neon bulbs and "detuning-of-the-tank" methods for approximating the degree of match between antenna and line, it will be unnecessary to point out the convenience of such a device, but the gadget is equally useful in the adjustment of any form of link coupling, from final amplifier to antenna tuner or between stages of the transmitter. Further, the Micromatch will measure r.f. power in the line up to the amateur limit. This new development seems to be destined to become as popular as the familiar plate milliammeter because, once having seen it perform, you can't imagine not having one for the shack.

Theory of Operation

All the useful properties of the Micromatch obtain because of its ability to measure energy flow separately in either direction on the transmission line. Since a transmission line is a one-dimensional affair, energy can flow from the generator to the load, or from the load to the generator. If the line is terminated in a matched load equal to the surge impedance of the line, then this load will absorb all the energy that the generator sends down the line; but if the load does not match the line, then part of this energy will be *reflected* back toward the transmitter. It is the interference between the transmitted wave and the reflected wave that gives rise to the standing-wave pattern.

Let us call the transmitted wave E_t and the reflected wave E_r. At some points on the line E_t and E_r will be in phase; at these points there will be a maximum voltage equal to $E_t + E_r$. At other points (a quarter wavelength away from the preceding) the two waves will be exactly out of phase, and there results a minimum voltage $E_t - E_r$. At all other points on the line the voltage will be somewhere between these two



extremes. Now the standing-wave ratio is by definition the ratio of the maximum to the minimum line voltage, i.e.

$$s.w.r. = \frac{E_t + E_r}{E_t - E_r} \qquad (1)$$

We see immediately that the s.w.r. can be unity only if the reflected wave, E_r, is zero, and this condition is obtained if and only if the line is terminated in a pure resistance equal to Z_o, its surge impedance.

It is possible to express the voltage and current at each point on the transmission line in terms of E_t and E_r; the expressions are:

$$E = k_1E_t + k_2E_r$$

$$I = \frac{1}{Z_o}(k_1E_t - k_2E_r)$$

where k_1 and k_2 are parameters that express the phases of E_t and E_r at each point on the line; all we need note about them is that their r.m.s. value is 1.0.[1]

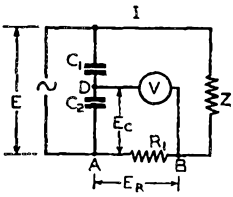


Fig. 1 — A simplified schematic of the Micromatch standing-wave meter. It is inserted in the transmission line between the load and the r.f. source.

Turning now to the circuit of Fig. 1, let us assume that C_2 is much larger than C_1, and that the reactance of C_1 is much greater than the surge impedance of the transmission line. Let us choose R_1 so that $R_1/Z_o = C_1/C_2$. We see that the voltmeter reads the r.f. voltage between points D and B, that is, the difference between the voltage across C_2 and the voltage across R_1. The voltage across C_2 is

$$E_C = \frac{C_1}{C_2}E = \frac{C_1}{C_2}(k_1E_t + k_2E_r)$$

and the voltage across R_1

$$E_R = R_1I = \frac{R_1}{Z_o}(k_1E_t - k_2E_r)$$

The voltmeter reading is the difference between these two voltages:

$$V_1 = E_C - E_R$$

$$= k_1E_t\left(\frac{C_1}{C_2} - \frac{R_1}{Z_o}\right) + k_2E_r\left(\frac{C_1}{C_2} + \frac{R_1}{Z_o}\right)$$

The coëfficient of E_t is zero, since we have chosen R_1 so as to make C_1/C_2 equal to R_1/Z_o, and remembering that the r.m.s. value of k_2 is 1.0, we have

$$V_1 = \frac{2R_1}{Z_o}E_r$$

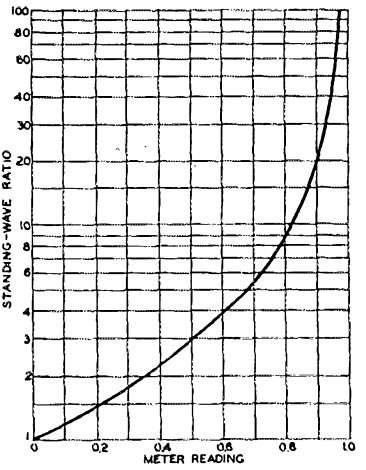


Fig. 2 — Standing-wave ratio plotted against meter reading of the Micromatch. The meter has a full-scale reading of 1.0.

We see that with the Micromatch connected as shown in Fig. 1, the meter reading is proportional only to the reflected wave E_r, and is not influenced by the transmitted wave E_t. Since E_r is zero only when the line is properly matched, this shows us the first and perhaps most important property of the Micromatch: the meter will read zero if and only if the transmission line is properly terminated in $Z = $ its surge impedance Z_o, so as to have unity standing-wave ratio.[2]

If we reverse the position of the generato and the load in Fig. 1, and again compute the meter reading, we find that the coëfficient of E_r is zero, and that we have

$$V_2 = \frac{2R_1}{Z_o}E_t$$

When thus connected, the Micromatch reads the transmitted-wave voltage only, and does not respond to the reflected wave.

Referring back to Equation 1, we find that by measuring V_1 and V_2 we can compute the s.w.r., since

$$s.w.r. = \frac{E_t + E_r}{E_t - E_r} = \frac{V_2 + V_1}{V_2 - V_1}$$

This computation may be avoided by making the meter direct reading, as follows: When measuring V_2, adjust the sensitivity of the voltmeter so that

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The complete expressions of k_1 and k_2 are:

$$k_1 = \sqrt{2}\cos\left(\omega t - \frac{\omega x}{c}\right),\ k_2 = \sqrt{2}\cos\left(\omega t + \frac{\omega(x - 2s)}{c} + a\right)$$

x is the distance between the generator and the point where the measurements are made, c is the velocity of light, ω is 2π times the frequency, s is the length of the line, and a is the phase shift which the transmitted wave undergoes when reflected from the load. E_t and E_r are both r.m.s. values.

[2] This result is obvious when Fig. 1 is considered as a bridge, but the other properties of the Micromatch cannot be well understood unless the traveling-wave picture is considered.

it just reads full scale, then measure V_1 without changing the voltmeter sensitivity. Then, since $V_2 = 1.0$,

$$s.w.r. = \frac{1 + V_1}{1 - V_1}$$

and the meter scale may be calibrated to read directly the s.w.r. corresponding to any voltage V_1. The calibration curve in Fig. 2 shows the standing-wave ratio in terms of meter deflection.

Now consider the use of the Micromatch as a wattmeter. Obviously, the net power delivered to the load is the difference between the transmitted power and the reflected power. For any load impedance, this is given by

$$P = \frac{E_t^2 - E_r^2}{Z} = K\,(V_2^2 - V_1^2)$$

where K is a constant which depends on the line impedance and circuit values, but not on frequency

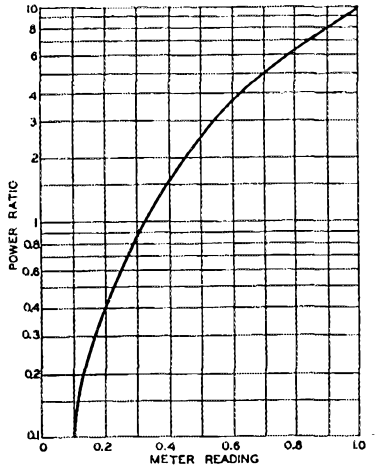


Fig. 3 — Calibration curve of the Micromatch indicator used as a wattmeter. One actual point must be found by comparison with a lamp or other known r.f. load, after which the above scale can be fitted to the meter.

Thus the power delivered to the load may be found by measuring V_1 and V_2 and taking the difference of their squares. The squaring may be done automatically by drawing on the meter the calibration curve shown in Fig. 3. Full scale on the meter is arbitrarily selected as 10. This power scale is of course only relative, and the meter must be calibrated at one point on its scale for each value of line impedance used. Note that with the calibration curve of Fig. 3, the Micromatch will indicate 1 per cent of full-scale power with good accuracy, while with the conventional r.f. ammeter it is not possible to read accurately below about 30 per cent of full scale, giving a power range of 10 to 1 against 100 to 1 with the Micromatch.

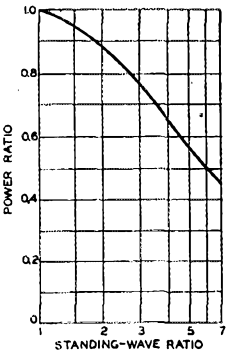


Fig. 4 — The error in wattmeter reading for various standing-wave ratios. This error can be eliminated, as explained in the text.

In using the Micromatch as a wattmeter, it is frequently possible to omit measuring V_1. This can be done if the s.w.r. on the line is small enough. For example, if the s.w.r. is 2, V_1 is one-third as large as V_2, and V_1^2 is consequently 10 per cent of V_2^2. Neglecting V_1 thus introduces a 10-per-cent error on lines with an s.w.r. of 2; the error introduced by this simplification for other values of s.w.r. is shown in Fig. 4.

Construction

The circuit diagram of the Micromatch indicator is shown in Fig. 5. The constants have been selected to operate at frequencies from 3 to 30 Mc., and for transmission lines from 70 to 300 ohms. The capacitor C_1 is made variable to allow the Micromatch indicator to be adjusted for various values of transmission-line impedance. The maximum capacity corresponds approximately to 70 ohms line impedance, while the minimum capacity will correspond to about 300 ohms line impedance. The resistor R_1 and the capacitor C_2 should be selected so that the above

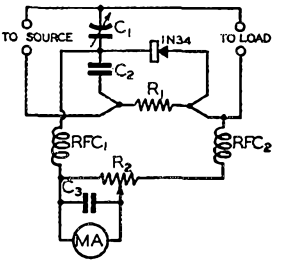


Fig. 5 — Circuit diagram of the Micromatch standing-wave indicator.
C_1 — 3–15-$\mu\mu$fd. midget variable.
C_2 — 820-$\mu\mu$fd. silver mica.
C_3 — 0.0047-μfd. mica.
R_1 — Special four-terminal 1-ohm 20-watt resistor. See text.
R_2 — 5000-ohm potentiometer.
MA — 0–1 d.c. milliammeter.
RFC_1, RFC_2 — 2.5-mh. r.f. choke.

range is obtainable on the variable capacitor C_1. The instrument is calibrated for impedance by attaching various *noninductive* load resistors to the load terminals and adjusting C_1 until the meter reads zero. The scale on C_1 should then be marked for the particular value of load resistance used. Another value of load resistance should be substituted and the procedure repeated. Sufficient points should be taken to obtain a smooth calibration curve. It should be emphasized here that the load resistors must be noninductive or an incorrect calibration will be obtained. The meter should be calibrated at about a 20-watt level. The load resistors may be made up of several carbon resistors connected in parallel to dissipate this amount of power. Care should be taken to determine that the resistors are actually carbon and not wire-wound.

The resistor R_1 is made up of ten 2-watt 10-ohm resistors connected in parallel, as shown in the photograph. Two leads are brought out at each end of the composite resistor, one set to carry the transmission-line current, and one set to connect to the crystal and capacitor C_2.

There are a few precautions to take in the construction of this instrument to prevent the loop formed by R_1, C_2 and the 1N34 from having voltage induced in it from the field of the line. This loop is made small by running the lead from R_1 to the crystal *inside* the resistor assembly R_1. The crystal is mounted directly against the capacitor C_2 and they are both mounted perpendicular to the line. If these precautions are not taken, serious errors may be encountered at high frequencies.

Since the entire range of the capacitor C_1 is used in this instrument, care should be taken to see that a minimum of capacitance from the wiring is added in shunt with it. The stator side of the capacitor is connected to the capacitor C_2 and the crystal rectifier. This connection should be short and far removed from the rotor side of C_1 or the side of the transmission line to which it connects. This helps to keep the minimum capacity small. Since there is line voltage on the rotor of the capacitor C_1 it must be insulated, and an insulated knob should be put on its shaft. It is usually not necessary to adjust this capacitor while the instrument is in use, so this should present no problem.

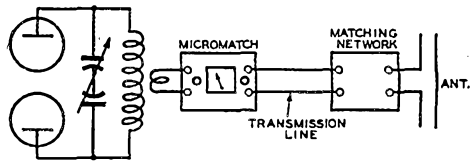


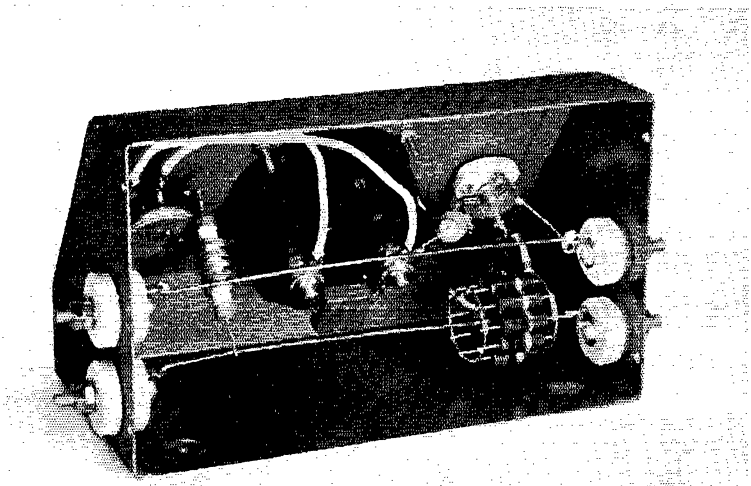
Fig. 6 — To check a "flat" transmission line, the Micromatch is connected in the line near the transmitter, although it can be used anywhere along the line. The matching network is then adjusted for minimum reading of the Micromatch.

When used as a wattmeter, with the potentiometer set for maximum sensitivity, full scale on the meter corresponds very roughly to 10 watts with a 70-ohm line and to 40 watts with a 300-ohm line, at all frequencies within its range and depending on the sensitivity of the particular crystal used.

When used at a power level near the minimum values indicated above, the nonlinearity of the crystal may introduce a slight error in both the wattmeter and standing-wave-ratio readings.

Uses for the Micromatch

Many uses have been found for the Micromatch indicator. Probably its most popular function is that of enabling the operator to determine the standing-wave ratio on his antenna transmission line and hence to adjust the matching network for minimum reflection. The Micromatch is inserted in the line, as shown in Fig. 6, and the s.w.r. read as previously described. The effect of any adjustment at the antenna matching network or of a change in element length, in the case of a rotary beam, can be observed immediately. By adjusting the elements and the matching network for minimum reading of the Micromatch, one is assured that the s.w.r. is minimized. These adjustments can be made with loose coupling at the transmitter end, if a high-powered transmitter is used. When the s.w.r. has been minimized, it will be found that the coupling can



A rear view of the Micromatch with its Masonite back cover removed. Notice the construction of the composite 1-ohm resistor and how the other components are arranged to have as little coupling as possible to the No. 14 wire main lines.

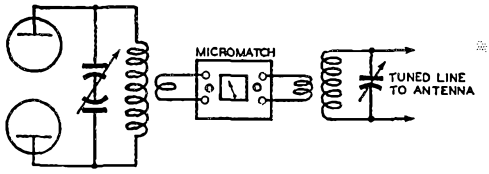


Fig. 7 — Link coupling to an antenna tuning unit is checked by inserting the Micromatch in the link line and adjusting the tuning and coupling of the antenna tuner for minimum reading of the Micromatch. The loading is then adjusted at the transmitter.

be increased at the transmitter and no detuning of the final tank circuit will be observed, except possibly at 28 Mc., where the coupling-loop inductance introduces some slight reactance. It must be remembered that any adjustments at the transmitter end can have no effect on the s.w.r. but only on the power level through the Micromatch.

In any two-wire line, a discrepancy in the s.w.r. may appear depending upon how the Micromatch is connected in the line. If this discrepancy appears, it indicates that the feeder currents are not balanced. This will amost invariably occur with unbalanced systems like the "J" end feed, and it will often occur when the feed line to the center of an antenna is not brought away at right angles to the antenna. In the latter case, there is usually no solution but to lead the feed line away in the proper manner.

One striking application of the Micromatch was the adjustment of an antenna tuning system for a 7-Mc. Zepp that was coupled to the transmitter by about 20 feet of 70-ohm line, as shown in Fig. 7. The Micromatch was first connected as a wattmeter and the potentiometer adjusted until the meter read just full scale. Reversing the Micromatch indicated an s.w.r. of 10! This particular antenna tuner had been adjusted by all of the usual rules of thumb to what was considered to be the correct adjustment.

The antenna tuner was then adjusted until the Micromatch read a minimum. It became immediately evident that the antenna tuner was not capable of properly matching the antenna to the transmission line. It was necessary to add a few turns to the adjustable link of the antenna-tuner coil. It also became very evident that this adjustable link at the antenna tuner was an impedance-matching adjustment and should not be used to vary the loading on the transmitter. When the antenna tuner was properly matched, and the standing-wave ratio was less than 1.1, the r.f. voltage on the transmission line was reduced so that a neon bulb could not be lighted off the line, and the coupling at the transmitter had to be increased.

The transmitter could now be operated over the entire 40-meter band and still maintain fair loading at the transmitter, without readjusting the antenna tuner. The standing-wave ratio rose at each end of the band, but at no point was it nearly as bad as before proper adjustment. Before proper matching, the antenna tuner required adjustment every 100 kc. to maintain proper loading of the transmitter.

The Micromatch soon dispelled the common fallacy that the antenna system should tune up with a minimum amount of coupling at the link in the transmitter. With the transmission line properly matched, the link was adjusted for proper loading of the transmitter. The setting of the link under this condition was much farther into the tank coil than the incorrect adjustment which existed prior to the proper matching. When the line is properly matched, moving the link in and out of the tank coil does not change the position of the final tank tuning condenser for minimum plate current.

It might be noted here that cut-and-try methods of antenna tuning can produce the condition of no change in the final tank condenser tuning when the link is moved in and out. This condition represents a resistance load at the link, but there is no simple means, except of course with the Micromatch, which will produce the *proper* value of resistance load at the link.

Another very important use of the Micromatch indicator is for adjustment of interstage link coupling. The diagram in Fig. 8 shows the Micromatch connected between the driver tank circuit and the final-stage grid circuit of a typical transmitter.

In this adjustment, the Micromatch is set to the impedance of the line or twisted pair connecting the two coupling loops. The amplifier grid circuit is then adjusted until unity standing-wave ratio is obtained. This should be done at the normal operating power level and with the plate voltage on the loaded driven amplifier. The adjustments are made by changing the value of the grid leak, R_2, and by the coupling of the loop at the driven amplifier. The grid circuit is, of course, maintained in resonance, as indicated by maximum grid current. In some in-

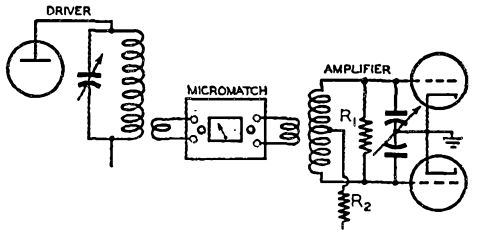


Fig. 8 — Interstage link coupling can be properly adjusted by means of the Micromatch. Since the grid-circuit loading depends upon the grid current of the tubes and the value of grid leak, R_2, adjustment should be made under actual operating conditions. In some cases it is necessary to load the circuit with an additional resistor, R_1, to obtain the proper match for the link line.

stances it may be necessary to add a loading resistor, R_1, across the circuit. The amount of drive is kept constant during the tests by changing the position of the loop at the driver end. If desired, the driving power can be measured by reversing the meter. It is of course necessary to calibrate the wattmeter scale for each setting of the potentiometer, but this can be done by comparing a light-bulb load with one of known wattage connected to the a.c. line. The meter need be calibrated at only one place on its scale to read power over quite a wide range.

Proper adjustment of this link-coupled circuit caused the driving power to be maintained essentially constant without retuning over a wider range than obtained by conventional matching methods.

In any transmitter, the Micromatch could be used to adjust all of the interstage couplings, and then left in the antenna feed line to monitor the standing-wave ratio.

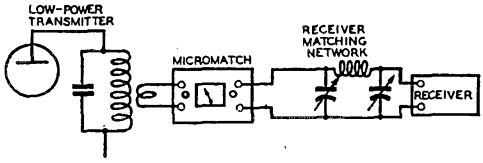


Fig. 9 — The Micromatch can even be used to match properly a receiver to the antenna, by using the transmitter as a low-power source of signal.

Another use of the Micromatch is that of adjusting an antenna tuner connecting a receiver to a transmission line. In this application the transmitter is used to feed a small amount of power into the receiver input circuit as shown in Fig. 9. Care should be taken to prevent damage to the receiver input circuit, by keeping the power level as low as possible. The receiver should be tuned to the frequency of the transmitter. The Micromatch should be set for the impedance of the transmission line. The antenna tuner is then adjusted for unity or minimum standing-wave ratio. This condition will produce the maximum signal across the antenna terminals of the receiver.

The Micromatch may also be used to measure impedance, such as the input impedance of a receiver. To make this measurement, the Micromatch is connected between a source of signal and the receiver input, and the capacitor C_1 in the Micromatch is adjusted for unity or minimum standing-wave ratio. The unknown r.f. resistance is then read on the dial associated with C_1 on the Micromatch. This method works quite well if the unknown impedance has only a small reactive component. An estimate of the reactance may be had by reading the standing-wave ratio after balancing the capacitor C_1. If the standing-wave ratio is unity this reactance is zero.

A 25-watt light bulb was measured by this method on the Micromatch. It had an r.f. resistance of approximately 300 ohms and a standing-wave ratio of near unity at 7 Mc.

After using the Micromatch it may be removed from the line without disturbing the impedance match, or it may be left in the line to monitor either the standing-wave ratio or the power output. The instrument should be very useful in monitoring an antenna during wet weather to determine the effect of dampness on the feeders and insulators. Two instruments may be connected in series, one to read power and the other to read standing-wave ratio.

To review briefly the use of the Micromatch, the following steps should be taken each time a reading is taken:

1) Connect the Micromatch as a standing-wave-ratio meter, and adjust the *load* for minimum standing-wave ratio, i.e., minimum meter reading.

2) Reverse the connections, and connect the Micromatch as a wattmeter. Adjust the potentiometer until the meter reads just full scale.

3) Reconnect the Micromatch as a standing-wave-ratio meter and read the standing-wave ratio of the transmission line. Readjust the load-impedance matching network if desired to obtain a better standing-wave ratio.

4) The meter may be left in the circuit either as a standing-wave-ratio meter or as a wattmeter.

After using the Micromatch for a few weeks, it doesn't seem possible that an amateur station could be operated without it. It seems as indispensable to tuning r.f. systems as a plate milliammeter is in tuning a Class C amplifier.

The Micromatch is a very useful device even if the only calibration is the essential one of C_1 for various impedance levels, since all of the s.w.r. applications can be used without knowing the magnitude, the meter serving as a "minimum" indicator.

Silent Keys

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

Ex-W2DJ, Edwin B. Lant, Larchmont, N. Y.
Ex-W3BLC, Floyd Rice, Bethlehem, Pa.
W5FHJ, Henry W. Hart, Ruleville, Miss.
W5FQ, Burt Stuart, Meridian, Miss.
W6GMU, Robert M. Ryan, La Habra, Calif.
W8WF, Charles A. Wise, Detroit, Mich.
W9DCV, Joseph G. Grant, Harrisburg, Ill.
W9IUA, Tech. Sgt. Robert L. Bennett, Elmhurst, Ill.
GW4KQ, Hugh H. Phillips, Cardiff, Wales

Predicting Amateur "Conditions"

A New Method of Using CRPL Charts for DX Work

BY NEWELL A. ATWOOD,* W3KTR

• **Methods previously outlined for using CRPL m.u.f. charts have been principally useful for determining the best working frequency between any two points at any given time of day. Here is a way to find at a glance *where* you can work, from a given location, at any hour. A small amount of preliminary work sets you up for rapid determination of probable DX conditions months in advance.**

PUBLICATION since the war of articles in *QST*[1, 2, 3] and elsewhere[4] describing propagation prediction methods has no doubt caused many an amateur, particularly the DX ham, to attempt to predict the best hours for DX QSOs. Such attempts have probably not yielded results commensurate with the efforts expended, in view of the fact that the prediction methods heretofore recommended are based on the location of the desired remote station and the time of the day that it is desired to work that station. Additionally, the answer obtained by such methods is in terms of maximum usable frequency or optimum working frequency at a given hour of the day. To the average ham, the term "conditions" means "What is the best time of the day to make DX contacts?" or "What DX can I expect to work with my rig during the hours I can spend in the radio shack?"

The monthly publications giving basic radio-propagation predictions three months in advance, and originating with the Central Radio Propagation Laboratory of the National Bureau of Standards,[3] can be used to permit an amateur to predict "conditions" with fair accuracy in a usable form and with little effort after the initial spadework is done. In the present period of the sunspot cycle these predictions will be found most useful for 10-meter operation, although the techniques here described should be equally applicable to 6- and 20-meter operation in the future.

* Commander, USN; c/o Office of Naval Research, Navy Department, Washington, D. C.

[1] W. R. Foley, "Forecasting Long-Distance Transmission," *QST*, February, 1946.

[2] E. H. Conklin, "The Bright New World — of Sunspots," *QST*, January, 1946.

[3] Newbern Smith & Richard Silverstein, "Radio Propagation Work at the National Bureau of Standards," *QST*, May, 1946.

[4] O. P. Ferrell, "DX Predictions," *CQ*, August–December, 1946.

[5] P. 46, *QST*, August, 1946.

While the prediction methods outlined in this article differ from those heretofore recommended the theory underlying each method is identical Briefly, this theory is that for distances in excess of 2500 miles (4000 kilometers), propagation is controlled by the F_2 layer of the ionosphere at two control points along the great-circle path between the two stations, each point being 1250 miles (2000 kilometers) from each station toward the other station.

For prediction of maximum usable frequency by the method recommended by CRPL, the F_2-4000 charts contained in the monthly CRPL publication are used with a world chart (also contained in the same publication) upon which the control points have been plotted. The condition of the ionosphere for each hour of the day at each control point is obtained in terms of maximum usable frequencies, the lowest of which is the maximum usable frequency for communication between the selected two stations at the designated hour, based upon reflections from the F_2 layer at the two control points.

To predict amateur "conditions," as outlined in this article, the same charts are used but in a somewhat different manner. A transparent chart, upon which has been traced curves or "contour" lines representing amateur frequencies, is used with a world chart upon which there appear a control area surrounding the amateur's location and great-circle paths to all parts of the world from the control area. By moving the transparent chart horizontally, the hours of the day at which the periphery of the control area and the contour area coincide can be determined and the areas of the world that can be worked at these hours can be ascertained at a glance. "Conditions" on 10 meters, for example, can be determined by observing what land areas are covered by the 30-megacycle shadow of the F_2-4000 "cloud" as it drifts from east to west during the twenty-four-hour day. The contour of this "cloud" differs from month to month and differs slightly over three zones of the world but a single transparent chart can be used to obtain a fairly accurate picture for any one month.

An amateur interested in predicting "conditions" should subscribe to *Basic Radio Propagation Predictions*, CRPL-D, published monthly by the Government Printing Office, Washington, D. C. (Single copies 15 cents; $1.50 per year.[5]) Figs. 1, 2, 6, 8 and 10 of this publication are used to construct the basic world chart and the trans-

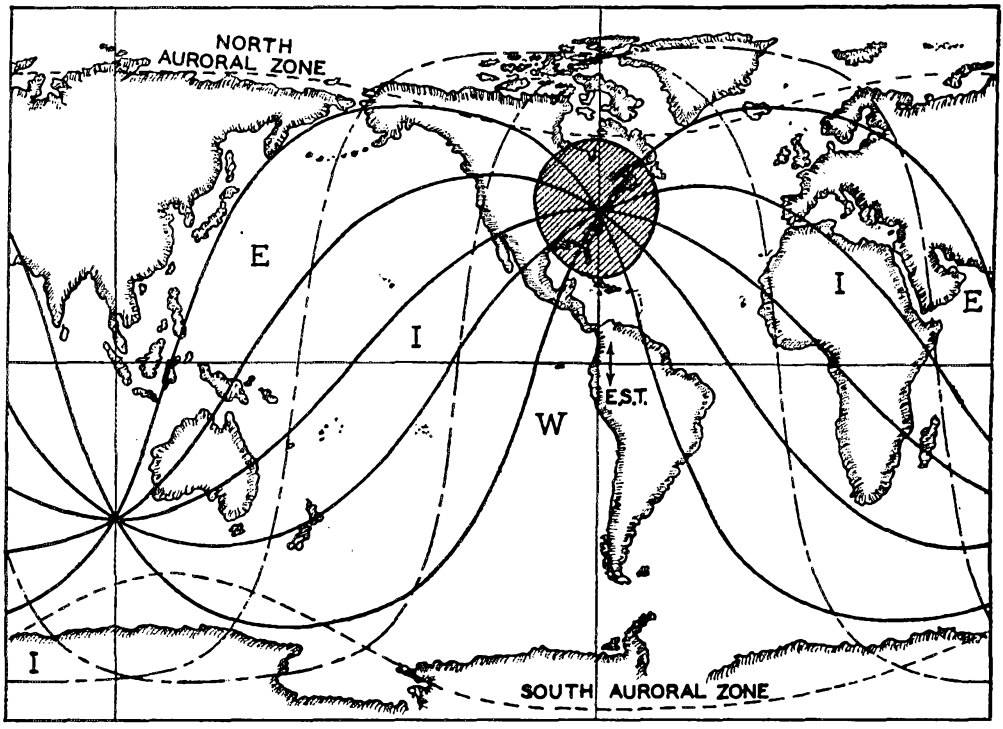


Fig. 1 — The basic map will resemble this one constructed for Washington, D. C., by the author. Each of the heavy curves (including the vertical line) represents a great-circle path, intervals between curves being 30 degrees of azimuth at the home location. The short double-arrowed vertical line marks the EST meridian.

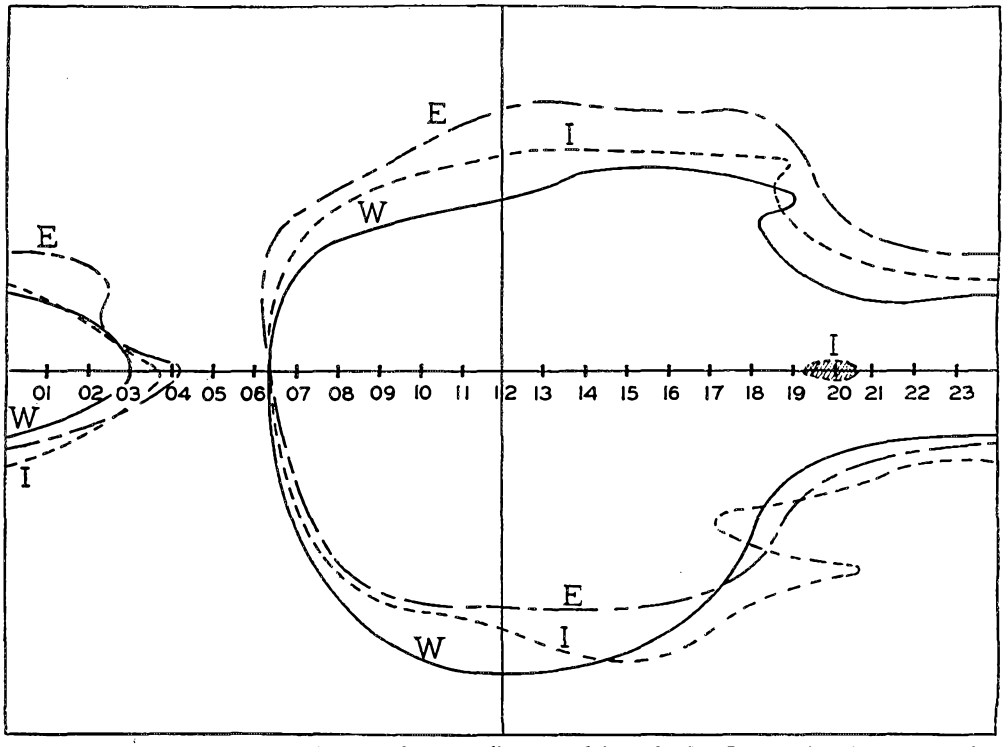


Fig. 2 — The 30-megacycle F_2-4000 m.u.f. contour lines traced from the CRPL prediction charts for April, 1947. The contours for the three zones are superimposed on the same chart so that 10-meter predictions the world over can be observed at a glance.

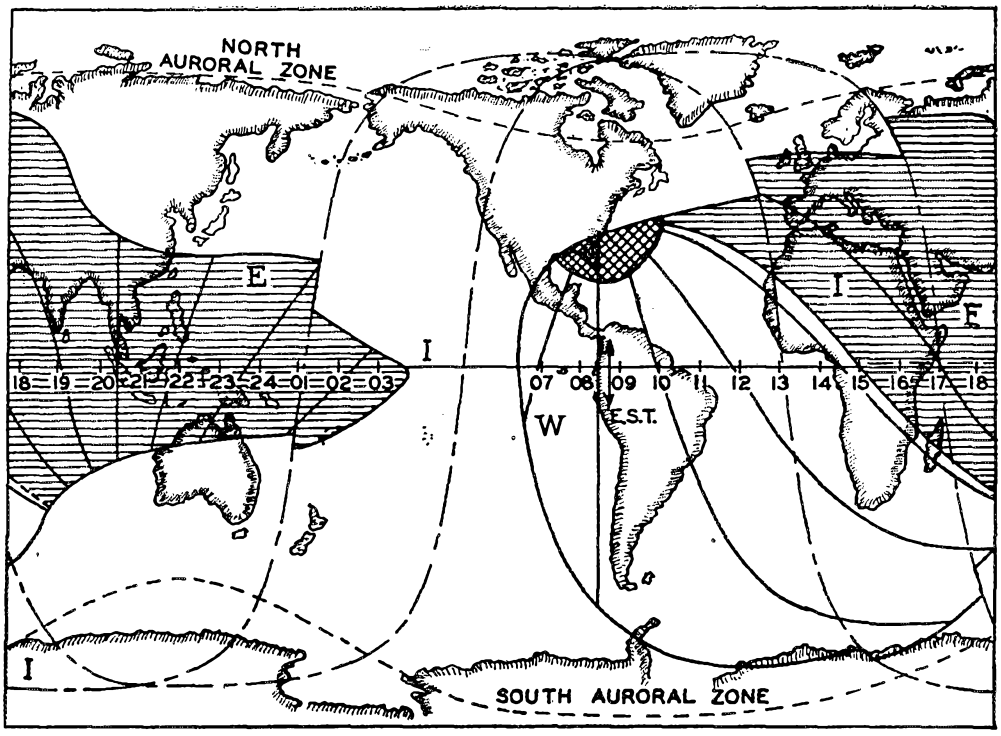


Fig. 3 — Conditions, as predicted by the charts, at 8:40 A.M. EST, during April, 1947. The white area that also encloses the lower portion of the home-station control area represents the part of the world that is "open" for 10-meter communication. Shaded areas cannot be worked over the short great-circle route, but are "possible" by the long path.

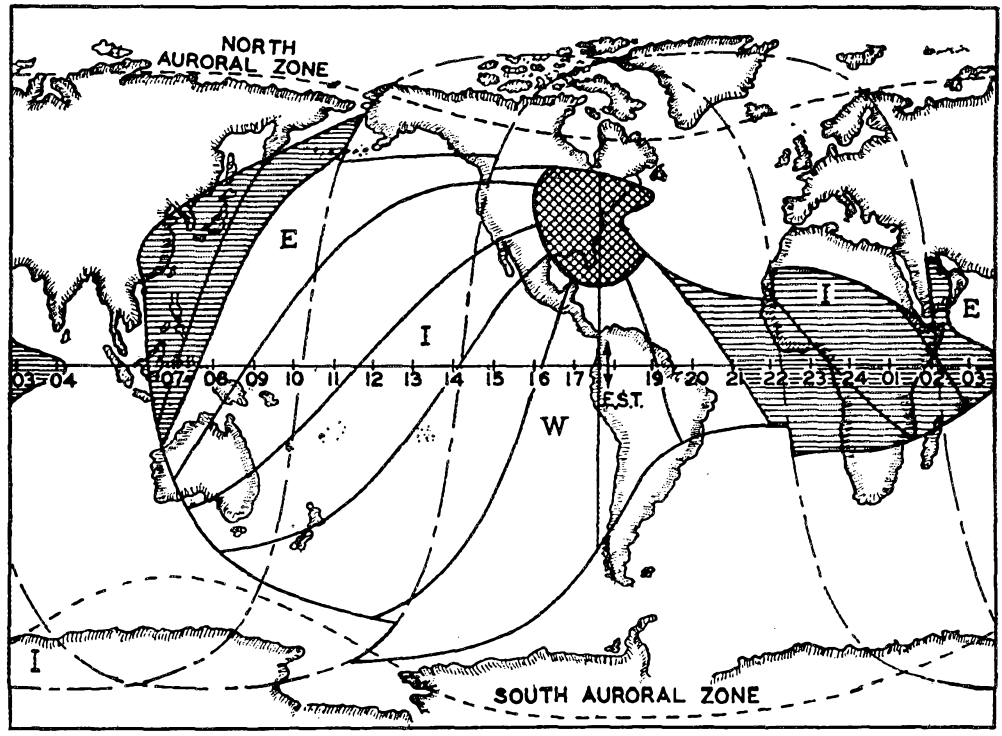


Fig. 4 — Corresponding to Fig. 3, but for 5:50 P.M. during April.

parent chart in the manner outlined below. These figures correspond with those shown as Figs. 5, 6, 7 and 9 of the February, 1946, *QST* article,[1] except in size.

Constructing the Basic Map

Upon the world chart, Fig. 1 of the CRPL publication, draw in heavy black lines a series of six great-circle paths passing through the location of your station and extending from this location to the borders of the chart in each great-circle direction at 30-degree angles around the compass. This is done by means of the great-circle graph, Fig. 2 in each issue of the CRPL publication (see Fig. 6 of the February, 1946, *QST* article[1]), as follows: Upon a sheet of tracing paper or thin transparent paper approximately the size of the CRPL Fig. 2, trace from that chart the Equator and three perpendicular lines corresponding to the points of convergence of the great circles on that figure. On the center vertical line, from the world chart, CRPL Fig. 1, mark as accurately as possible the location of your station. Using a 30-60-90-degree triangle, draw short lines passing through the location of the station at 30-, 60- and 90-degree angles to the perpendicular line. Great-circle paths are next drawn in by moving the tracing paper horizontally (maintaining coincidence between the Equator lines) and drawing each of five great-circle paths which pass through the location of your station tangent to the short 30-60-90-degree lines previously drawn in, using the closest great-circle paths of CRPL Fig. 2 as guides. The perpendicular lines represent the sixth great circle running due north and south through the location of your station. From right to left, these great-circle curves, including the perpendicular lines, represent bearings from the station location of zero through 360 degrees at 30-degree intervals.

Next, on each great-circle path, distances 2000 kilometers each side of the home-station location are spotted from the dot-dash lines of Fig. 2 of the CRPL publication. These points are then connected by a smooth curve to outline the control area, 2000 kilometers (1250 miles) in radius.

The curves and the control area are next transferred to your basic world chart, making certain that the locations of the home station and the Equator are properly positioned during the transfer.

Because of the type of world-chart projection used, the periphery of the control area will not be a circle but will take the shape of an egg or a spinning top with its point toward the Equator. The Equator on this world chart should be drawn in as a heavy horizontal black line from border to border. Also, the central meridian of the time zone in use at the amateur's station, e.g. 75, 90, 105 or 120 degrees for Eastern, Central, Mountain or Pacific Standard Time, respectively, should be drawn in as a short, heavy vertical black line at the Equator, for use in reading time from the time scale on the transparent chart to be described later. It will be found convenient to color the land areas on the world chart using different colors (light red, green and blue are recommended) for the land areas falling in the *E*, *I* and *W* portions of the world chart. The chart thus constructed can be used as a basic chart for predictions from month to month thereafter at various amateur frequencies, and for these reasons it is best to mount this basic chart upon heavy cardboard or upon a piece of smooth wood, using vegetable glue or similar adhesive.

Incidentally, this basic world chart with its great-circle paths will be a good guide to the direction in which that rotary beam should be pointed to make the DX contacts predicted from the charts.

Prediction Charts

To be used with the basic chart, a transparent chart is prepared, preferably upon a roughened cellulose (although thin white tracing paper may be used), by tracing in part from Figs. 6, 8 and 10 of the CRPL publication. A permanent horizontal line representing the Equator is traced in ink on the transparent chart and a permanent horizontal scale of hours, also obtained from the same figures, is entered on the chart, most conveniently along the Equator line. Upon the transparent chart there are traced, from the F_2-4000 charts of the CRPL publication for the month for which predictions are desired, "contour" lines corresponding to the amateur frequency which is in use, or the high frequency of the band in use (e.g. 30 megacycles for 10 meters). These "contour" lines should be traced from the *E*, *I* and *W* F_2-4000 charts, preferably in colors corresponding to those used upon the basic chart for the land areas lying in the *E*, *I* and *W* zones respectively. Contour lines for succeeding months can be transferred to the transparent chart after erasing such lines for the previous month, if traced with pencil. Or, if it is desired to know "conditions" for several months in advance, several transparent charts can be prepared for use with the one basic world chart.

Making Predictions

Once constructed, the charts are easily kept current and easily used. In use, the two charts are always positioned vertically so that their horizontal Equator lines coincide. For this purpose guides may be associated with the basic world chart which will permit the transparent chart to be moved only in a horizontal direction.

The transparent chart is slid horizontally so that the contour area outlined thereupon first touches, then overlies and later passes out of contact with the periphery of the control area on the world chart. The proper *E*, *I* or *W* contour

areas for the zone in which the control areas lie should be used, of course. The band begins to open up at the time of first contact between the contour area and the control area, and remains open until there is no further contact between these two areas; time is read from the transparent chart, using the time scale along the Equator at the point which coincides with the vertical line on the world chart corresponding to the central meridian of the time zone at the amateur's location.

World areas that can be contacted during the period that the band is open, as worked out above, can be read directly from the charts. Since radio signals travel by great-circle paths, and since propagation is primarily controlled by the condition of the F_2 layer at the control points, it is only necessary to ascertain when the control points along these paths, i.e., a first point on the periphery of the control area and any other second point along that great-circle path, become effective at the desired frequency, to ascertain what can be worked along that path 1250 miles beyond the second control point. In other words, by means of the two charts, the time at which the first control point on any great-circle route becomes effective, and the location of all second control points along that great-circle route, are presented visually to permit a quick answer to the question "What are present conditions?"

Allowance should be made for the zones in which the control points are located, using the proper contour areas for each zone (e.g., the control points for red, blue and green land areas should fall within the red, blue and green contour areas). Additionally, it should not be overlooked that land areas 1250 miles beyond the contour areas *along great-circle paths* may be worked as long as both control points fall within the proper contour areas for each zone.

The use of the charts is much simpler than any instructions as to how they are used, and Figs. 1, 2, 3 and 4 of this article may illustrate this. Fig. 1 shows the basic world chart constructed as outlined above for an amateur station located in Washington, D. C. The control area is shown in close-ruled lines and great-circle paths at 30-degree intervals are shown. A vertical line corresponding with the 75th Meridian West is used for reading time along the time scale on the transparent chart. Fig. 2 shows the transparent chart with 30-megacycle contour lines for the *E*, *I* and *W* zones for the month of April, 1947.

Correlation of 30-Megacycle Predictions and Observations at W3KTR for Washington, D.C.

Date (1946)	*Station*	*Location*	*Predicted Open Period*	*Time (EST) Heard or Worked*
Oct. 5	G5JY	Birmingham, England	0730 — 1340	0826
5	D4AIW	Germany	0730 — 1300	0831
5	PAØWJ	Holland	0730 — 1310	0838
6	ZS2AZ	East London, S. Africa	0600 — 1530	0735
6	ZS1BV	Capetown, S. Africa	0600 — 1530	1508
13	VU2AQ	Bombay, India	0930 — 1020	1010
13	K6OQE	Honolulu, Hawaii	1100 — 1940	1216
17	LU7BU	Buenos Aires, Argentina	0710 — 1810	1737
26	FA8DX	Algeria, N. Africa	0620 — 1220	1047
Nov. 3	G8MX	Herts., England	0640 — 1240	0738
3	LA8C	Oslo, Norway	0720 — 1100	0844
3	D4AAC	Frankfort, Germany	0650 — 1145	0923
3	PAØDR	Holland	0700 — 1200	0918
9	ZS1BC	Capetown, S. Africa	0550 — 1620	0638
9	PZ1A	Dutch Guinea	0600 — 1700	0703
20	F7AA	Paris, France	0630 — 1250	1207
20	HC1FG	Quito, Ecuador	0650 — 1800	1420
23	KH6GH	Hawaii	1050 — 1920	1841
27	GW5VX	Glam., S. Wales	0640 — 1250	0652
Dec. 8	G6GF	Lincs., England	0740 — 1140	0744
8	D4APN	Nr. Frankfort, Germany	0740 — 1110	0749
14	XAFM	Naples, Italy	0715 — 1120	0743
22	HC1FG	Quito, Ecuador	0730 — 1720	1201
22	G4KY	London, England	0740 — 1140	0825
27	PAØNO	Maassluis, Holland	0740 — 1100	0750
28	SM7SV	Sweden	0810 — 0930	0825

The numerals along the Equator constitute a "local-time" scale, and can be read directly as Washington time using the 75th-meridian vertical line on the basic chart. Fig. 3 shows the basic and transparent charts superimposed at 8:40 A.M. while Fig. 4 shows the same charts superimposed at 5:50 P.M. From these figures, "conditions" on ten meters at these hours can be easily observed and DX contacts can be predicted readily. With the actual charts, the times at which various world areas come in and go out can be predicted with considerable accuracy.

Areas falling within the contour lines and designated by horizontal rulings are "visible" but not "workable," since great-circle paths passing through these areas do not enter the home-station control area at a point falling within the contour lines. However, it may occasionally be possible to work these areas by the *long* great-circle paths, as may be seen by a study of the charts, and it is probable that this accounts for statements occasionally heard over the air going something like this: "I worked into the Philippines off the back of my beam, and at 8:30 in the morning! Imagine that!"

Reliability

General correlation of predicted "conditions" and stations heard or worked on 10 meters over a period of several months late in 1946 is shown in the accompanying table. This table compares predictions made in the manner described above with actual observations from the author's amateur station located near Washington, D. C. Differences in predicted "open" periods from

(Continued on page 140)

A Low-Cost 2-Meter Transmitter

Improved Transmitter Performance for the Beginner and Low-Power Enthusiast

BY EDWARD P. TILTON,* W1HDQ

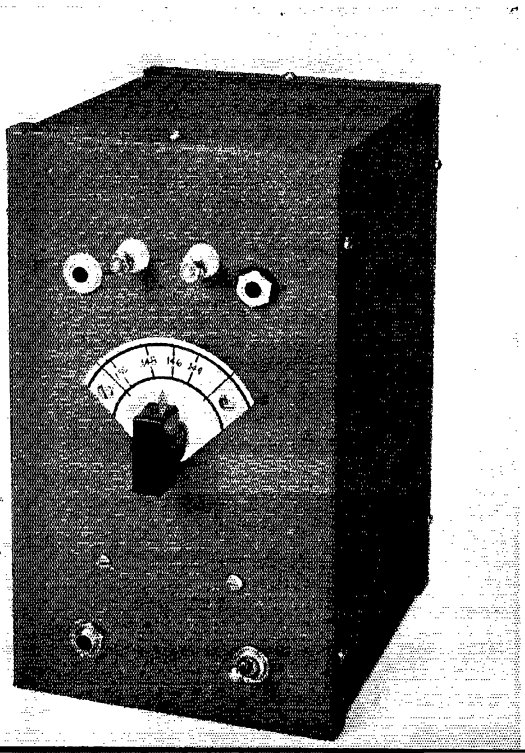
• It's a workaday world, and many amateurs can only dream their designs of crystal-controlled or MOPA 2-meter rigs to come, while at the same time they must struggle along with low power and modulated-oscillator budgets. In this day of v.h.f. refinement there is, however, a ray of hope for this deserving and well-intentioned group — the stabilized modulated oscillator. The little job described puts out a vastly better signal than the majority of the simple rigs now in use on 144 Mc., and its war-surplus tubes and low-cost components keep the total cost under $20.00, down to the last nut and bolt.

INSTEAD of berating the modulated oscillator, and complaining about the admittedly poor quality of many of the signals heard currently on 144 Mc., why not give us some simple rigs that will put out the kind of signal you want to hear on the band?" This query, in various forms, has been cropping up with increasing frequency in correspondence received at Headquarters recently. Many ask for descriptions of simple MOPA rigs using low-cost tubes, while others would like to know how to stabilize the modulated oscillator, but nearly all have a common aim: something simple and inexpensive which will sound better than the you-know-whats that are cluttering up the band today in most locations.

The answer is not easy; the construction of a good MOPA, for instance, requires a lot more than merely the construction of a simple triode oscillator driving a triode amplifier. Even back in the pre-1938 days on 56 Mc. this technique was found to be ineffective. It is utterly useless on 144 Mc. In such a set-up, where no buffer stage is employed, the oscillator *must* be lightly loaded. There must be an excess of drive, so that the final stage can be coupled only loosely to the oscillator, otherwise the degree of frequency modulation will be, to all intents and purposes, just as bad as though the oscillator were modulated directly. Only by using a high-*C* oscillator employing a good-sized tube, loosely coupled to a beam-tetrode amplifier requiring only a small amount of grid drive,[1,2] can a reasonable degree of stability be attained. This method is just about as costly as crystal control, and the latter is much to be preferred.

What Makes a Signal Bad?

Frequency modulation, in itself, is not particularly harmful in moderate amounts, for properly-controlled f.m. can be copied on even the sharpest receivers. It is the tendency of most modulated-oscillator rigs to jump frequency when the audio is applied, which renders them unreadable on selective receivers. Many oscillators also suffer from excessive a.c. hum, resulting from the use of a.c. on the filaments of instant-heating tubes. The greatest evil in most oscillator rigs in use on 144 Mc. is their inability to maintain oscillation at low plate voltages. Many which run



Front view of the simple 144-Mc. transmitter. The jacks at each side of the antenna terminals are for insertion of a meter in the oscillator grid (left) and plate (right) circuits. The microphone jack is at the lower left and the on-off switch is at the right. The calibration scale is drawn with India ink on heavy white paper.

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

[1] "Stabilizing the 144-Mc. Transmitter," Grammer, April, 1946, *QST*.

[2] "A V.H.F. Amplifier Using the 829," March, 1946, *QST*.

♦

at 300 volts on the plate stop oscillating when the voltage is reduced to 150 or less. It is easy to see what happens in such a set-up when anything over 50-per-cent modulation is attempted! This condition results from insufficient excitation, as evidenced by low grid current when the oscillator is coupled to a load. *Grid current*, not plate current, is the important reading, in oscillators as well as amplifiers, but how many 2-meter oscillators will show the grid current recommended for the tubes used? Try it on yours, and see for yourself!

The Remedies

The cure for all these ills is crystal control. Let us start out on the assumption that there is no really satisfactory substitute, if one is interested in radiating a first-class signal. But for the man who wants to get on 2 "quick and easy," there certainly is something better than the barely-intelligible lopsided gurgles currently heard on the band!

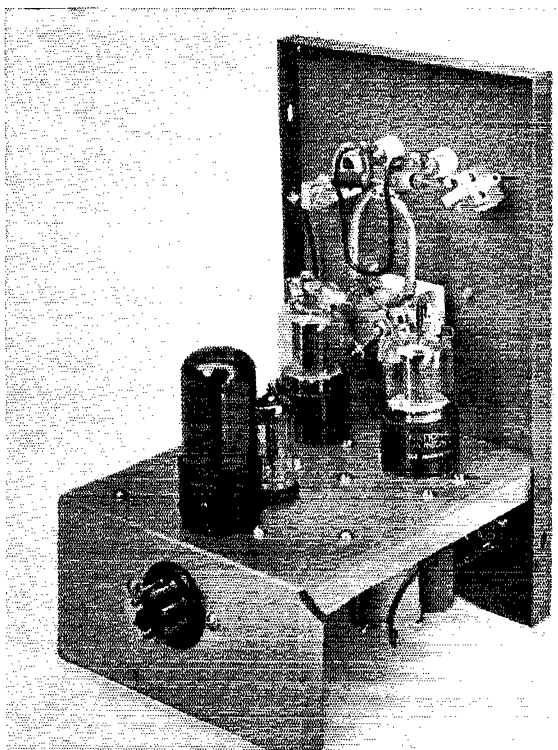
Modulation is simply a process by which the plate voltage of a radio-frequency stage (oscillator or r.f. amplifier) is varied at an audio rate. It is obvious, therefore, that the oscillator must not change frequency too greatly when its plate voltage is varied, if it is to put out a readable signal. A frequency-voltage run on a low-*C* oscillator may show a frequency change of a megacycle or more with only moderate changes in supply voltage. The cure for this is the high-*C* oscillator, with some provision for keeping the excitation up to a value sufficient to maintain strong oscillation under load. The disadvantage of the high-*C* set-up is, of course, its lowered output, but by employing push-pull we can use a lower value of *C* than with single-ended stages and still get moderately-good stability, and the output comes up noticeably compared to single-ended rigs in the same power class.

A.c. hum is bound to result when filament-type tubes are operated from an a.c. source, unless an adjustable center-tap resistor is placed across the tube filaments and the a.c. potential carefully balanced to ground. Even this is not a complete cure, and it has the further disadvantage that it renders the oscillator unsuitable for portable or mobile operation from a storage battery. The simplest cure is the use of heater-type tubes for the oscillator, and the little 2C22s employed are a very inexpensive solution. They are available in tremendous quantities, at low cost, on the surplus market. The 2C22 (also known as the 7193) was produced for i.f.f. equipment that operated in a frequency range just below 200 Mc. It has an element structure similar to the 6J5, but its plate and grid leads come out of the top of the envelope, making it especially suitable for v.h.f. applications.

The excitation problem was solved by resurrecting an old friend of the early days on 5 — the "unity-coupled" oscillator. There is grid excitation to spare, as a result of the grid coil being run inside the plate coil, and this push-pull oscillator shows the rated Class C operating conditions for the tubes, as to grid current and bias, when the oscillator is loaded for maximum output. It remains in oscillation until the plate potential is reduced to 22 volts, and over a voltage range equivalent to 75-per-cent modulation the frequency change is only about 100 kc. The frequency stability under high positive-voltage peaks is very good, and though the frequency changes rapidly below 50 volts, the power radiated on negative modulation peaks is so low that the resultant frequency modulation is of little consequence. The result is a signal that is readable on any receiver having a pass-band of 100 kc. or more.

Constructional and Circuit Details

This transmitter is designed for use with a plate supply of 250 to 300 volts, making it ideal for portable and mobile operation with the popular sizes of vibrator or genemotor supplies. For home-station use, a small power supply, capable of delivering 275 volts at 100 ma. and 6.3 volts at 1.5 amperes, is required. The unit is housed in a utility cabinet 5 × 6 × 8 inches in size. Its design is characterized by rugged mechan-



Back view of the 2-meter transmitter, showing the symmetrical arrangement of components. Note that the "U"-shaped tank inductance is mounted directly on the stator terminals of the butterfly tuning condenser.

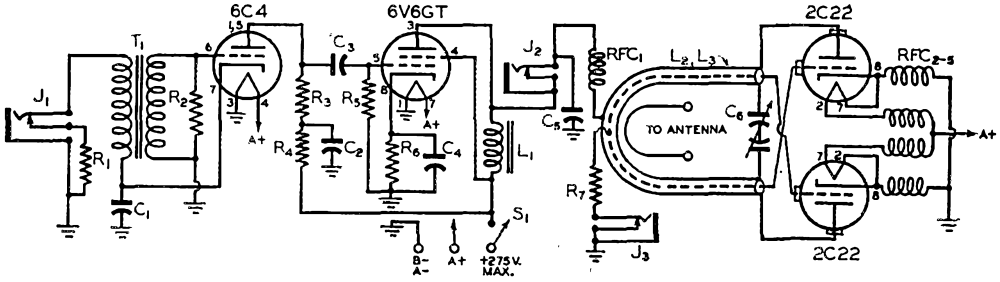


Fig. 1 — Schematic diagram of the simple 144-Mc. transmitter.

C_1, C_4 — 10-μfd. 25-volt electrolytic.
C_2 — 8-μfd. 450-volt electrolytic.
C_3, C_5 — 0.01-μfd. 600-volt paper.
C_6 — Butterfly variable (Cardwell ER-14-BFS modified; see text).
R_1 — 470 ohms, 1 watt.
R_2 — 0.33 megohm, ½ watt.
R_3, R_4 — 5000 ohms, 5 watts.
R_5 — 0.47 megohm, ½ watt.
R_6 — 680 ohms, 1 watt.
R_7 — 10,000 ohms, 1 watt.
L_1 — Midget filter choke.
L_2, L_3 — Unity-coupled grid and plate coils. See text and Fig. 2.
J_1, J_2, J_3 — Closed-circuit jack.
RFC_1 — No. 28 d.s.c. wire, close-wound on 1-watt resistor, ¼-inch diam., ⅝ inch long.
RFC_2, RFC_3, RFC_4, RFC_5 — 20 turns No. 20 d.s.c. wire close-wound on ¼-inch polystyrene rod.
S_1 — S.p.s.t. toggle switch.
T_1 — Single-button microphone transformer (UTC "Ouncer" — surplus).

ical construction, making for good stability under mobile conditions.

Four tubes are employed: a 6C4 speech amplifier, a 6V6GT modulator, and two 2C22s as oscillators. The only elements of novelty are the means of obtaining the microphone current, and the mechanical construction of the oscillator tank circuit. No battery is needed for microphone current, this being obtained by running the cathode current of the speech amplifier through the microphone transformer. The 6C4 cathode is by-passed with a large electrolytic condenser. The plate circuit of the speech amplifier is decoupled and by-passed with a large-value electrolytic, C_2, to reduce hum. Since the 6C4 stage is used principally as a means of providing current for the microphone, resistance coupling is employed, this providing more than adequate gain for a single-button microphone.

The unity-coupled tank circuit is made of 3/16-inch copper tubing, bent into a "U" which is two inches long over all. The ends of the "U" are made into spade lugs, as shown in Fig. 2, the slotted ends providing a means of inductance adjustment in case the tank circuit turns out to be other than exactly the correct length. The lug ends are fastened directly to the terminals of the butterfly-type tuning condenser, C_6, being held in place by the nuts which are a part of the condenser terminal assembly. Part of the "U," at the curved end, is cut out with a hack saw or file, to provide an opening for the center-tap of the grid coil. An easy way to make the grid coil is to cut two pieces of insulated wire (it should have good quality insulation) about four inches long, and feed them into the "U" through the center opening. The center-tap is made by twisting the cleaned ends of the wires together before insertion into the "U." The protruding center-tap should be covered with household cement after the grid resistor is soldered on, to keep it in position and prevent its shorting to the plate tank. Note in Fig. 1 that the grid leads are transposed as they come out of the open ends of the "U." The 2C22s will not oscillate if the polarity of these leads is wrong.

The plate leads may be of ¼-inch copper braid, or of copper ribbon, which is even better. These are fastened to the two other stator terminals of the butterfly condenser. If braid is used, it may be made solid at the end by flowing solder over the last half inch, after which a hole may be drilled in the solder-impregnated portion, to pass the stator terminal screw.

The butterfly tuning condenser, C_6, is a standard unit, and may be used in its original form, provided the tank circuit is made exactly correct

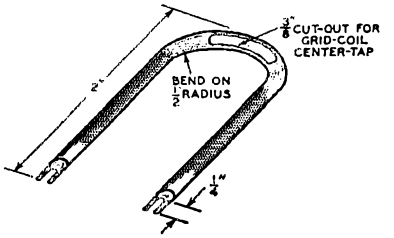
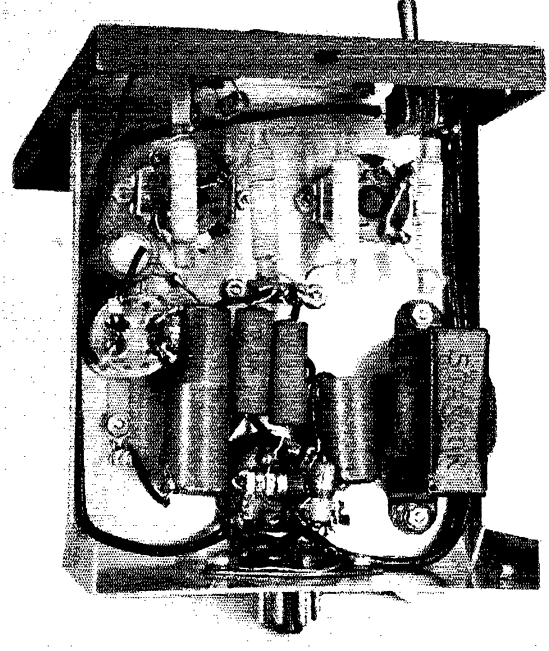


Fig. 2 — Detail drawing of the oscillator plate inductance. It is made from 3/16-inch copper tubing, bent into a "U" shape. Ends of the "U" are formed into spade lugs, the slots in which provide a means of slight inductance adjustment. It is mounted directly on the stator terminals of the tuning condenser.

in size. In the final model we altered the condenser slightly, to give more tuning range and make the size of the tank coil less critical. One of the circular rotor plates was removed and cut to form



Under-chassis view shows the four heater chokes and audio components. The small round object, left center, is the microphone transformer, a surplus midget unit. The audio choke is at the right.

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an additional butterfly rotor plate, making the minimum capacity somewhat lower. The result is a tuning range of about 142.5 to 150 Mc., with the 2-meter band approximately in the middle of the range. The condenser rotor shaft is equipped with a tension-adjusting nut which may be set tight enough so the rig will not be jarred off frequency in the course of any normal handling.

Heater-circuit chokes were found to be necessary, the stability and output being far better after they were installed. They are not critical, however, and may be made readily by winding No. 20 wire on a ¼-inch form, which may be either polystyrene or bakelite. The forms are drilled at each end with a hole just large enough to pass the wire, and the leads themselves are stiff enough so that no mounting brackets are required, the chokes being mounted directly on the tube sockets.

Provision is made for reading both plate and grid current, two meter jacks being mounted on the panel, at each side of the plate tank. Their terminals make convenient mounting places for the grid resistor, R_7, and the plate-circuit r.f. choke, RFC_1. Note that the jacks are connected so that the meter leads need not be reversed, when changing from one jack to the other. The plate-meter jack must, of course, be insulated from the metal panel.

Watch That Grid Current!

Since the grid is the controlling element in the operation of a vacuum tube, it stands to reason that the grid current is a most important reading in a Class C stage, whether it be amplifier or oscillator. This is particularly true of oscillators, though this fact is overlooked by many workers and ignored by most texts. The plate current is a fair indication of the operation of a Class C amplifier, but it is almost entirely useless in the case of an oscillator. It is impossible to tell, from the plate current, when the antenna loading is adjusted properly on most oscillator rigs, but the grid current will provide a sensitive indication. It also shows plainly whether the oscillator is functioning correctly. If the grid current and bias are normal under load, the plate current can be ignored, except to see that the input is not excessive for the tubes used.

When this transmitter was first tried it was found to be drifting badly when anything over 200 volts was applied to the plates of the oscillator. A check of the grid current showed that it was running excessively high, so the 5000-ohm grid resistor originally employed at R_7 was replaced with a 10,000-ohm resistor. The grid current was then about 8 ma., with a dummy load connected across the antenna terminals. Drift was then very low, at plate voltages up to 300, and twice the input could be run without serious frequency drift. The grid current serves as a sensitive indication of antenna loading, and the position of the "U"-shaped coupling loop should be adjusted so that the grid current is approximately 8 ma. for best stability and output. The plate current need be measured only to determine how much input is being run; it is of little or no value in determining the correct loading. It will run about 60 ma. with a 275-volt supply.

The oscillator frequency may be checked with Lecher Wires, or by listening to the signal in a calibrated receiver. In either case there should be a load across the antenna terminals, as the frequency may be appreciably different between loaded and unloaded operation. A rough calibration is shown in the front-view photograph. The approximate pointer settings for the two edges and the middle of the band are indicated, and the maximum and minimum settings of the butterfly condenser are shown by the two marks which are separated by 90 degrees. This calibration scale was made in rough form in pencil and then drawn over with black India ink. It is glued to the panel, and further held in place by the condenser mounting nut and two small screws.

Several members of the Headquarters staff, when looking over this little rig for the first time, have asked, "Where is the gain control?" The answer is, of course, that there isn't any. With a single 6V6 used as a modulator for an input of 10 to 18 watts, there is no occasion for backing off on the gain, and a half-watt carbon resistor, R_2, across the microphone transformer, is much cheaper.

(Continued on page 180)

Gain *vs.* Element Spacing in Parasitic Arrays

An Experimental Study of Three- and Four-Element Beams

BY R. G. ROWE,* W2FMF

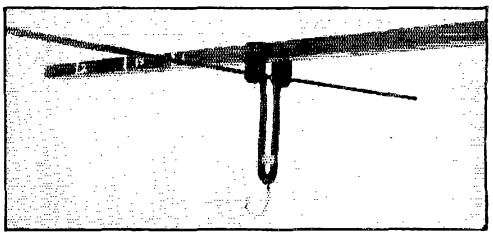
• Antenna measurements, to be of any significance, require a great deal of care, special equipment, and knowledge of the factors that can cause the measurements to be in error. This article gives the results of measurements intended to bring out the relationship between gain and spacing in parasitic arrays, under controlled conditions and with a technique that is completely described. Wider spacing than is commonly used is shown to give greater gain.

RECENTLY a limited amount of data has been published on the advisability of using wide *vs.* close spacing in multielement parasitic antenna arrays in order to realize maximum forward-gain capabilities.[1, 2] In the prior art, an article by G. H. Brown develops the theory of parasitic arrays and gives gain figures for combinations employing a single parasitic element in coöperation with the driven element.[3] This article has formed the basis for the design of the close-spaced parasitic arrays that have been so enthusiastically received by the amateur radio fraternity.

A graph has been published showing the maximum realizable gain of an array comprising a single parasitic element either as a director or reflector.[4] According to this, maximum forward gain may be attained in a two-element beam (driven element plus single parasitic element) when the parasitic element is acting as a reflector and is spaced 0.15 wavelength from the driven element, or when the parasitic element is acting as a director and spaced 0.1 wavelength from the driven element. With the parasitic element as a reflector, power gains in the order of 5.4 db. are indicated; whereas, with the parasitic element acting as a director, power gains of 5.7 db. are shown.

Upon the last two references has been based the assumption that the published design data may be applied exactly to three-element parasitic arrays (driven element plus single reflector and single director) for maximum forward gain, whereas the references properly avoid any such claim. For years many amateur radio operators have retained close spacing, believing that it will provide the highest forward gain. A certain percentage has used wider spacing, feeling that the so-called disadvantages of high *Q*, narrow bandwidth and difficult adjustment of the close-spaced array were not worth the claimed additional gain. Some of the earlier articles concerned with three-element beams showed spacing of 0.1 wavelength for the reflector and 0.15 wavelength for the director. Later articles showed reversed parasitic-element spacing, but of the same order of magnitude.

Because the theory of parasitic arrays having more than one parasitic element has not been developed -- or, at least, published — for the cases of most interest to the amateur, experimental results apparently constitute the only available source of information on the question of wide *vs.* close spacing. While a few scattered results initially may be viewed with skepticism, more and more published data eventually will resolve the question for practical purposes. It is with the thought of adding to the fund of empirical information that the present article is written.



The antenna element with its coupling link. The center of the link is grounded to the amplifier chassis by means of the flexible braid at the center of the turn.

To aid, rather than confuse, contemporary experimenters, any published information should include details of the experimental apparatus and procedures employed. The imaginary or real weaknesses of the apparatus and procedures should be pointed out and discussed in order to set the limits of validity and to simplify the job

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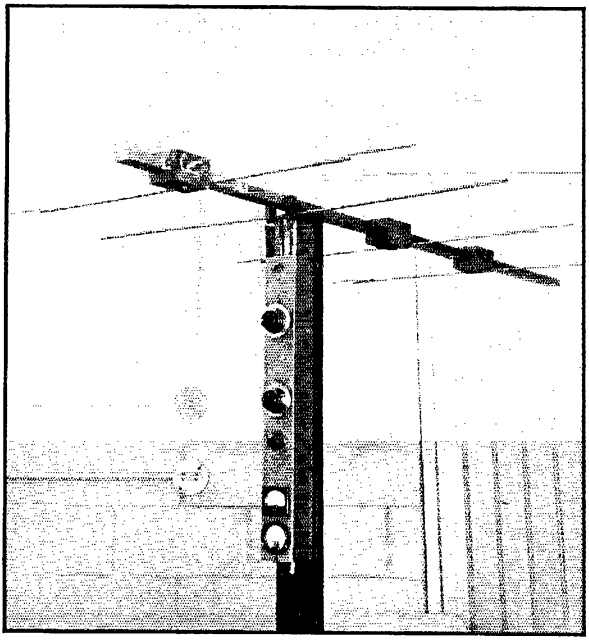
[1] D. Whittemore, "Quarter-Wave *vs.* Close-Spaced Beams," *CQ*, February, 1946, p. 12.

[2] E. P. Tilton, "The World Above 50 Mc.," *QST*, June, 1946, p. 58.

[3] G. H. Brown, "Directional Antennas," *Proc. I.R.E.*, January, 1937, vol. 25, p. 78.

[4] *The A.R.R.L. Antenna Book*, "Parasitic Arrays," p. 66.



The transmitting test set-up, showing four elements in place in the antenna assembly. The power amplifier is mounted in a shield box and inductively coupled to the driven element. Excitation for the amplifier is fed through the coaxial fitting at the bottom of the shield.

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of subsequent experimenters. With this in mind, the writer will outline apparatus, procedures and results in experiments concerned only with the forward gain of wide *vs.* close spacing in parasitic arrays.

Method of Signal Generation

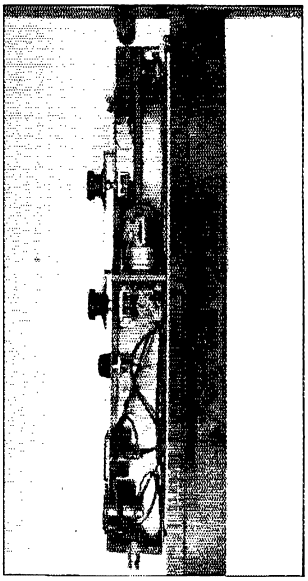
In the following described experiments a self-excited oscillator coupled to a neutralized power amplifier with a parallel-rod tank circuit was utilized as the signal source. The rod tank circuit was shunted at its high-impedance end with a butterfly capacitor for resonance adjustment. The 815 power amplifier was operated at a constant plate power input of some 35 watts and at constant grid current. Plate power input was controlled by load coupling adjustment. In initial experiments a General Radio Type 857-A 95- to 525-megacycle oscillator was used to excite the antenna arrays, but the plate-current rise with load was negligible in this oscillator, making the determination of plate power input impracticable. While an attempt was made to use a grid-dip meter, which was more sensitive to oscillator loading, direct oscillator-to-load coupling was abandoned because of the added difficulty of adjustment and the instability of frequency with variation in reactive loading. Because the General Radio oscillator output is limited, it was found necessary to substitute an 815 parallel-rod oscillator to provide sufficient power-amplifier grid excitation.

After a period for thermal stabilization, the output frequency was continuously monitored and held constant at approximately 140 megacycles by use of a General Radio Type 720-A heterodyne frequency meter.

Method of Antenna Coupling

The antenna was coupled directly to the parallel-rod tank circuit of the shielded power amplifier by a loop at its center, as shown in one of the photographs. The loop was cut from 1/16-inch-thick copper sheet and made one-half inch wide. This method was decided upon to minimize standing-wave losses which probably would have occurred in a feed line, as well as to eliminate impedance-matching problems. Originally it was believed that this method of feed was desirable in that a variety of low driving-point impedances is encountered.

To permit this method of feed it was necessary to construct the power amplifier vertically in a 2¾ × 2¾ × 27-inch copper shield box, as shown in the photograph. The long dimension of the box is at right angles to the plane of the array. This configuration minimizes the amount of metallic conductor spanning the plane of the electric vector of the field and minimizes the required change in antenna length resulting from the introduction of the metal box. However, it is believed that the metal shield box has no effect on the length of the parasitic elements, as might have been the case had the long dimension of the



A view inside the amplifier unit. The tube is an 815 with a linear plate tank circuit. The antenna pick-up-loop coupling is adjustable by means of a through-bolt operated by the wing nut at the top of the shield.

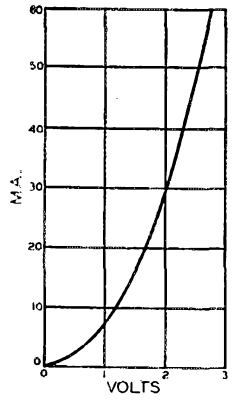
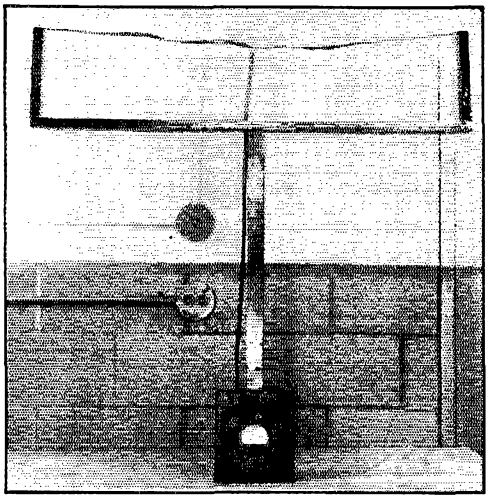


Fig. 2 — Relationship between voltage and current in a germanium crystal diode.

box been lying in the plane of the array at right angles to and bisecting all of the elements.[5] Because of the possibility that the metal shield might affect the required length of the antenna element in the array, and because the coupling-loop reactance will affect the antenna-element length, no attempt has been made to correlate the length of the parasitic elements with that of



The Twin-Lead folded-dipole receiving antenna mounted on a wooden frame above the indicating meter.

the antenna. In each case parasitic-element lengths have been adjusted for maximum forward gain at predetermined spacings.

The vertical power amplifier mounted on its wooden supporting stand, to which in turn was fastened the wooden boom for the array, is shown in another photograph. The parasitic elements were clipped to wooden collars that could be slid lengthwise along the boom to adjust the spacing. All of the elements were made of $\frac{3}{16}$-inch o.d. brass rod and provided at each extremity with friction-fit adjustable ends to permit variation in over-all length. Each brass rod was scribed at half-inch intervals near each end to facilitate length measurement.

Signal-Strength Measurement

For reception, a folded-dipole antenna 39 inches long made from 300-ohm Twin-Lead feed line was used. A $\frac{3}{4}$-wavelength section of the

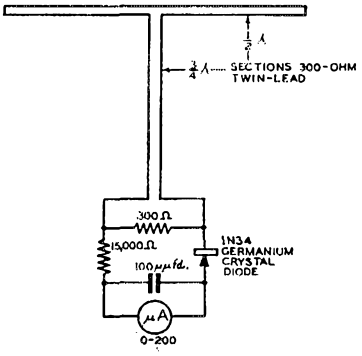


Fig. 1 — Circuit diagram of field-strength indicating receiver using crystal-diode rectifier.

same line coupled the antenna to a 300-ohm 1-watt carbon load resistor across which measurements were made. In initial experiments the circuit shown in Fig. 1 was used, with the series circuit comprised by the 15,000-ohm carbon resistor, the 0–200 microammeter and the 1N34 germanium crystal diode functioning as a voltmeter across the 300-ohm load resistor. Initial db.-gain calculations, based upon voltage ratios in accordance with the formula

$$db. = 20 \log \frac{E_2}{E_1},$$

where E_2 is the measured voltage produced by

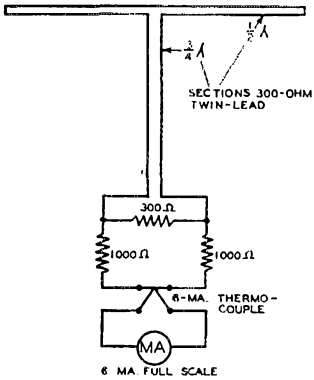


Fig. 3 — Circuit diagram of receiver using vacuum thermocouple.

[5] R. G. Rowe, "New Parasitic Beam Design," *Radio News*, January, 1947, p. 40.

the array and E_1 is the measured voltage produced by a half-wave dipole, were abnormally large, as expected, because of the approximately square-law characteristic of the germanium diode at low impressed voltages, as shown in Fig. 2.

The measuring circuit finally employed, shown in Fig. 3, metered a constant fraction of the current in the terminating resistor through the 1-watt 1000-ohm carbon isolating resistors and the small vacuum thermocouple shown in the photograph. The thermocouple and its associated 0–100-scale meter were calibrated and shown to follow the square law on direct current. This relationship was not measured at the operating frequency of 140 Mc.

Thus the meter reading was proportional to the square of the current in the terminating resistor,

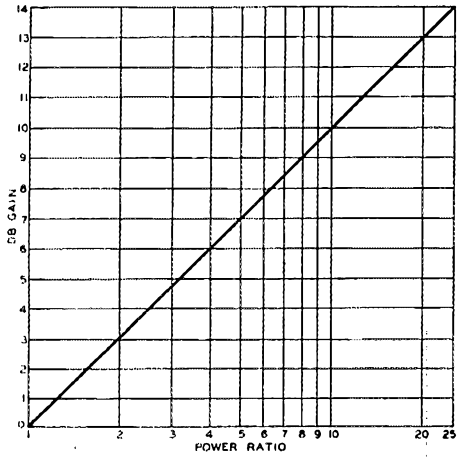


Fig. 4 — Conversion chart, decibels to power ratio.

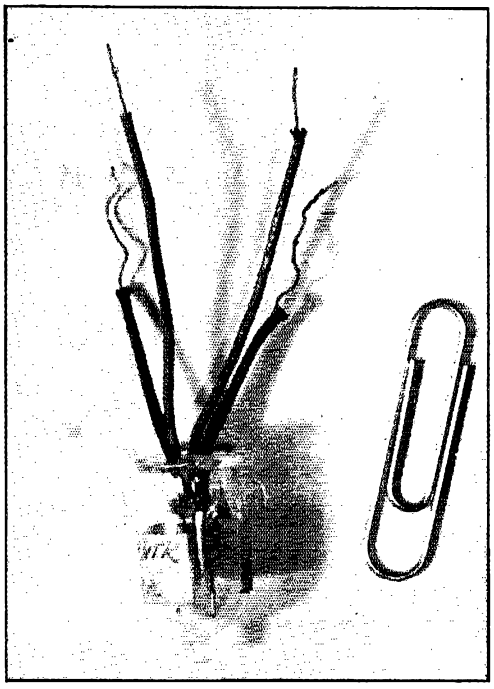
and thus directly proportional to power. Hence, db. gain was calculated according to the formula

$$db. = 10 \log \frac{P_2}{P_1},$$

where P_2 may be the meter indication produced by the array and P_1 that produced by a half-wave dipole or reference antenna. The receiving apparatus is shown in another photograph.

Fig. 4 shows a plot of power ratios, P_2/P_1, against db. for convenience in interpreting the db. gain from the two meter readings or the power ratios. To determine the db. power gain of a particular array over a half-wave antenna, the reading of the meter of Fig. 3 produced by the array is divided by that produced by the half-wave reference antenna. For example, if the dividend were 10, corresponding to a power ratio of 10, inspection of the graph of Fig. 4 indicates a power gain of 10 db.

For the convenience of those not possessing the thermocouple arrangement of Fig. 3, the meter



The six-milliampere vacuum thermocouple used for field-strength measurements.

of Fig. 1 has been standardized against that of Fig. 3. This standardization was performed by shunting both metering circuits across the 300-ohm line-terminating resistor and taking readings on the thermocouple meter as the microammeter reading was advanced in 10-unit steps by increasing the field strength. The resulting plot appears in the graph of Fig. 5. As a first approximation the circuit of Fig. 1 may be employed as the field-strength meter. From the graph of Fig. 5 the relative readings of the 0–200 microammeter may be interpreted in terms of current squared, or power. The resulting power ratio will give db. gain directly from the graph of Fig. 4. Because the thermocouple receiver was not im-

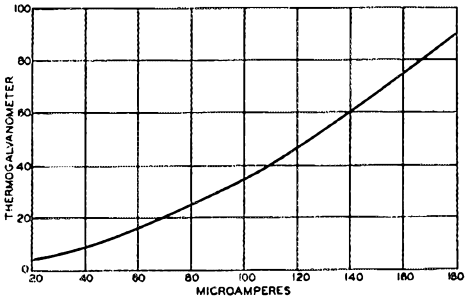


Fig. 5 — Comparison between readings of the receivers shown in Figs. 1 and 3.

TABLE I

Gain with various parasitic-element spacings and lengths, measured with crystal-diode receiver.

Length of Parasitic Elements, Inches			*Spacing of Parasitic Elements, Wavelengths*			*Diode-Type Receiver Readings*	*Db. Gain*
Directors		*Reflector*	*Directors*		*Reflector*		
2nd	*1st*		*2nd*	*1st*			
		Radiator Alone				38	
	40	41		0.1	0.1	90	
	40	42		0.1	0.1	105	
	40	43		0.1	0.1	108	6.5
	39	42		0.1	0.1	92	
	40.5	42		0.1	0.1	100	
	40	42		0.1	0.15	115	
	40	41		0.1	0.15	105	
	40	43		0.1	0.15	120	
	40	44		0.1	0.15	118	
	40.5	43		0.1	0.15	130	7.8
	40.5	43		0.15	0.1	108	
	40	43		0.15	0.1	132	7.8
	39.5	43		0.15	0.1	130	
	39.5	43		0.2	0.1	143	8.3
	40	43		0.2	0.1	130	
	39	43		0.2	0.1	138	
	39.5	43		0.2	0.15	150	8.7
	39.5	42		0.2	0.15	150	
	39.5	42		0.2	0.2	160	9.2
	39.5	43		0.2	0.2	160	
40	40.5	43	0.1	0.1	0.15	115	
39.5	40.5	43	0.1	0.1	0.15	138	
39	40.5	43	0.1	0.1	0.15	135	
39	40	43	0.1	0.1	0.15	146	
39	39.5	43	0.1	0.1	0.15	146	
39.5	39.5	43	0.1	0.1	0.15	150	8.7
39	39	43	0.1	0.1	0.15	143	
40	40	43	0.1	0.1	0.15	145	
39	39.5	43	0.2	0.2	0.2	165	
38.5	39.5	43	0.2	0.2	0.2	170	9.6
38	39.5	43	0.2	0.2	0.2	170	

mediately available, many of the readings were taken on the crystal-diode receiver and later converted as explained under "Experimental Results."

Locale

The measurements were made within a reinforced concrete building in a room 32 feet by 16 feet, with the transmitting and receiving arrays spaced three wavelengths apart. The room contained several large metal cabinets along the walls and a large amount of conduit-enclosed wiring. While it is planned to repeat the measurements out-of-doors when weather conditions permit, employing the several modifications in the apparatus later to be described, it is believed that the present results are reasonably accurate, indicative and worthy of publication at this time, particularly because they fall in line with earlier published results.

Experimental Results

Table I is a chart of field-strength meter readings taken with the diode-type receiver of Fig. 1, with reference to various spacings, number of parasitic elements and length of parasitic elements. Only the highest meter readings for each particular spacing have been converted to indicate db. power gain over the half-wave radiator. This chart represents the results of one test run; other similar runs show a close correlation.

Table II is a chart of field-strength meter readings taken with the vacuum-thermocouple receiver of Fig. 3, with reference to various spacings and number of elements. Only the highest meter readings for each particular spacing are shown. Included in this chart is a column headed "Db. Gain From Table I." This has been inserted to indicate the correlation between these two separate series of measurements. The greatest variation, appearing in the four-element 0.2-wavelength spaced array, is only 0.8 db., or well within experimental error and indicative of the magnitude of the correlation experienced in these measurements.

In order to check the apparatus against the published results on arrays using a single parasitic reflector in combination with a driven element, the field-strength reading of the thermocouple metering apparatus of Fig. 3 was set at 8 on the 0-100 scale of the meter by adjusting the coupling to the reference half-wave radiator alone and noting the amplifier plate power input. A single reflector, spaced 0.15 wavelength behind the radiator, was adjusted in length until a maximum field-strength reading of 24 was obtained at the identical plate power input. This

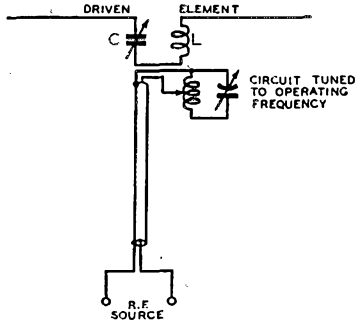


Fig. 6 — Proposed feed system to provide a resistive load on the power amplifier through a coaxial transmission line.

shows a power ratio of 24/8, or 3, which, from the graph of Fig. 4, may be interpreted as a power gain of 4.8 db. The published data for this array show a theoretical gain of 5.4 db. (neglecting element resistance, which would make the actual gain lower), indicating a close correlation between the theoretical and measured power gains.[4] It is worthy of note that in a separate series of tests with two-element beams, employing a single parasitic element either as a reflector or a director, the measured gains correlated closely with theoretical gains in both cases. With the parasitic element as a reflector, the forward gain of the array peaked at a parasitic spacing of approximately 0.15 wavelength; whereas, with the parasitic element as a director, the forward gain of the array peaked at a parasitic spacing of approximately 0.1 wavelength.

TABLE II

Gains measured with thermocouple receiver, compared to published gains and gains from Table I.

Parasitic-Element Spacing			*Meter Reading*	*Ratio with Dipole*	*Db. Power Gain (Measured)*	*Db. Gain (From Table I)*	*Db. Power Gain (Published)*
Directors		*Reflector*					
2nd	*1st*						
Radiator Alone.....8							
		0.15	24	3	4.8		5.4
	0.1	0.15	50	6.3	8.0	7.8	5 to 7
	0.15	0.1	52	6.5	8.1	7.8	
	0.2	0.1	55	6.9	8.4	8.3	
	0.2	0.15	60	7.5	8.8	8.7	
0.1	0.1	0.15	68	8.5	9.3	8.7	7 to 9
0.2	0.2	0.15	83	10.4	10.2		
0.2	0.2	0.2	87	10.9	10.4	9.6	

However, in this particular series of experiments with three- and four-element beams, the highest forward gains were obtained with wider parasitic-element spacing, as indicated in the accompanying tables.

While it is somewhat outside the scope of this article to view the present results in terms of signal improvement, it is well to bear in mind that an increase of 3 db., while representing only a small change in the S-meter reading on a modern communications receiver, may be sufficient to render a signal intelligible through heavy interference. There is another expedient for securing such signal improvement, however, in which an additional advantage obtains. By vertically stacking two close-spaced arrays, such as the Premax RB-6109 beam for example, over-all power gains in the order of 10 db. or more may be realized. By feeding each beam in phase through separate feed lines of equivalent length, 2- to 3-db. gain in addition to the 6- or 8-db. gain of a single beam will result when the top beam is 0.5 wavelength above the bottom beam. Increasing this spacing to approximately 0.6 to 0.7 wavelength will result in somewhat higher forward gain. The added advantage obtains from the fact that either one or both of the beams may be excited, effectively changing the height of the antenna above ground and enabling control of the vertical lobe of the array over a limited angle.

Projected Tests

As previously mentioned, it is expected that a similar series of experiments will be performed out-of-doors in the future, incorporating several modifications. Parasitic-element spacings greater than 0.2 wavelength will be investigated in an effort to determine the spacing at which forward gain begins to drop off.

A crystal-controlled signal source will be employed to obviate the requirement of correcting for oscillator drift and frequency shift with changes in amplifier loading. The various arrays will not be coupled directly to the amplifier, but will be excited through a short coaxial feed line and matching network according to the diagram of Fig. 6. The inductive reactance L of the coupling loop at the center of the driven element will be compensated by the series capacitor C. It was noticed in these experiments, and has been recorded by others, that maximum field strength often did not quite coincide with the minimum plate-current dip of the amplifier plate meter. While this phenomenon can be caused by reactive loading, it has not been determined, by the writer at least, whether this is because of the fact that unity power factor in the tank circuit does not occur at maximum impedance,[6] or because the amplifier grid input impedance varies according to the current-voltage phase relationship in the plate tank circuit of the neutralized power amplifier.[7, 8] The prospective feed system may be adjusted to eliminate the effect because it will provide a resistive load for the amplifier. Removal of the relatively large metal shield box from the vicinity of the antenna element will enable the proper evaluation and correlation of the antenna length with that of the parasitic elements.

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[6] Glasgow, *Principles of Radio Engineering*, 1936 edition, p. 38.

[7] Batcher & Moulic, *The Electronic Engineering Handbook*, 1944 edition, p. 206.

[8] A third possibility is the variation in screen current with plate current. Where the screen is fed from the plate supply through a dropping resistor the screen voltage changes with plate-current variations, resulting in a shift in operating conditions that frequently causes the optimum screen voltage to be reached at a plate-current value higher than that representing resonance. Screen-current variations also cause a change in grid impedance. — *Ed.*

Atlantic City—1947

Part I—How We Got Our Present Amateur Bands

BY A. L. BUDLONG,* W1BUD

• For the amateur who desires to keep himself well informed, this series of articles is must reading. Part I, in this issue,[1] sets forth briefly the facts, figures and dates in the history of amateur frequency assignments, a subject of vital interest to ARRL members as we enter upon the period of another world telecommunications conference. Part II, to follow in May *QST*, will describe how an international conference does business and outline the preparations taken in the U. S. for the Atlantic City Conference, which starts May 15th.

To the average person, Atlantic City is a summer resort, home of the famous boardwalk and site of the "Miss America" beauty contests, located somewhere on the East Coast of the United States. To the average amateur, it is the 1947 location of that periodic nightmare known as an international radio conference, a place where the "commercials" always triumph and where the amateur always gets gypped out of some more frequencies. There is no question about the gypping business because we now have to operate in certain narrow bands whereas once — as the fable goes — we had everything from 200 meters down, all for our very own.

These ideas are firmly implanted in the amateur mind; they are almost universally accepted as basic fact. Were we to say that the international treaty under which we now operate affords us U. S. amateurs precisely the same frequency bandwidths as our very first international allocation, in 1927; that no U. S. law ever gave amateurs an exclusive assignment of all the territory from 200 meters down; and that neither any U. S. law nor international treaty so much as mentioned amateurs or amateur radio until 1927 . . . were we to assert that these are the facts, it would appear that explanations are in order.

And indeed we think they are. Certainly it is true that the average amateur has only a hazy idea of what we ever had, how we got it, why we have international conferences, and how they do business. What we propose to do here, therefore, is to give a brief factual account of amateur frequency assignments, both domestic and international, from the very first days, and to follow with a short description of the hows and whys of an international conference. This is being written in the belief that the information will be valuable to all amateurs and because it is felt it would be more widely read now than at some time when interest in such subjects is not so high.

A History of Amateur Assignments

Why do we have to have international agreements on radio? Broadly speaking, there are three reasons:

1) Since stations of one nation are frequently in communication with stations of another nation, it is necessary to have agreements on such operating details as calling procedure, distress signals, call assignments, methods of collecting tolls on radiograms, etc., unless utter confusion is to be encountered when any two stations try to do business over the air.

2) Because it is possible to operate radio stations throughout a wide range of frequencies, it is necessary to agree in advance where the various services will locate themselves in the spectrum, so that stations will know where to find each other.

3) Since radio signals are not confined to the borders of the country in which they originate, international agreements on allocations to services are also necessary in order to prevent chaotic conditions on the air and hopeless interference between services.

The first two were probably the major considerations in the early radio conferences. The third was not so vital in the early days of radio but

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[1] The substance of this first installment appeared originally in January 1938 *QST*, and has been revised only to the extent necessary to bring it up to date.

today is extremely important.

Pursuant to the international agreements, each nation, both as a matter of common sense and agreement, arranges its own domestic laws so that they conform to the international commitments. Obviously, it would be silly if the various nations, after carefully working out solutions to their problems, disregarded the remedies by permitting the stations within their borders to operate on some entirely different basis.

Now let us trace the course of all the international conferences and all our own national laws to see how the amateur got taken care of as the laws came along. We'll cover the international treaties first, and then cover our domestic (U. S.) radio laws set up under these international treaty provisions.

International Regulation

The very first international radio conference, though it doesn't really belong in this story, was held in

1903

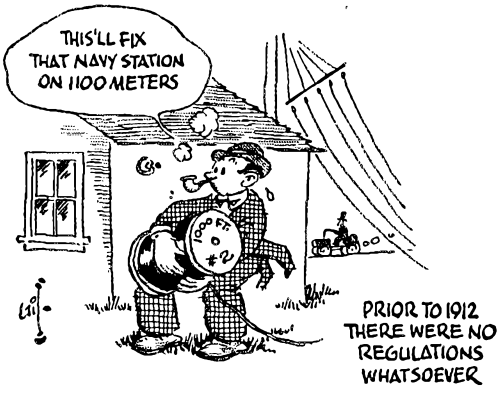
It was held in Berlin. It didn't say anything about wavelengths, operating procedure or anything of this sort and was held primarily for one reason: there was getting to be considerable trouble because of the fact that stations using Blotto Co.'s equipment would communicate only with other Blotto-equipped stations and would turn studiously deaf ears to calls from stations using Bliffsky or other gear. Such nonsense obviously had to be stopped and this first conference, participated in by eight nations (including the United States, which was to participate in all subsequent conferences) was called mainly for the purpose of putting an end to such shortsightedness. A few clauses regarding charges for messages and priority of distress calls completed the brief document.

The next conference, resulting in the first actual treaty, was the one that really started things off. It was held in

1906

Like the first, it took place in Berlin. Twenty-seven nations participated. Perhaps it would be well to say right now that the principal objective was the setting up of arrangements to deal with ship-to-shore work, that being the main thing radio was then used for. In fact, the only services defined in the treaty regulations were coastal stations and shipboard stations — a station, presumably, was either one or the other!

Judged by present standards, the conference resulted in a pretty simple treaty and an even simpler set of regulations to go along with it. However, it is of interest to us because it was here that we see the *very first* agreements of any kind on wavelength assignments. These agreements were exceedingly simple: coastal stations open to general public service had to be able to use both 300 and 600 meters; ship stations were to use 300 meters for a normal wavelength but could use others if they did not exceed 600 meters; small boats unable to "get up" to 300 meters were authorized to use "a shorter wavelength"; and finally — get this! — coastal stations, apart from their two specified waves, could use *any* wavelength, so long as it was either below 600 meters or above 1600 meters. Had coastal stations in those days wished to use any of the territory represented by our present amateur bands, they were free to do it.



There was no mention of amateurs in the treaty and no provision for them except that if any nation had licensed amateurs at that time (none did, including our own United States) it presumably would have had to see to it that they stayed below 600 or above 1600 meters.

In addition to these matters, the treaty and regulations specified three-letter calls, limited shipboard power, normally, to a kilowatt, outlined details of hours of service for coastal stations, the posting of "wireless" telegrams, rates, collection of charges, etc., specified the use of the International Morse code for radio work, designated SOS as a distress call and outlined some very rudimentary regs on methods of calling and working.

This second Berlin gathering also decided on the principle of holding similar conferences from time to time and, as a matter of fact, the next was held six years later in London. So we come to

1912

Forty-three nations from all over the world participated in this London conference; our radio gatherings were beginning to amount to something! Not much was done to change the 1906 treaty and regulations but they were enlarged on somewhat. As before, general public-service stations had to be able to use 300 and 600 meters, but now they could also use 1800 meters. Ship stations were 300 and 600 meters. A curious addition to wavelength specifications was one

prohibiting stations used exclusively for sending signals designed to determine the position of ships from using a higher wavelength than 150 meters. Here was the first "short-wave" assignment, as such, and it was to radio-bearing stations! However, this was by no means an exclusive assignment, because, just as in the 1906 treaty, any station could use any wavelength (except that the compass stations had to stay under 150) as long as it stayed under 600 or over 1600 meters.

Ship power was still limited, normally, to a kilowatt; additional power could be used if needed, however, for distances over 200 miles or under unusual circumstances. The Q signals came into being. Revisions and additions were made to other operating details but not a great deal of change shows up in this treaty in these matters as compared with the earlier one. Our old friends, the coastal stations and shipboard stations, were still the only defined services.

At this gathering it was agreed to hold the next conference in 1917, but the first World War and its aftermath upset things so badly that it was fifteen years before another radio conference took place.

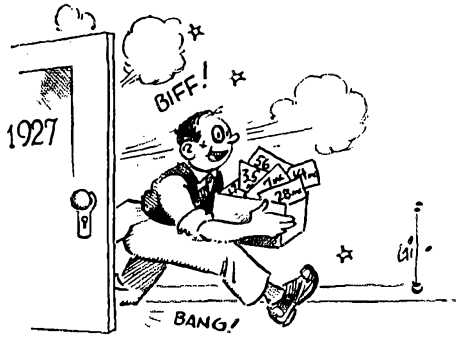
1927

The 1927 conference was held at Washington. Nearly eighty nations participated; as of that time, this was the largest international gathering ever held on any subject and the *first* since the advent of "short waves."

The delegates were confronted with a perfectly stupendous task because of the tremendous strides made in radio development since the previous gathering. All the old concepts of radio had been discarded and new theories evolved; new uses for radio had been found with a resulting terrific enlargement in the number of services; telephony had been developed and had given birth to the broadcasting industry; the short waves had found use. As may be imagined, the conference regulations were numerous and detailed, bearing but little resemblance to those in the former documents.

Radio services had segregated themselves into dozens of different distinct classes by this time, so the services mentioned in the list of definitions were considerably more detailed. One of the definitions was that of "private experimental stations." There were two subheads to this definition: the first explained that the definition included stations of the kind we now recognize as "experimental"; the second stated that the definition applied also to "a station used by an 'amateur.'" We had arrived. Here, for the first time, we find ourselves mentioned in an international radio document.

More than that, the radio spectrum — heretofore virtually wide open to everybody — was now split up into channels, from 10 kilocycles to 23,000



kilocycles, and the various services allotted certain specified channels or groups of channels for their use. And in this table, we amateurs were allocated the following bands: 1715–2000 kc., 3500–4000 kc., 7000–7300 kc. and 14,000–14,400 kc. Since the regular table of allocations did not go above 23,000 kc. and since we amateurs urged assignments still higher, special assignments were designated at 28–30 Mc. and 56–60 Mc. jointly for the use of the amateur and experimental services. All these bands are the same width specified as available to American amateurs in the international regulations under which we are now operating (Cairo 1938).[2]

Licenses were required of all amateur operators and it was further stipulated that each such licensee would have to demonstrate ability not only to transmit the Continental code but to receive it — "by ear." The code speed required of licensees was left to each country to determine for itself, however.

Of course, the regulations also went into great detail on all other matters such as revision of the Q-signal list, calling procedure, rates, methods of collection, license requirements (commercial), etc., but we take it for granted that by now our readers are aware that each set of regulations in the international treaties includes these matters and we will not refer to them further. From now on we will treat only those portions of the treaties that deal with amateurs and amateur radio.

Following the Washington Conference, came a five-year interval, and then the second of the really "modern" conferences, in

1932

This was held in Madrid. Very little change

[2] Readers about to take pen in hand to point out that the current U. S. amateur band at 28 Mc. is not the full width indicated here, and that the 1.7-Mc. band has not been available for amateur operation in this country since the war, are reminded that we are talking here of the *international* regulations, not U. S. regulations of the moment. The current international regulations do make provision for the amateur bands shown; the reasons for our temporary postwar U. S. assignments will be dealt with in the second half of this article.

was made in the previous treaty or its annexed regulations. Our amateur frequency bands were continued intact. However, we had not been satisfied in the Washington regulations with having the definition of an amateur included only as part of a definition of the "private-experimental-station" class; at Madrid, therefore, we sought to have amateurs recognized as a separate and distinct class. The effort was successful and at Madrid, for the first time in an international treaty, we see the amateur service recognized strictly as such.

The next international meeting, which produced the regulations under which we are now operating — and which will be revised at Atlantic City beginning May 15th — was in

1938

The location was Cairo, Egypt. By now, the increasing pressure on the high-frequency spectrum brought about by expansion of existing services and the introduction of new ones was creating serious problems in the allocations table. The spectrum between 3 and 25 Mc., once thought to be of virtually limitless extent, was full to overflowing — with more customers clamoring for admission every day. As might be expected, those countries having little interest in amateur radio regarded our amateur bands as legitimate areas for the spotting in of some of the overflow, and the aggregate initial proposals of the other countries (particularly those in Europe) for a revised allocation table cut heavily into all our bands. Only the unswerving stand of the U. S. delegation in our behalf, supported by our neighbors and sister republics in the Americas, saved all our previous bands for amateurs in this region — we in North and South America emerged without the loss of a kilocycle. Elsewhere, however, amateurs did not fare so well: in the European region, the 3.5-Mc. band was severed, and amateurs permitted only in the portions 3500–3635 kc. and 3685–3950 kc.; outside the American continents, too, amateurs no longer enjoyed exclusive rights to the entire 7-Mc. band, and both amateurs and broadcasting could be permitted to use the territory between 7200–7300 kc.; in Europe, the 5-meter band was reduced, at least in practical effect, to less than half its original width of 4 Mc.

Aside from these allocations matters, there were few other developments of even passing interest to amateurs, and all the other strictly amateur provisions were continued without change.

National Regulation

We have now shown, very briefly, what has happened from the early days up to the present time in terms of *international* regulation. During all this time, however, we were confronted with changing laws and regulations on amateur radio here in the United States under the terms of the United States laws, so let us go back now, see what those laws were and what kind of *domestic* treatment we got under them.

The outstanding thing about early radio law in this country is that it was an awfully long time before we got the first one!

There was no United States radio law in 1903 at the time of the first Berlin international conference already mentioned, nor was there one in 1906, at the time of the second Berlin affair. It might be thought that this country was obligated to have some sort of national law or regulations after the 1906 conference, in order to carry out the agreements made there to which the U. S. had been a party. The reason there wasn't is that, although we had *signed* the treaty, we didn't *ratify* it until six years later; there had been quite a lot of squabbling and disagreement about that treaty, anyway.

So we see the years dragging on through 1906, '07, '08, '09 — and still no U. S. law on radio. This doesn't mean that no law was needed; indeed, by the latter part of this period "wireless" was assuming considerable proportions in the daily life of the world. But with no laws here all stations, whether amateur, government or commercial, could operate with whatever call, wavelength and power they wished, subject to no regulations whatsoever — and that is precisely what they all did!

In 1910 a very brief law was passed requiring ships of a certain size to carry radio equipment, but it said nothing more than that and has no real bearing in the present discussion. The act was subsequently modified slightly by another similar act in 1912 but that, also, is of no concern to us.

Nevertheless, the year 1912 is highly significant from our standpoint, for in that year three things happened: first, our Senate finally ratified the 1906 Berlin agreement; second, we participated in the 1912 London Radio Conference and signed the resulting treaty (it was promptly ratified early in 1913); third, the United States wrote its very first radio legislation. This was the so-called 1912 Law, under which we were to operate for the next fifteen years.

Now, we want to direct particular attention to this law because this is the one of which it has been said that it granted amateurs all the territory from 200 meters down, for their own exclusive use. Did it? Let us examine that law and see.

To begin with general considerations, it may be said that the law required that henceforth all transmitting stations in the United States must be licensed. Authority to issue licenses was delegated to the Secretary of Commerce and Labor. There were sections calling for the use of a pure and a sharp wave, etc., one requiring listeners to observe the secrecy of messages,

provision for punishment of violation of the regulations or the transmission of false distress calls. No individual services were defined except our old familiar stand-bys from international treaties, the coastal stations and ship stations.

This is all fine, but what about wavelength assignments, and particularly that part of the law giving amateurs 200 meters and down? All right, here goes for the wavelength assignments: the 300-meter wavelength was specified for general public-service work, per the international agreements of 1906 and 1912. Furthermore, with one exception, all stations were authorized to use any wavelength they chose, provided they stayed below 600 or above 1600 meters — this again being simply a duplication of the international specification of the time. Now, some readers have by this time noticed that phrase "with one exception." Yes, that exception is the one about which there has been so much controversy; that exception is the one that is supposed to have given hams everything from 200 meters down. To end the suspense, we will quote that article, in full. Here it is:

General Restrictions on Private Stations.

Fifteenth. No private or commercial station not engaged in the transaction of *bona fide* commercial business by radio communication or in experimentation in connection with the development and manufacture of radio apparatus for commercial purposes shall use a transmitting wavelength exceeding two hundred meters, or a transformer input exceeding one kilowatt, except by special authority of the Secretary of Commerce and Labor contained in the license of the station: *Provided:* That the owner or operator of a station of the character mentioned in this regulation shall not be liable for a violation of the requirements of the third [3] and fourth [4] regulations to the penalties of one hundred dollars or twenty-five dollars, respectively, provided in this section, unless the person maintaining or operating such station shall have been notified in writing that the said transmitter has been found, upon tests conducted by the Government, to be so adjusted as to violate the third and fourth regulations, and opportunity has been given to said owner or operator to adjust said transmitter in conformity with said regulations.

[Following this was regulation No. 16, stating that any station of the above class within 5 nautical miles of a naval or military station had to keep under 200 meters and under *one-half* kilowatt in power.]

It may be added, that's all that was said on the subject, in the 1912 law.

Now, did this grant amateurs the exclusive use of the territory below two hundred meters? Alas, it did not! To begin with, this was not a grant of privilege to certain classes of stations; it was, instead, a restriction. Unless certain stations were engaged in transacting business, or developing apparatus in that connection, they couldn't go above 200 meters.

Were amateurs the only ones so restricted? Not at all; as a matter of fact, amateurs are not even mentioned. Read the start of the quoted section; it will be seen that the restriction applies equally to private and commercial stations. If this section can be interpreted as granting amateurs "200 meters and down," it also grants certain classes of commercial station precisely the same privilege. However, it is important to note about this time that "private station" and "amateur station" are not the same. As we have already pointed out, the section doesn't mention amateurs as such. To be sure, amateurs at that time were classified as "private stations" — but so were a number of other classes! School and training stations were "private stations." So were many of what we now think of as "experimental" stations. Stations set up by a firm to enable it to conduct its own business between its various branches were private stations. About this time, it becomes apparent that between the broad interpretation of "private station" and the inclusion of that "or commercial" the Fifteenth regulation was meant to apply to virtually every station, unless it was conducting commercial business (or developing apparatus in that connection). Correct! It was!

Nor is that all; we point again to the fact that the section says only that the specified types of station cannot go above 200 meters (or over 1 kw.) without special authority. Well, how about the regular commercial stations that were allowed to operate above 200 meters; could they also go below 200 if they wished? The answer is that they could. The authority is contained in the second regulation, which we quote:

Second. In addition to the normal sending wavelengths, all stations, except as provided hereinafter in these regulations, may use other sending wavelengths: *Provided* that they do not exceed 600 meters or that they do exceed 1600 meters . . . [there then follows some dope on use of pure and sharp wave].

The only "except as provided hereinafter" contained in the law was the Fifteenth section already quoted.

Let this, then, be said: the 1912 law, to the extent that it gave amateurs the territory from 200 meters down, assigned precisely the same privileges, by law, to every other class of station in the country.

Except for a period during World War I, when all radio stations were closed down, this is the law which we operated under for fifteen years. Incidentally, since another part of this law stated that stations should specify their operating wavelengths in their applications, practically all amateurs gave "200 meters" as their operating wavelength, and then tried to edge up higher than that if they could get away with it! As a matter of interest, no amateur license issued in the United States ever stated that the licensee was entitled to use all the territory from 200 meters down.

Although not affecting any very large group of amateurs, special arrangements were effected

[3] The third regulation required the use of a "pure wave."
[4] The fourth regulation required the use of a "sharp wave."

during this time between the ARRL and the Department of Commerce whereby certain "above-200" wavelengths were made available to outstanding relay stations.

We have said that the 1912 law was the only one we had until the Communications Act of 1927 was passed. Now, it is apparent that nothing in the 1912 law creates special bands for the various services (we have quoted all the 1912 law which applied to wavelength grants or limitations), yet it is a fact that, three years before the 1927 international conference, amateurs in the U. S. were operating in specific bands of frequencies in the short-wave spectrum.

How come?

All right — brace yourself, for we suspect this will be news to many — those bands were not assigned under law, they had no legal standing, and we had them solely on the basis of temporary and informal agreement with the other radio services of the United States.

Here's the story:

Following the 1912 law, nothing much happened to disturb the tranquillity of two-hundred-meter operation until around 1923, when a small group of amateurs (and commercials, too, if we are to be truthful) began going to the wavelengths well below two hundred, to see if they were feasible for communicating purposes. As we now know, they most certainly were, but it took a transatlantic QSO [5] to make the average ham believe it, at that time. An interesting sidelight here is that since all amateur stations at that time were required to specify their operating wavelengths, and since these were invariably of the order of 150, 175 or 200 meters, it was necessary for the first short-wavers to get special permission to operate on such wavelengths as 100, 90 and 60 meters — these not having been specified in the licenses!

At any rate, when the short waves began to demonstrate their worth around 1924, everybody in creation made a headlong rush for them. Remember: under the ancient 1912 law, still in effect at that time, every single service in the United States had equal rights with everyone else for the use of the short waves!

Now, keep a firm grip on everything up to this point while we backtrack a couple of years to 1922 to pick up some dope that is going to constitute part of our 1924 picture, when we finally unveil it.

Around 1922 it was apparent to the then Secretary of Commerce (Hoover), who was charged under the 1912 law with the duty of administering radio, that the law was hopelessly inadequate for existing conditions. A new law was badly needed, but Congress, with the same slowness which characterized its belated enactment of the original law, simply couldn't seem to get around to making one. So Secretary Hoover called the first of what came to be known as the "Hoover Conferences" at Washington, participated in by representatives of all the radio interests in the country, to see if some mutual agreements couldn't be worked out and some recommendations for the legislators evolved.

The first of these advisory conferences, in 1922, didn't do very much so far as we are concerned, except that it recommended enactment of proper legislation to deal with radio, suggested certain amateur frequencies (of no interest to us, at the moment, since they were around 200 meters), suggested a definition for amateurs (the 1912 law had no such definition), and recommended that amateur status be defined by law and amateur wavelength assignments ditto. Another recommendation was for the creation of amateur deputy inspectors, possibly at a dollar a year, to help out in amateur regulation! Unfortunately, although a number of radio bills were subsequently introduced in Congress, nothing was actually done in the way of legislation to carry out any of these recommendations. Perhaps it was for this reason that the recommendations of the succeeding Hoover conferences actually became regulations by reason of their adoption as such by the Department of Commerce — not with authority of law, however, but purely on the basis of mutual agreement among services. This curious regulatory status lasted until the "blowup" of 1926, of which we shall speak shortly.

The second conference took place in 1923; the short waves had not yet opened up, and the conference recommendations for amateurs were all in the vicinity of 150-200 meters. Amateur radio would have kicked like the dickens if they had been anything else.

The third conference was in 1924; between it and the second the short-wave business had split radio wide open! The 1924 conference was tremendously important, therefore.[6] However, bear in mind that nothing any of these Hoover conferences did had any actual legal status. The recommendations were nothing more than recommendations; such agreements as were reached were on the basis of mutual understandings between services, temporarily (and illegally) incorporated into the regulations by mutual consent and thereafter observed by all until a new law came along. Actually, by this time everyone in radio realized that the wording of the 1912 law was such that the Secretary of Commerce had been given no authority whatsoever to enforce any wavelength assignments other than those set forth in the law

(*Continued on page 188*)

[5] 1MO-XAM (U. S.) with 8AB (France), Nov. 27, 1923.

[6] Since the short waves "broke" several months before the conference, the ARRL had negotiated several special low-wave bands for amateurs, pending the decisions of the conference. The resulting conference agreements were considerable expansions over the space made available by these temporary assignments.

A 40-Watt Modulator with Cathode-Coupled Driver

Four Stages in a Compact Unit

BY WILLIAM J. LATTIN,* W4JRW

TYPE 6L6G tubes in push-pull Class AB_2 operation require a driver of low impedance and good regulation, because the tubes draw grid current on the positive signal peaks. When a transformer-coupled driver is employed, a fixed-bias source is needed which must have such excellent regulation that battery bias often is used. An excellent coupling transformer having fairly high inductance and low-resistance windings is required. Since it was desired to build a 40-watt modulator as compactly as possible, the use of a cathode-follower driver was investigated and found to be quite practical.[1]

The circuit shown in Fig. 1 was set up in the laboratory and measurements of power output and distortion were made. The results are shown by the curves plotted in Fig. 2. It will be seen that an output of 40 watts was obtained with about 3-per-cent total distortion. The total "B" current drawn by the sections of the 6SN7GT cathode followers remains constant at about 13 milliamperes for all signal voltages applied, which indicates that the regulation of the negative supply voltage is unimportant. This was verified by using a negative-voltage source applied through a 10,000-ohm resistor without by-passing to obtain −67.5 volts at the cathode return of the 6SN7GT. The power output and distortion readings were the same as shown in Fig. 2.

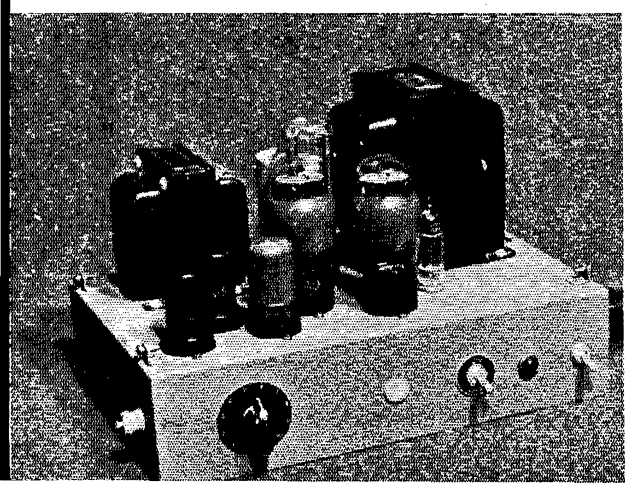
A graphical analysis of the cathode follower which was made in order to estimate the values of cathode resistors and operating voltages may be of interest. This is shown in Fig. 3. The solid-line curves are plate-current *vs.* grid-cathode voltage (E_g) characteristics obtained from a tube handbook. An axis of R_kI_p, which shows the cathode-follower output voltage, is shown for R_k = 5000 ohms. The operating characteristic of the cathode follower is shown by the dash-line curve (only for R_k = 5000 ohms). This operating curve may be drawn easily because when $I_p = 0$, $E_k = 0$ and $E_{pk} = 300$; when $I_p = 10$ ma., $E_k = 50$ and $E_{pk} = 250$, etc.

A line having a slope of 5000 ohms (for R_k) is drawn from $I_p = 0$ and $E_g = 0$ through the point at −10 volts E_g and 2 milliamperes, since −10 volts divided by 2 milliamperes is 5000 ohms. Now with no signal, E_k will be about 13.5 volts as shown by the arrow drawn horizontally from the intersection of the 5000-ohm solid line with the operating characteristic to the E_k axis. Since E_k cannot be made negative but can go only to zero on the negative swing of a sine-wave signal applied to the grid, about 13.5 volts peak is the largest sinusoidal output that can be obtained before clipping on the negative half-cycle starts. It may be seen that clipping on the positive side will not start until the peak grid voltage is much higher. This may be determined by sliding a ruler parallel to the 5000-ohm line along the E_g and E_k axes and extending the line to the right until it again crosses the E_g axis. To obtain higher voltage from the cathode follower the grid may be returned to a positive point. For instance if the grid-to-ground voltage is + 20 and E_k = + 30, a peak output of about 30 volts can be obtained without clipping on the negative side.

This driver circuit was used in the 40-watt modulator shown in Fig. 4. The negative supply voltage was obtained by means of a half-wave rectifier using the same transformer as the main "B" supply. It was found that the 10-μfd. by-pass on the screen supply for the 6L6Gs, C_{11}, was quite worth while since it resulted in about 10

*1304 Locust St., Owensboro, Ky.

[1] Greenwood, "Cathode-Follower Circuits," *QST*, June, 1945, p. 11; Henry, "Improved Driver Stages for Class-B Amplifiers," *QST*, Nov., 1945, p. 45.



The cathode-coupled modulator is built into a compact unit which includes power supply. The output transformer is mounted externally in the r.f. unit.

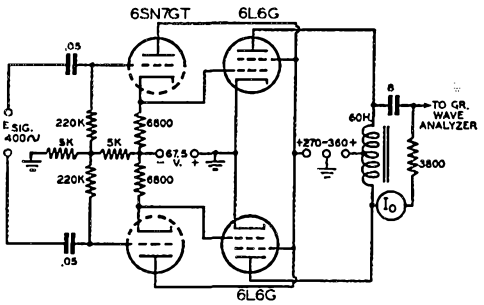


Fig. 1 — Circuit used for measuring power output and distortion in the cathode-coupled Class AB_2 modulator.

per cent more power output than is normally obtained with an unby-passed screen-voltage divider.

The possibility of returning the cathode-follower resistors to ground and using self-bias on the 6L6Gs with a VR-75 voltage regulator across the self-bias resistor was considered. However, this would have required a "B" supply 75 volts higher, and also several VR-75 tubes in parallel would probably have been necessary, because the plate-and-screen current of the 6L6Gs rises to over 200 ma. under full drive. Since the negative voltage supply was so readily obtained, it was used in preference. If a selenium rectifier with a high-enough peak-inverse-voltage rating were available, it would further simplify the negative-voltage supply, since the use of a separate filament winding is advisable with the 6X4 because

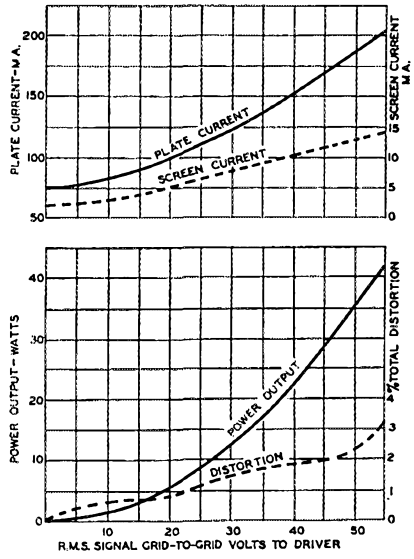


Fig. 2 — Curves showing power output and distortion from a 6L6 Class AB_2 amplifier with cathode-coupled driver.

of the high a.c. voltage from cathode to ground.

In the cathode-follower driver, the grid return was made to a point 34 volts positive with respect to the cathode return, resulting in a value of E_k of about 45 volts. Since the return for R_k is made to −68 volts, the potential at the cathodes of the 6SN7GT, which is applied to the grids of the output tubes, is −23 volts with respect to ground. This provides the correct bias on the output tubes as well as a large

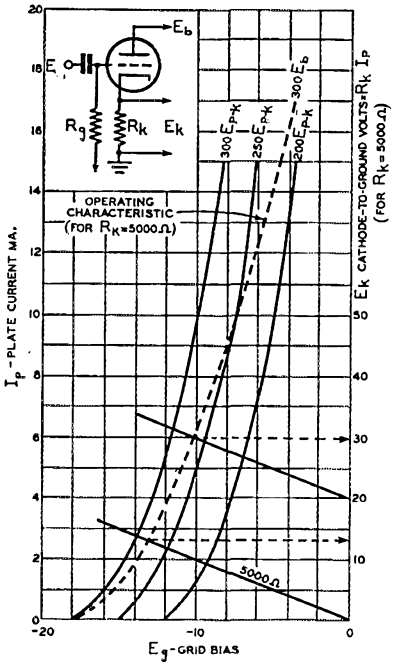


Fig. 3 — Curves used in 6SN7GT analysis. Grid-cathode voltage is shown across bottom. When upper 5000-ohm line is extended, it crosses the E_g axis at +20 volts.

margin of safety in the signal voltage which may be applied to the cathode-follower grids before clipping can occur.

A Type 6SJ7 is used in the first amplifier stage which is followed by a 6SC7 phase inverter. The only requirement for these two stages is that they provide sufficient gain to obtain about 55 volts r.m.s., from grid to grid, at the 6SN7GT.

Construction

The photographs show most of the constructional details of the modulator unit. One small chassis contains all of the components except the modulation transformer, T_1, which is mounted in the unit containing the r.f. amplifier, and is not shown.

The power supply occupies the rear half of the chassis with the filter choke, L_1, to the left, the power transformer, T_2, to the right and the 5U4G rectifier tube and filter condenser in be-

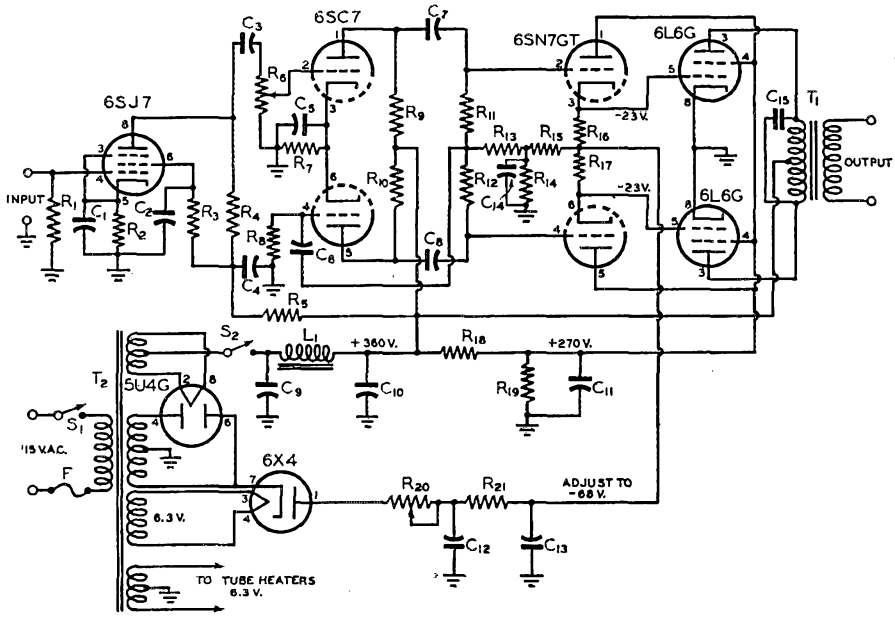


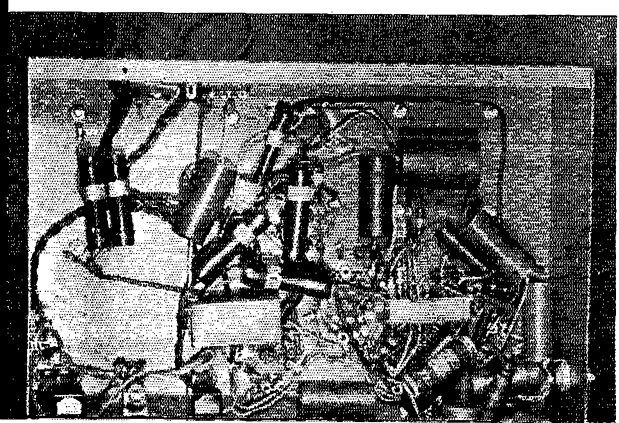
Fig. 4 — Circuit diagram of the 40-watt modulator using a cathode-coupled driver.

C_1, C_5 — 25-μfd. 50-volt electrolytic.
C_2 — 0.1-μfd. paper.
C_3 — 0.02-μfd. paper.
C_4 — 8-μfd. 450-volt electrolytic.
C_6, C_7, C_8 — 0.05-μfd. paper.
C_9, C_{10}, C_{11}, C_{12}, C_{13} — 10-μfd. 450-volt electrolytic.
C_{14} — 20-μfd. 150-volt electrolytic.
C_{15} — 0.01-μfd. mica, 1000 volts.
R_1, R_3, R_8 — 1 megohm, ½ watt.
R_2 — 680 ohms, ½ watt.
R_4, R_9, R_{10} — 0.22 megohm, 1 watt.
R_5 — 47,000 ohms, 1 watt.
R_6 — 1-megohm variable.
R_7 — 1500 ohms, 1 watt.
R_{11}, R_{12} — 0.33 megohm, ½ watt.
R_{13} — 0.1 megohm, ½ watt.
R_{14}, R_{15} — 22,000 ohms, 1 watt.
R_{16}, R_{17} — 6800 ohms, 1 watt.
R_{18} — 2500 ohms, 10 watts.
R_{19} — 25,000 ohms, 10 watts.
R_{20} — 5000-ohm variable.
R_{21} — 2000 ohms, 10 watts.
L_1 — 10-hy. 200-ma. filter choke.
F — 3-amp. fuse.
S_1, S_2 — S.p.s.t. toggle switch.
T_1 — Modulation output transformer.
T_2 — Power transformer — 375-0-375 volts r.m.s., 200 ma.; 6.3 volts, 4 amp.; 6.3 volts, 0.5 amp.; 5 volts, 3 amp.

tween. Grouped along the front edge of the chassis, from left to right, are the 6SJ7, the 6SC7, the 6SN7GT, the pair of 6L6Gs and the 6X4 rectifier. The microphone input connector is set in the left-hand edge of the chassis and along the front edge are the gain control, R_6, and the two toggle switches, S_1 and S_2.

Underneath, the various by-pass condensers are grouped around the tube sockets close to the points to be by-passed. The short lead between the microphone connector and the grid terminal of the 6SJ7 is covered with shield braid to prevent hum pick-up and instability.

This modulator has been in use for several months and has proved to be capable of modulating one hundred per cent an 829 running at about 80 watts input, as checked on an oscilloscope.



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Bottom view of the cathode-coupled modulator showing the general location of small parts.

Happenings of the Month

CONFERENCE PREPARATIONS

The United States has issued invitations for the convening in Atlantic City on May 15th of a world conference to revise the international radio regulations of Cairo. At this conference the post-war planning of the various countries of the world will come to fruition. The meeting may last as long as six months.

On the part of the United States, preparation for this conference has been under way for some years back. The very extensive hearings of FCC and the work of IRAC, reported in *QST* the last several years, have been part of it. Ever since the preliminary Moscow conference the U.S. has had a special Government-industry committee at work in Washington, under the Department of State, polishing up the United States' proposals to their final form. ARRL Assistant Secretary A. L. Budlong has been a member of this special committee, in daily session for three months, in addition to the League's usual Washington activities. The proposals of the U.S. have now been completed and at this writing have been reviewed and approved by FCC, on behalf of civilian services, and by IRAC, on behalf of Government services, and submitted to the Department of State's Telecommunications Coördinating Committee, on the way to the Bern Bureau for publication in the formal Book of Proposals of the conference. These proposals incorporate our amateur bands as they now exist above 3.5 Mc. and continue to provide for a new amateur band at 21–21.5 Mc. They propose also a 50-kc. widening of the 11-meter band.

The U.S. proposal for the 160-meter region provides for the assignment of 1800–2000 kc. jointly to navigational aids (loran) and to amateur, fixed and mobile services. This band consists of two regional loran channels of a width of 100 kc. In any average area, only one channel is required and it is proposed that the amateur, fixed or mobile services in any area may employ the band not required for loran on the condition that they do not cause harmful interference. But in the United States both channels are in use and the arrangement contemplates no amateur assignment here so long as loran remains at that part of the spectrum. The question of sharing between amateur and loran in this country, as sought in the ARRL brief, still remains to be solved *as a domestic matter* on the basis of technical investigations. That idea is receiving separate study but there is no news on it yet.

Meanwhile, of course, the League keeps in close touch with the developing situation at Washington and will continue to participate in the country's preparations for the conference.

Canadian General Manager Reid has attended a series of meetings at Ottawa at which the Canadian position for the world conference was formulated. Canada will propose the present bands except making the 10-meter band 28 to 30 Mc., plus a new band from 21 to 21.45. The Canadian meetings also determined the amateur regulations for the new licensing year beginning April 1st, with the decision to retain all present Canadian amateur allocations, including 'phone assignments extending 50 kc. beyond the U.S. ones in both the 3.5- and 14-Mc. bands.

Many countries are believed to be planning to press at the conference for an expansion of h.f. broadcasting assignments and also for increased allocations for "tropical broadcasting." (In the tropical countries, static prevents the use of the usual "standard" broadcasting frequencies and the service is commonly conducted on frequencies between 4 and 6 Mc.) There is encouraging indication from many of the member-societies of the IARU that their governments will support and defend the amateur allocations, including the new band at 21 Mc. The views of the United Kingdom, as they existed in middle January, included a new amateur band from 21.25 to 21.45 Mc. but proposed shaving our lower bands to a harmonic family: 3.5–3.6, 7.0–7.2, 14.0–14.4 Mc.; also retaining the band 1715–2000 kc. on a shared basis with restricted power. The British thinking at that time included no band in the vicinity of 5 or 6 meters and involved a shifting of the 2-meter band and a narrowing of the 400-Mc. band. The 28–30-Mc. band would be cut off at 29.7 as in the U.S.A. While these are not necessarily the final British views, the indication is that U.K. is building up a "trading position" based on the Moscow understanding between some European countries.

RSGB advises that it will send three representatives to the world conference.

We expect to have further conference news each month.

BOARD MATTERS

Throughout the final years of the war, and since, the officials of the League, operating under the directions of the Board of Directors, have actively looked after the interests of the amateur

at Washington as plans were perfected for the postwar world, and have fully participated in the preparations for the coming world conference. Everything is believed to be in readiness. The ARRL Board itself holds its annual meeting in the month of May, the same month that the conference opens. To review and perfect the arrangements for the protection of our rights, the Board is holding a special meeting at West Hartford on March 14th to deal solely with such matters. It is expected that every division will be represented. The meeting occurs too late in the month to report in this issue of *QST* but we shall have an account of it and its minutes, in our next issue.

Meanwhile we want to tell you about the known items of business to come before the regular annual meeting of the Board in May. These topics are outlined to you so that, in advance of the meeting, you may have an opportunity to state to your director your opinion on any of them that interest you. You are invited to do this; your director will welcome your views.

You are of course already familiar with the proposal for a Class D license, on which your opinion has been sought on cards printed in our last issue. You are also familiar with a proposed plan for a rearrangement of the 10-meter band by types of emission, as published at page 26 of December *QST*, on which you were invited at the time to write to your director. The directors comprising the Board's Planning & Regulations Committees at a recent meeting in New York transmitted seven additional recommendations to the Board, which will be considered at the May meeting, and these we now describe to you as follows:

1) As recently explained, it is believed desirable to postpone further proposals about 'phone frequencies until after the world conference, so that we may waste none of our energies meanwhile. The conference is expected to end by November. It seems desirable, though, to get along with the study of the 'phone matter as soon as things are in the clear, and this means that the subject should be worked on before the 1948 meeting of the Board. The Board's committee therefore proposes that the Board issue no new proposals this year but that the committee be authorized to study the question as soon as the world conference ends and to originate proposals which, with the approval of the Board, would then be presented to the membership in *QST* and a poll taken of amateur opinion thereon. The Board would then be able to act finally on the proposals, in the light of the opinion expressed by amateurs, at its 1948 meeting.

2) There is great unevenness in the memberships of the various ARRL divisions. They vary in size from about 700 members to about 7000. This is unfair and makes for injustices, since each director has only one vote. It would be much better for us, and we would come closer to our ideals, if our division memberships were of more nearly the same size. This question was before the Board last year and was referred to this committee for study. The committee now endorses the project and recommends to the Board that our organization be changed to ten divisions coinciding with FCC's ten amateur call areas. The call areas were deliberately planned to effect as even a distribution of amateurs as was practically possible and the committee believes that the observance of those boundaries in ARRL affairs would make for convenience and for a much better proportionate representation of amateurs in the affairs of our Board. At our present membership the ten divisions would vary from about 3000 to about 6000 members, a great improvement over the 10:1 ratio that now exists. These figures include associate memberships, the percentage of which is nearly uniform over the country. It is also proposed that the division names be changed to Division One, Division Two, etc., so that any amateur, member or no, will instantly know in which ARRL division he lives.

3) The Board asked the committee to study various methods of referring questions to the membership to learn what was acceptable to them on the moot questions of the day. The committee after its study responds to the Board that in its opinion the Board already has on its books a mechanism for this purpose which it believes is wholly suited to the League's needs and which it recommends be continued in use whenever needed. This is the method with which you are already familiar in *QST* polls of amateur opinion on stated subjects, with a detachable postcard. The Board's existing rules provide that questions may be thus addressed either to all amateurs or just to the members of the League, as the case may require, and that the Board in finally considering the matter shall take into account the opinions thus expressed. There are also safeguarding rules that the headings and type sizes used in *QST* shall be as prominent as those used for articles in the same issue, etc., so that all questions so referred to the membership for opinion will be fairly presented.

4) Ten-meter amateurs are having second-harmonic BCI trouble with Television Channel No. 2. When the v.h.f. spectrum was rearranged a couple of years back, the League made it plain that it was desirable to retain the harmonic relationship between amateur bands but FCC found it expedient to convert our 5-meter band to a 6-meter one. The Board last year referred to its committee a suggestion that the League ask FCC to shift the 10-meter band to 25 Mc. to escape this television BCI. The committee responds that the steps already taken by the United States are such that it is not considered feasible to contemplate a shift in the location of our band, nor does it believe that would solve the problem of inter-

force from other harmonics. The question is a difficult one and the solution is not yet visible, so the committee asks permission to retain the problem under study with a view to making further recommendations. It reports that as a temporary measure it has requested the publication of helpful information in *QST*.

5) Considering the increasing interest in n.f.m. 'phone and its advantages in reducing BCI, the committee proposed that it be given a wider trial in some of our other bands. It looks good but we are not sure that it is as good as it looks, the committee said in effect, and it therefore proposed that only part of the 'phone bands be opened to this mode now, and that the subject be reviewed after we have had some practical experience. Specifically it recommends that the Board request FCC to authorize narrow-band frequency- or phase-modulated 'phone operation on 3850-3900 kc. and 14,200-14,250 kc. for an experimental period ending June 30, 1948, under the condition that the bandwidth shall not exceed the bandwidth occupied by an amplitude-modulated signal of the same audio characteristics, the Board to re-examine the question at its 1948 meeting in the light of experience to that date.

6) The committee strongly felt that the present Class A licensing arrangement has outlived its usefulness. Nearly half of all amateurs hold Class A and 'phone work represents about half of amateur activity. It would seem that any amateur of a year's experience who desires to work the Class A 'phone bands readily gets that privilege, so that the licensing arrangement is meaningless as concerns its original function of confining Class A rights to a relative few. Reviewed in the light of present-day conditions, the committee therefore strongly urges the Board to adopt a proposition that was before it last year, that it request FCC to make the Class A license available to a Class B licensee (but not Class C) after one year's experience, by an endorsement to be given upon application, but without additional technical examination.

7) In the 6-meter band we now have A1, A2, A3 and A4 emission authorized, and f.m. 'phone (including wide-band) on the part above 52.5 Mc. Most of the occupancy is confined to the low end, and it's the truth that there isn't much of it for a band that wide. It is desirable to encourage greater occupancy of this splendid band and to make it worth a fellow's while to work in the higher reaches of that band. One way to do that would be to permit n.f.m. to come down lower in the band and another excellent way, it is thought, would be to permit "duplex" or carrier-on operation in some higher part of the band. Many amateurs greatly esteem the privilege of "duplexing" but it's a luxury that we can't afford in more congested bands. The committee recommends that the Board ask FCC to authorize narrow-band frequency- and phase-modulated 'phone on 51-54 Mc., and that both wide-band f.m. 'phone and AØ duplex be authorized on 52-54. This would eliminate the present odd figure of 52.5 and leave only two figures to remember.

Several other proposals or probable proposals are known as we go to press:

While portable equipment may be operated on any amateur frequency, mobile operation is permitted only above 27 Mc. One reason for the League's opposition to mobile work on lower frequencies in past years was the well-warranted fear of the invasion of the amateur bands by small-boat owners looking for utilitarian communication. With FCC's provision of adequate facilities for this service, this hazard seems removed. Vice-President McCargar has given notice of his intention to sponsor a proposal to request FCC to permit mobile operation on the lower amateur bands. No further details are known at this time.

It may be necessary to propose an increase in ARRL membership dues, including *QST*, to $3. The rates to foreign countries have already been substantially increased and the price of *QST* on the newsstands has necessarily been raised to 35 cents a copy but the domestic membership dues, being specified in the By-Laws, have not been increased. The expenses of the League these days are enormous and we have heavy tasks ahead. *QST* costs half again as much to produce as it did a few years ago and the costs of every activity have similarly risen. There is reason to expect some dropping off in the other revenues of the League. While ARRL is currently in excellent financial condition, it must remain that way and its ability to hold together must not be impaired by some sudden loss of other income. It is hoped that, if it becomes necessary to ask for an increase, the members will know from their experience in other departments of life that some rise in dues is a reasonable thing and will feel that the even figure of $3 is little enough to pay for *QST* and what the League does for amateur radio.

The Chicago Area Radio Club Council reports that the hotel situation in Chicago is such that it is unable to stage the national convention authorized for the autumn of this year. The Board will have before it a request that they now be authorized to put on the convention over the Labor Day weekend of 1948.

This clears the hook up to the moment. If additional agenda items develop in the coming month, they will be outlined to you in our next issue. Your directors' address is to be found in the front of this issue.

THE U.S. AMATEUR PROPOSALS

The American proposals for the revision of the Madrid convention and the Cairo regulations comprise an enormous mimeographed book. The United States proposes many changes throughout

the texts of the treaties. In an earlier item in this department we have reported the substance of the U.S. proposals for amateur allocations. The allocation table itself is of course one article in the text of the regulations. The State Department government-industry committee which has been doing this job, and on which as reported in our March issue ARRL's Assistant Secretary Budlong has been in daily attendance, decided that the allocation table should be accompanied by an explanatory document giving the reasons for its frequency proposals, service by service, with an explanation of the U.S. philosophy on each. Amateurs will be greatly interested in reading what is said of our service, for all the world to see. Following is the text:

In the United States there is a tremendous public interest in the amateur service, which is comprised of more than 60,000 radio amateurs whose interest in radio communications is purely without commercial interest or profit motive. Indeed the term "amateur" is defined in the Regulations as "a duly authorized person interested in radio technique solely with a personal aim and without pecuniary interest." Many of the developments and techniques now in common use are due to the inventiveness and ingenuity of the radio amateur. Improved techniques developed by him have resulted in savings of spectrum space for the other services. From the viewpoint of spectrum economy, the radio amateur is one of the most efficient users of radio frequencies. The almost intolerable interference conditions which confront the user of the amateur h.f. bands have merely served as an added incentive to the amateur to use receiving systems which will provide adequate selectivity. Thus it is not unusual to find an amateur receiving system with directive antennas, crystal filters and even two or more stages of heterodyne detection, possibly coupled to an audio filter system. "Single-signal" receivers are the product of amateur ingenuity and development. Transmitting systems likewise take advantage of the various combinations of directive antennas, stable oscillators, power supplies free from audio modulation and minimum band widths of emission.

These high technical standards are for the most part voluntary and have been adopted in order to satisfy the communication requirements of the radio amateur. These may be classified as:

1) Experimentation
2) Training in communication procedures
3) Long distance communication with low powered transmitters
4) Disaster and emergency communications
5) Training in maintenance and operation of radio equipment

Experimentation

Amateurs put into actual practice the sum total of radio engineering knowledge, and because of the large number of amateur experimenters, assure the maximum probability of learning of variations in existing techniques and of developing new techniques. This work should continue in order that progress will not be stifled. This is particularly important in the "microwave" spectrum, above 1000 Mc., where much remains to be learned.

Training in communication procedures

Amateurs transmit, receive and relay noncommercial messages in order to develop their traffic handling ability and to train themselves to serve later as commercial or government radio operators. It would be difficult to man the commercial and government radio stations were it not for the availability of amateur operators who have trained themselves. It is essential that this training continue.

Long-distance communication with low-powered transmitters

Amateurs have provided reliable knowledge of radio wave propagation. This is because of the thousands of long-distance communications which take place daily in the high-frequency amateur bands. Further, the friendships developed between amateurs of the different countries have contributed materially to the spreading of technical knowledge and good will throughout the world. Because of the tremendous public interest in this phase of amateur radio, the United States considers it of paramount importance to continue the exclusive allocations of high-frequency bands for this purpose

Disaster and emergency communications

Since 1913, amateur radio has been the principal, and in many cases the only, means of outside communication in more than 100 storm, flood and earthquake emergencies in the United States. The public service which has been rendered by amateurs is matched only by the public interest in amateur radio.

Training in maintenance and operation of radio equipment

Because amateurs generally build and maintain their own equipment, they acquire a proficiency which enables them to qualify as technicians serving the public, maintenance operators of radio stations and for other positions of responsibility. Only the incentive of the satisfaction derived from operating amateur radio stations will assure the continuation of this valuable training.

Frequency band proposed for the amateur radio service

The basic principles considered by the United States in the choice of frequency bands for the amateur service are:

1) Observance of the Cairo bands, insofar as possible
2) Harmonic relationship, where feasible
3) Adequate new bands in the v.h.f., u.h.f. and s.h.f. spectrum
4) Exclusive bands

The Cairo band 1715–2000 kc. now is required for the internationally recognized maritime and aeronautical aid known as loran, described hereinafter, and for other services. To compensate, at least in part, for the loss of this band the United States is recommending a new band exclusively for amateurs in the high-frequency harmonic series to start at 21,000 kc. During the higher part of the sun-spot cycle, which now is approaching, it is expected that amateurs will find this band most useful, as it bridges the gap of frequencies lying between the bands at 14,000 and 28,000 kc.

In summary, the exclusive amateur bands recommended by the United States are:

Band, kc.	*Spectrum space, kc.*
3500–4000	500
7000–7300	300
14000–14400	400
21000–21500	500
	Total 1700 kc.

Band, Mc.	*Spectrum space, Mc.*
28.0–29.7*	1.7
50–54	4
144–148	4
220–225	5
1215–1295	80
2300–2450	150
3300–3500	200
5650–5850	200
10000–10500	500
21000–22000	1000
	Total 2144.7 Mc.

* The 11-meter band does not appear in this tabulation because it is not exclusively amateur. The U.S. proposal is for widening the band, to be 27.16 to 27.48 Mc., with the center frequency 27,32 designated for industrial, scientific and medical devices and with the whole band shared by amateur, fixed and mobile services subject to "diathermy QRM." The fixed and mobile use in this country will be only incidental, mostly special noncommunicating devices. The band 420–450 Mc., omitted in the above tabulation because it is not exclusive, duly appears in the U.S. proposals in its present status, temporarily shared with altimeters, to be ours alone when no longer needed for altimeters. — *Ed.*

ARE YOU LICENSED?

• When joining the League or renewing your membership, it is important that you show whether you have an amateur license, either station or operator. Please state your call and/or the class of operator license held, that we may verify your classification.

CANADIAN ELECTIONS

In the first ARRL election held in Canada since before the war, Dominion members of the League returned Alexander Reid, VE2BE, to office as the ARRL Canadian General Manager for the unexpired remainder of the current director term and for the following full two-year term, 1948–1949. The balloting:

Mr. Reid 406
Thomas Hunter, jr., VE3CP 308

With very similar figures the incumbent Alternate CGM, Leonard W. Mitchell, VE3AZ, was returned to office for the same term:

Mr. Mitchell 413
Charles H. Harris, VE6HM 296

Thus the team of Reid & Mitchell has been selected by the Canadian membership to carry on. Mr. Reid has been CGM since 1930, Mr. Mitchell his alternate since 1940.

TO FORMER A.A.C.S. MEN:

The Headquarters of the Airways & Air Communications Service of the ATC of the Army Air Forces contemplates the early distribution of a station directory listing all amateur stations operated by AACS personnel throughout the world. Major General H. M. McClelland, the commanding general, wishes also to include ex-AACS members who are presently active amateur operators, to further the possibilities of contact between wartime buddies via the amateur airways. All former AACS men who have active stations are requested to register the following data *immediately* for inclusion in the directory: name, call, mailing address, location of station, power, frequencies worked, type of emission, identity of AACS unit to which once assigned. Address: Commanding General, Headquarters AACS, ATC, Washington 25, D.C., Attn: A-3, Operations Division. You are also requested to spread this word to all former AACS members.

EVIDENCE OF OLD CALLS

Amateurs eligible for a change in station call, particularly old-timers who believe themselves eligible for a two-letter call, are requested when filing FCC application to attach any handy documentary evidence they may have of the prior holding of such call. This saves a lot of FCC checking; in fact, FCC's record of the old days of Department of Commerce licensing is pretty sketchy. The best evidence is a canceled license but even a "Grand Island QSL" would help. Such evidence will be returned when the license is granted.

KZ5 CIVILIAN AMATEURS

The only amateur operation that has ever been permitted in the Panama Canal Zone has been that of stations owned by military organizations and operated by military personnel for training purposes. American amateurs working as civilians in the Zone, as employees of the Government, about a year ago petitioned for the establishment of civilian amateur radio there. The project was endorsed by the Headquarters Panama Canal Department and approved by the War Department. Detailed amateur regulations were drafted by H.P.C.D. and went into effect February 14th. The regulations are a close paraphrase of FCC's amateur rules, being identical as to classes of license, frequencies, power and technical requirements. Calls will be from the KZ5 series. Licenses are confined to citizens of the United States residing in the Canal Zone. There is a provision for the recognition of FCC licenses. Provision is made for the licensing of amateur stations to the commanding officer of a military organization, in the same manner as obtains in the United States. International messages emanating from third persons are prohibited except that such communications may be transmitted to amateur stations licensed by FCC. All communications must be in clear. There are a few special rules concerned with the security and defense of the Canal.

This is a big step forward. There will now be many more KZ5 calls on the air. They are assured of a warm welcome!

NOTICE—

Your Change of Address

should reach Headquarters at least 30 days before the issue date of the *QST* with which it is to take effect. Please send us your old address along with the new, OM. The Post Office Department will not forward *QST*s mailed to your old address — copies we cannot duplicate — unless you provide the extra postage. May we have your coöperation? Thanks!

The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* W1HDQ

FEBRUARY, as usual, was a quiet month for v.h.f. enthusiasts. There was little DX activity of any sort on 50 Mc., and the coldest weather of the year brought little of interest in the way of propagation conditions for the occupants of 144 Mc. and higher. It was a good month for fence mending, and a lot of this was going on. One needed only to mention v.h.f. on any lower-frequency band to find a kindred spirit, and 10 and 11, particularly, were being used by members of the v.h.f. fraternity to discuss their problems and plans for the coming summer.

Round tables were organized all over the country to keep activity alive in face of the lack of DX opportunities, and new stations were showing up for these sessions almost everywhere. There was a heartening interest in improved gear for 144 Mc., with more and more fellows going to crystal control and superhet receivers. There were even a few hardy souls braving winter's blasts to get started on beam antennas. Everywhere there was a note of optimism, and there was little question that the spring and summer of 1947 were going to provide a new high in v.h.f. interest and activity.

The possibilities for international work on 50 Mc. were getting more attention, but, except for certain areas where activity is low, the peak had passed and there was little likelihood of anything happening before next fall. Prospects for a North Atlantic crossing were low, and daily checks on the W1-G path indicated that the peak for the month was about 45 Mc., except for a brief period on Feb. 24th, when G6DH heard WQR on 48 Mc. F.m. stations in this country were still being heard daily by G6DH, PAØUN, and PAØUM, and they were hearing stations from the southeast up to about 50 Mc., indicating that amateur signals might have been heard from that direction, had any been on the air.

There is still plenty of opportunity for 50-Mc. DX in the right places — if only there are stations active. Working south from Latitude 20 in South America, or east and west along Latitude 30 to 40, South, should be easy in April and fair in May, but there is little prospect that anyone will be on to take advantage of it. The only candidate we know of, in addition to CE3FV, previously reported, is PZ1A, at Paramaribo, Surinam, who has promised to be on soon. Similarly, there are strips of high m.u.f. about 15 degrees either side of the Equator in Africa — if that will do anyone any good. North-south hops from Southern Europe to Africa are promising, and east-west paths around Latitude 20, North, are still good in the Pacific Ocean areas, though the VK and ZL territory tapers off after April.

The record-breaking contact between J9AAK,

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

RECORDS

Two-Way Work

50 Mc.: KH6DD — J9AAK
4600 Miles — January 25, 1947

144 Mc.: W3HWN — W1MNF
390 Miles — September 29, 1946

235 Mc.: W9OAW/6 — W6WQN/6
110 Miles — December 15, 1946

420 Mc.: W6FZA/6 — W6UID/6
170 Miles — September 28, 1946

2300 Mc.: W1JSM/1 — W1ILS/1
1.6 Miles — June 23, 1946

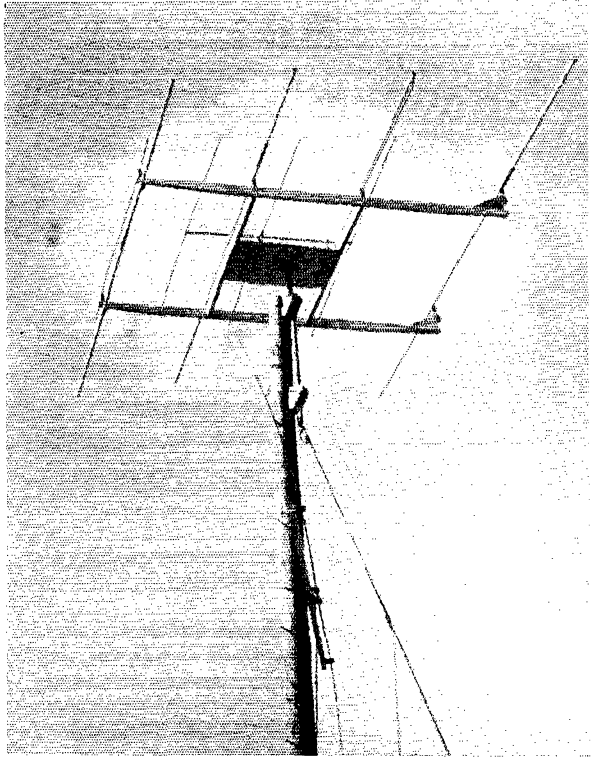
5250 Mc.: W2LGF/2 — W7FQF/2
31 Miles — December 2, 1945

10,000 Mc.: W4HPJ/3 — W6IFE/3
7.65 Miles — July 11, 1946

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

♦

Major W. O. "Texas" Brewer, J9AAK-W5KDA, who was at the Okinawa end of the record-breaking 50-Mc. contacts with KH6DD and W7ACS/KH6 on January 25th. The rig is a converted Navy TDQ, with an 829 in the final running 60 to 80 watts input. At his right is the BC-610 used on 10 and 20. Receivers used on 50 Mc. are an S-36 and an ARR-5, both war-weary and modified.



The four-element arrays used for 28 and 50 Mc. at J9AAK have their forward directors mounted below the plane of the other elements.

♦

Okinawa, and KH6DD, Oahu, reported last month, has not been repeated at this writing, though both parties were on the watch for the anticipated peak about 27 days following the January 25th work. Contacts between KH6DD and W6VDG/KW6 on Wake Island continued on a crossband basis for several days after January 25th, and are believed to have been made two-way when W6VDG/KW6 got his 50-watt rig going on 6. Another station on Wake, W6ONP/KW6, is reported ready to go on 6 with a 500-watt job. J9AAK has been heard on Wake, but no contact has yet been made. Another prospect for 50-Mc. DX in Honolulu is KH6DW. He is the former W4AUU, Macon, Georgia, a v.h.f. man from way back, so he should know how it's done. He heard both ends of the J9AAK-KH6DD QSO.

In the Netherlands, at least two stations were making regular use of their special licenses for 50-Mc. operation. PAØUM in Rotterdam and PAØUN in Eindhoven were working daily on 50 Mc., with strong signals over this 60-mile path. Another European prospect, worked recently on 28 Mc. by numerous Ws, is SHF-1, experimental station at the Chalmers Institute of Technology, at Goteborg, Sweden. They expect to be going on 50 Mc. soon.

It appears unlikely that our friends in Britain will be able to obtain even temporary permission for 50-Mc. transmission, so it behooves us all to remember them, pounding away on 58.5 to 60 Mc., whenever conditions appear to indicate a possibility of international work. It is probable that next fall will see the m.u.f. rising high enough to open that band for trans-Atlantic work, and there is at least a possibility of our making it during sporadic-*E* peaks this summer. At least we should not forget to tune that range now and then when things are hot.

Here and There on 6

With the supply of aluminum and dural being what it is these days, not many of us have given thought to substitutes, but here is an idea for those who may be situated in places remote from the junk yards where such materials can be picked up. In a recent issue of *Break-In*, the magazine of our brother society in New Zealand, ZL1AO describes a 50-Mc. array in which he uses wooden doweling which has been sprayed with metal paint. The rods were given two coats, one of copper and one of zinc. Copper straps were used for making contact for attaching the feeders, and then the whole assembly was given a coat of clear lacquer to reduce electrolysis effects.

The 6-meter band may not have been open recently for international work, but some boys have been getting out on about 42 Mc.! A number of 20-meter 'phones have been heard in Europe on their third harmonics, but the prize in this category is a contact between G6DH and YI2AT on February 21st, when YI2AT was being received on 42 Mc. in England. During his customary check on the frequency range between 30 and 50 Mc., G6DH ran across the signal of YI2AT calling "CQ 10" on 42 Mc. Denis called him on 28 Mc. and learned that YI2AT was using a Tri-tet oscillator with a 7-Mc. crystal, quadrupling to 28 Mc., and an 807 in the final, feeding a long-wire antenna. Apparently there was enough 6th-harmonic output from the oscillator to drive the 807 a bit, and the signal was plainly readable on both 28 and 42 Mc., even though the input was only 25 watts and the final was grid-modulated. Too bad YI2CA wasn't set to go on 50 Mc. about then! YI2CA, reported missing recently, is back on the air, but is being delayed in getting his 50-Mc. rig on the air because of difficulty in obtaining the necessary parts.

Here is another of those DX reports: The 50-Mc. signal of W1KUD was reported heard in Copenhagen, Denmark, on January 18th at 8:45 A.M. EST. This was a good day, the observed m.u.f. being around 47 Mc., but we need more information before accepting this report as authentic.

Ionospheric disturbances can produce some strange effects. On the morning of Feb. 16th (that day when the c.w. DX Contest was almost

a washout) there was nothing to be heard from the United States on 28 Mc. at 1200 GCT, the customary opening time for 10 in England, but WGTR on 44.3 Mc. came in at 1250, reaching S9 by 1300. Other f.m. stations were heard with good strength until after 1600, although no Ws were heard on 28 Mc. until 1535. This is not the first time that G6DH has noticed what appears to be an opening "from the top down." On several days recently he has heard the f.m. stations with good strength when no other signals have been heard from this country down to about 36 Mc. On other days the services around 40 to 42 Mc. will be heard before the f.m. stations appear.

Those f.m. stations can fool you. They run a lot of power, and they have mountain-top locations and high-gain antennas. Their reception at distances from 1500 to 4000 miles or more may indicate a possibility of 50-Mc. DX, but not necessarily. Harmonics of other services are a more certain indication, since their power is apt to be more like that of most amateur stations. If harmonics or other signals are heard above 47 Mc. it's time to "get cracking." There has been quite a bit of transcontinental reception of f.m. stations recently, which has stirred the interest of 50-Mc. workers on both coasts. W6HZ and W6QG have heard WGTR, Boston, and WNNE, Mt. Washington, N. H., very well, between 8 and 10:30 A.M. PST. They would be glad to arrange c.w. tests with interested stations in the East. It will probably be too late for F_2 work by the time this appears in print, but we should be on the lookout for transcontinental sporadic-*E* skip in May, June, and July.

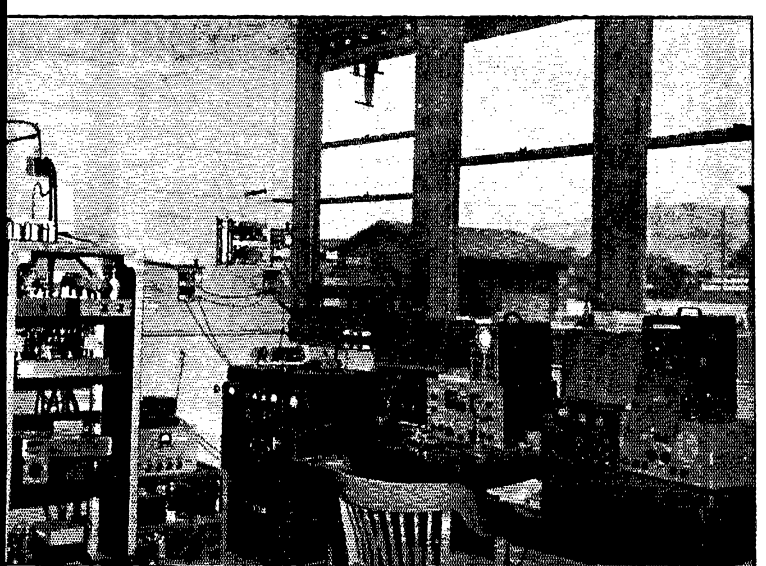
The best f.m. DX reception is reported by K7IUI, Anchorage, Alaska. He has heard Chicago, St. Paul, Milwaukee, Detroit, Ft. Wayne, Alpine, and Boston, and he wonders why he is unable to hear any 50-Mc. stations.

A glance at the frequency listings we've been running for several months will show that there is a marked concentration of activity below 50.5 Mc. This is OK during the winter months, but we predict that there is going to be some real QRM when the band begins to open. Not everyone is on the low end, however, and it behooves us all to watch the frequencies above 52 Mc. for those hardy souls who are up there. They include numerous f.m. stations (those phase-modulated rigs sound OK) and a few nets, not to mention stations scattered around the country who operate above the middle on general principle.

Several old-timers from prewar days on 5 are now on 6 in Shreveport, La. and vicinity. These include W5ZS, Dixie, with 50 watts to an 829 and a 3-element rotary; W5DXB, Vivian, with 85 watts to a pair of 809s and a 3-element beam; W5BFX, Shreveport, with 90 watts to a T-40, a.m. and f.m., and a 3-element array; and W5ML, Oil City, 110 watts to an 829 and a 3-element array. Note their frequencies in the box — no low-enders here! W5s AKI, IOP, AEN, JFF, and KXO are now getting set. These fellows are interested in extended-local as well as DX work, and to further this end they are active each evening between 6:30 and 8:00 P.M.

Need Nevada — and who doesn't? W2NCR/7 says that the Las Vegas Amateur Association is interested in 2 and 6, and that he and other members will be going before the spring DX season gets under way.

With the aid of a little weather observation you can get a good idea of the degree of atmospheric bending to be expected for the next 24 hours or so. Some fellows watch the sun for evidence of increased sunspot activity and resulting high m.u.f. Now here is WØHXY, St. Cloud, Minnesota, with a device for measuring earth currents, and he is able to warn the boys of impending aurora DX on 6. One instance when it worked well was on Feb. 16th, when WØDZM and WØQIN worked WØUSI. W9PK, Downers Grove, Ill., worked WØQIN, W9DWU, and W8QYD during this session. There was a mild flurry of aurora in the East that night, but we have no reports of anyone working stations he could not work by ordinary propagation, though the aurora



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This is "the works" at KH6DD, Ewa, Oahu, coholder with J9AAK of the world's record for 50-Mc. work. At the operating position are the Super-Pro and S-36. The r.f. section of the S-36 is used as a converter, feeding the Super-Pro for v.h.f. reception. In the corner is the BC-610 used on 20, 40 and 80. At the left, top deck, is the 10-meter rig which uses a 6L6-6L6-813 p.p.-100TH line-up. On the shelf below are the 100TH driver and p.p. VT-127-As used on 50 Mc. Both rigs operate from an 1800-volt supply and 810 modulator at the bottom and at the right of the open rack. Antennas include a rhombic and a W8JK "Twin-Three" for 50 Mc.

Who's Where on Six?

W1BJB	Lincoln, Mass. (n.f.m.)	52.6 Mc.
W1CGY	Enfield, Conn. (n.f m.)	52.51
W1CTW	Arlington, Mass.	51.35
W1GJZ	Greenwood, R. I.	50.18
W2LAL	West Englewood, N. J.	50.2
W3CGF	Baltimore, Md.	50.1
W3ENZ	Washington, D. C.	50.7
W3FQZ	Takoma Park, Md.	50.93
W3GKP	Silver Springs, Md.	51.45
W3GOA	Bethesda, Md.	50.7
W3IUN	Washington, D. C.	50.2
W3JCL	Baltimore, Md.	51.1
W3JSO	Timonium, Md.	51.55
W3KBE	Washington, D. C.	51.0
W3KTR	Bethesda, Md.	50.73
W3LWX	Avondale Terrace, Md.	50.25
W3MBM	Baltimore, Md.	50.16
W3NG	Hyattsville, Md.	50.4
W3WA	Catonsville, Md.	52.2
W1LNC/3	Washington, D. C.	50.45
W1MUX/3	Washington, D. C.	50.19
W4GLV	Leesburg, Va.	50.12
W4HS	Arlington, Va.	VFO
W4KMA	Alexandria, Va.	51.2
W1KJV/4	Arlington, Va.	50.6
W6EGF/4	Arlington, Va.	50.15
W5BFX	Shreveport, La.	53.2
W5DXB	Vivian, La.	51.0
W5ML	Oil City, La.	53.4
W5ZS	Shreveport, La.	52.6
W5LIU	Ft. Worth, Texas	50.65
W6OLO	N. Hollywood, Cal.	50.1
W6OLO/6	(mobile)	51.0
W9GWL	Griffin, Indiana	51.6
PZ1A	Paramaribo, Surinam	50.2
VO4L		50.7
VK5NR		52.52

distortion was plainly in evidence whenever beams were aimed North.

The Eager Beavers of Kansas and Missouri are losing a member, but they are hoping it is for a good cause. Little Beaver, WØJCQ, Ft. Riley, Kansas, is off for Yokohama. Being an incurable v.h.f. enthusiast Bill is taking along a rig for 6 and 2 meters.

Stabilization Gaining on 144 Mc.

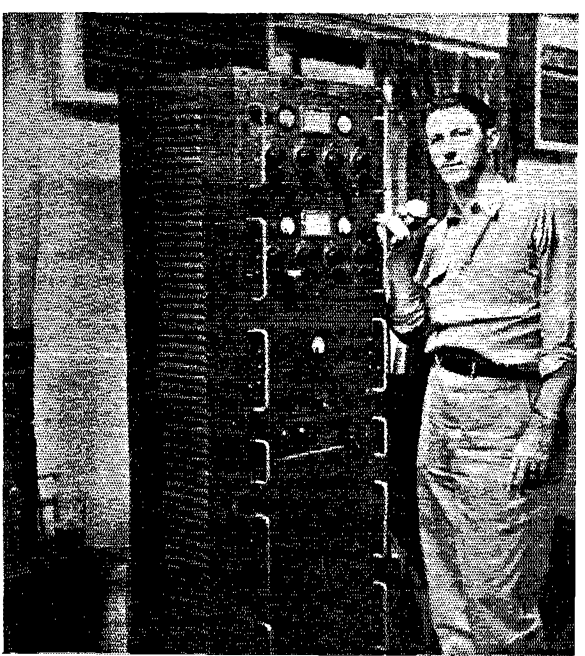
A year ago crystal control was practically unknown on 144 Mc. We had made the jump from 112 Mc. not long before, and operation on 2 was confined almost entirely to the use of rigs which had been employed in WERS work during the war. Working on 144 Mc. meant listening to a mess of hash compounded of radiating receivers and splashing transmitters. A lot has happened in a year; probably more advancement than was ever crammed into one year in all the history of v.h.f. endeavor. The availability of surplus gear which could be adapted to amateur use had a lot to do with it. Tubes like the 832 and the 829, star performers in the v.h.f. range, became cheap and plentiful. The 6AK5, capable of real gain in 144-Mc. r.f. stages, made possible the construction of converters having performance approximating that to be expected of lower-frequency units. Beam antennas, simple to build and adjust at this frequency, became almost standard equipment.

In many populous areas it is now possible to use a selective receiver without sacrificing contacts, since most of the more active stations are crystal-controlled; yet the boys with the simple gear can still have fun on 2. The presence of many selective receivers has given most of the users of oscillator rigs an opportunity to learn just how badly they sound, however, and one listen on a superhet has often been enough to start a fellow on the construction of a crystal rig. The SCR-522 and the ARC-3 have provided a solution for many who think the construction of a crystal-controlled transmitter too difficult.

That there are plenty of stations to work is evidenced by the showings of some of the contestants in the 1947 Marathon, notably W2ZD, Maplewood, N. J., who worked 134 different stations during the first reporting period. The use of phase modulation, with a frequency multiplication of 27 times, helped to boost his total score to 620 points, the highest ever recorded by a 144-Mc. entrant.

One of the first things one notices when he first uses a selective receiver on 144 Mc. is the tremendous amount of room on the band. Where a superregen seems loaded when the band has more than five or six signals at the most, the selective receiver makes it possible for hundreds of signals to be present at one time without severe QRM. W2BYH and W2SVI have been having some fun working c.w. on 2, and it turned up the fact that

(Continued on page 186)



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Here is Eugene A. Piety, W7ACS/KH6, who also worked J9AAK and W6VDG/KW6. His rig is a converted BC-640 which works from a crystal on 5555.8 Mc. with 6V6-807-24G to p.p. 24Gs, running 70 watts input, modulated by 811s. The antenna for 6 is a 3-element array which was erected in 31 minutes flat. Receivers are an S-27 and an AR-88 used in the same arrangement as the S-36 and Super-Pro at KH6DD.

Modernizing the Old Receiver

Simple Means of Improving Gain and Image Rejection

BY WILLIAM L. NORTH,* W7BHE

• In this article the author describes a few simple alterations in his 10-year-old communications receiver which resulted in considerable improvement in performance in both gain and image rejection. While incidental regeneration doubtless contributes toward these results, the article demonstrates that individual treatment of the front end of a receiver can yield very worth-while increases in performance.

AFTER having heard the performances of some of the new receivers, the author was rather discouraged with the one in his ham shack. Regardless of the fact that ten years ago it performed along with others in the same general price bracket, it just didn't have the "sock" of the newer ones. Furthermore, images on ten and twenty meters were sometimes bothersome. Consequently, the "old friend," which had done its job in an excellent fashion all of these years, had fallen into disrepute. A new receiver was out of the question, so it was decided to find out just what might be done in the way of improving the performance of the old. It might be well to mention here that the receiver concerned is an RME-69, but it is felt that the improvements to be described are not peculiar to this particular receiver and may be duplicated in others. The original r.f. amplifier circuit is shown in Fig. 1.

In looking over the field, no major improvements in circuits could be found on newer receivers outside of such things as noise suppressors, etc. Fundamentally the new receivers remain superheterodynes and the improvements in sensitivity and selectivity have been brought about mainly by the use of better components. Better tubes account for improved performance in many of the receivers, and it was with this in mind that the author set about investigating how the old one could be improved. Incidentally, several other things equally important were overlooked in the first analysis and this necessitated remodeling the receiver twice.

Choice of Tubes

The selectivity (determining image rejection) and sensitivity of a superheterodyne are dependent, for the most part, on the Q of the tuned r.f. circuits. Although the Q of ordinary unloaded circuits is high enough for good selectivity, precautions must be taken or the tube following the first tuned circuit will so greatly load it that the effectiveness of the entire amplifier will be largely lost. This is particularly important at the higher frequencies, where loading is many times that exhibited at lower frequencies. It is for this reason as well as the fact that it becomes more difficult to keep up the Qs of the unloaded circuits, that image rejection, gain and sensitivity fall off on ten and twenty meters in nearly all receivers. Furthermore, it may serve to little avail merely to substitute a tube with a higher transconductance, because even in a good circuit, the loading may be so increased as to largely offset the additional gain of the tube. Full advantage of a better tube may be realized only where other defects of the amplifier can be remedied, if such defects are present. The term "better tube" does not mean merely a tube of higher transconductance because so many tubes with large transconductance have such high input admittance that their substitution results in small increased gain and a considerable loss in image rejection.

In surveying the newer tubes, it became ap-

*2115 N. E. 59th Ave., Portland 13, Oregon.

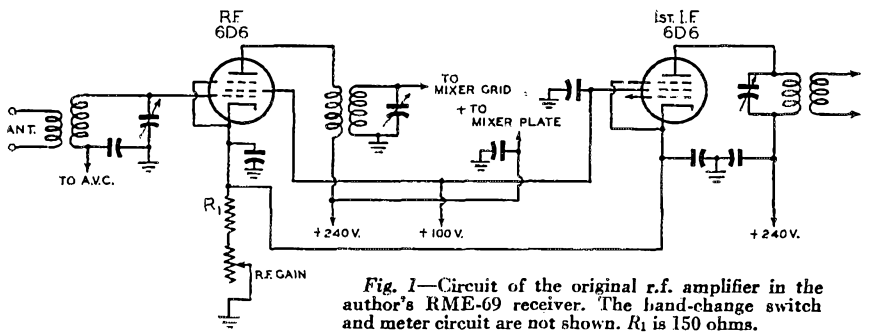


Fig. 1—Circuit of the original r.f. amplifier in the author's RME-69 receiver. The band-change switch and meter circuit are not shown. R_1 is 150 ohms.

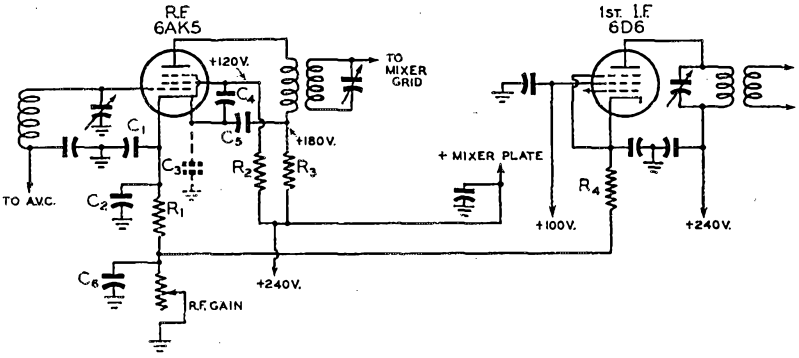


Fig. 2—Modified r.f. circuit for the 6AK5 r.f. amplifier. C_1, C_2, C_4, C_5, C_6 — 0.1-μfd. paper. C_3 — 500-μμfd. mica. R_1 — 200 ohms. R_2 — 50,000 ohms. R_3 — 7500 ohms. R_4 — 300 ohms.

parent that the 6AK5 was by all means the tube to use in the r.f. amplifier of a receiver. Its input admittance is fairly low at 28 Mc. and, in addition, its transconductance is in the order of 5100 compared to around 1500 for tubes such as the 6K7, 6D6, etc. What could be simpler? An adapter was made from an old 6-prong tube base and a 6AK5 was substituted for the 6D6 in the r.f. stage of the RME-69. The results were far from startling; in fact, the only improvement noticeable was at frequencies lower than about 10 Mc.

Circuit Modifications

In view of the fact that the 6AK5 and 6D6 are not designed to operate at the same values of bias, screen and plate voltages, the failure of the experiment was attributed to this. The receiver was taken out of the cabinet and by the use of several resistors and associated by-pass condensers, voltages were adjusted to those rated for the new tube. The other components in the r.f. amplifier stage were left as found. An immediate improvement in gain was measured on all frequencies, varying from 18 db. at 2 Mc. to 4 db. at 30 Mc. with several frequencies showing gains in the order of 25 db. The resulting increase in gain was so startling to the author, and the receiver had so much "sock," that it was left in this condition for several weeks, and once again it seemed like a new receiver rested on the operating desk.

However, being a true ham, and considering that in spite of the improved gain at the lower frequencies there had been relatively little increase in gain and image rejection on ten meters, it was decided to carry the investigation further.

In attempting to bring up the gain at 30 Mc., it was considered possible that degeneration was entering into the picture — that the length of the cathode lead external to the tube, in particular, was introducing inductive reactance at the higher frequencies, thereby reducing the gain at 30 Mc. Accordingly, it was decided to discontinue use of the adapter and install the miniature socket in place of the old 6D6 socket, thus shortening the leads considerably. Furthermore, upon studying the receiver, it was found that grid, screen, and plate by-passes were brought to the chassis rather than to the cathode terminal of the socket. The control-grid ground return could not be connected to this terminal because the tuning-condenser rotor was grounded. Since lifting the condenser from ground would have involved a major construction job, it was left as originally installed. All other by-passes were returned to the 6AK5 cathode terminals. This tube has two such terminals, one for grid returns and the other for plate returns. The decision to alter these by-pass connections ultimately made the r.f. stage work.

Immediate improvement in gain at 30 Mc. was noted, amounting to some 12 db. over that obtained before work on the receiver was started. Simultaneously the signal-to-image ratio was increased to better than 30 db. Since this is considerably greater than would be expected from the tuned circuits even if there were no loading, it seems evident that regeneration contributes to this sort of performance; in fact, the stage had a tendency to oscillate at certain spots within the two higher-frequency ranges. This instability was eliminated completely by the use of C_3 as shown in Fig. 2. It may not be required in all receivers. Fig. 3 is a graph of the gain with the modified r.f. stage, using the gain of the original receiver as a basis.

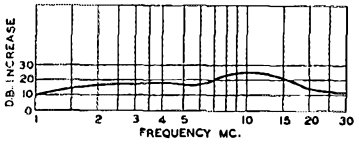


Fig. 3 — Curve showing increase in gain obtained by altering the input stage of the RME-69.

A comparison of the original of Fig. 1 and the modified circuit of Fig. 2 will show the change in the original by-passing. Some of the condensers were originally located several inches away from the r.f.-tube socket and were common to either

(*Continued on page 130*)

VE-W Contest

April 4th–5th–6th

THE calls "CQ VE" and "CQ W" will be heard for the first time since 1939 on April 4th as revival of this great contest gets under way. The all-time high of 574 participants will be topped if precontest interest is any indication. Leaders in 1939, VE3SF and W2IOP, will have to look to their laurels to maintain supremacy.

Sponsored by the Canadian Amateur Radio Operators' Assn., the first postwar VE-W get-together promises to be a highlight among operating activities in 1947. A "CQ VE" to raise Canadians and "CQ W" to raise United States stations will provide you with operating thrills from the opening gun right down to the finish line! The Contest Rules follow:

Dates: Starts Friday, April 4th, 8 P.M. Ends Sunday, April 6th, midnight. (Local time.)

Operating Time Limit: Your period of operation must not exceed 20 hours.

Object: Each VE will work as many W stations in as many U. S. ARRL sections (see page 6, *QST*) as possible. Each W will work as many VE stations in as many VE sections as possible.

Scoring: Message preambles will be exchanged. Each preamble sent will count one point and each one received will count one point. It is not necessary for preambles to be exchanged both ways before a contact may count, but one must be sent or received before credit is claimed. All preambles must be handled under approved ARRL procedure. Mark each new Section as it is worked. The "check" portion of the preamble will be the RST report of the station worked. On 'phone the "T" will be omitted, of course. Sample preamble: "Nr 1 VE3CAR CK 589 Toronto Ont 8:02 P Apr 4." W stations multiply their final score by 8, there being approximately eight times as many U.S. sections. VE stations multiply the number of points by the number of U.S. sections worked.

Frequency Bands: Any or all amateur bands.

Power Multipliers: Under 30 watts, multiply total score by 2; between 30 and 100 watts, multiply total score by 1.5; over 100 watts, multiply total score by 1. (D.c. input to the final.)

Operator Handicap: If more than one operator is used at a competing station, the total score must be divided by the number of operators having a part in the score.

Prizes: A Certificate of Merit will be awarded to the leader in each ARRL section. There will be additional prizes for the highest-scoring Canadian and American stations.

Logs: All logs should be mailed to the Canadian Amateur Radio Operators' Association, 46 St. George Street, Toronto 4, Ontario, Canada, not later than midnight, April 30, 1947.

Operator's Certificate: The following certificate is requested on each log submitted: "I hereby state that in this contest I have not operated my transmitter outside any of the frequency bands specified on my station license; and also that the score and points set forth in the above summary are correct and true."

You've been asking for it ever since the end of The Great Silence. Here it is! Let's see a big turnout for one of the most popular of contests: April 4th-5th-6th; "CQ VE" and "CQ W"; 20-hour time limit; Certificates of Merit; prizes. May the best men win!

APRIL 1922 *QST* didn't leave any of the recent big ham doings unreported — the little Headquarters staff was busy participating in all the conventions, the Governors-President Relay, and the very important first session of Secretary Hoover's Radio Commission.

Up front in this issue is the Editor's report on the Washington Radio Conference, another attempt by the Department of Commerce to make technical and regulatory repairs on the Radio Law of 1912, to cope with the rapid growth of new radio services. The spokesmen for the big corporations were heard first. They did not have an easy time of it, with charges of monopoly, restraint of production, and manufacture of inferior receiving equipment being repeatedly hurled their way. Independent commercial companies and other interests identified with the new medium, radiotelephony, also had their say.

Amateur Radio was represented by ARRL President Maxim, sitting on Mr. Hoover's advisory committee alongside such prominent amateurs as E. H. Armstrong, C. M. Jansky, jr. and L. A. Hazeltine, and by Vice-President Stewart, Secretary Warner, Paul F. Godley, and officials of League-affiliated clubs. Lead-off man for the amateur argument was our recently-returned hero, "Paragon Paul," who stated the amateur position in strong terms. He especially denounced the "American-small-boy" publicity we have been receiving in various circles, to which Secretary Hoover replied:

> I would like to say at once that anyone starting any such suggestion that this Conference proposes or had any notion of limiting the area of amateur work was simply fabricating. . . . The amateurs were asked to be represented in this Conference and they are represented here today. . . . So I wish to sit on that right at the start — the whole sense of this Conference has been to protect and encourage the amateur in every possible direction.

(Continued on page 132)

Foreign Notes

DECEMBER CALENDAR

The December issue of the I.A.R.U. Calendar is devoted principally to a discussion of prospects and preparatory work for the coming world telecommunications conference. First briefly reporting the five-power Moscow conference (from data published in the January issue of *QST*), the Calendar urges officers of all member-societies to keep in close touch with government communications authorities with the following common objectives:

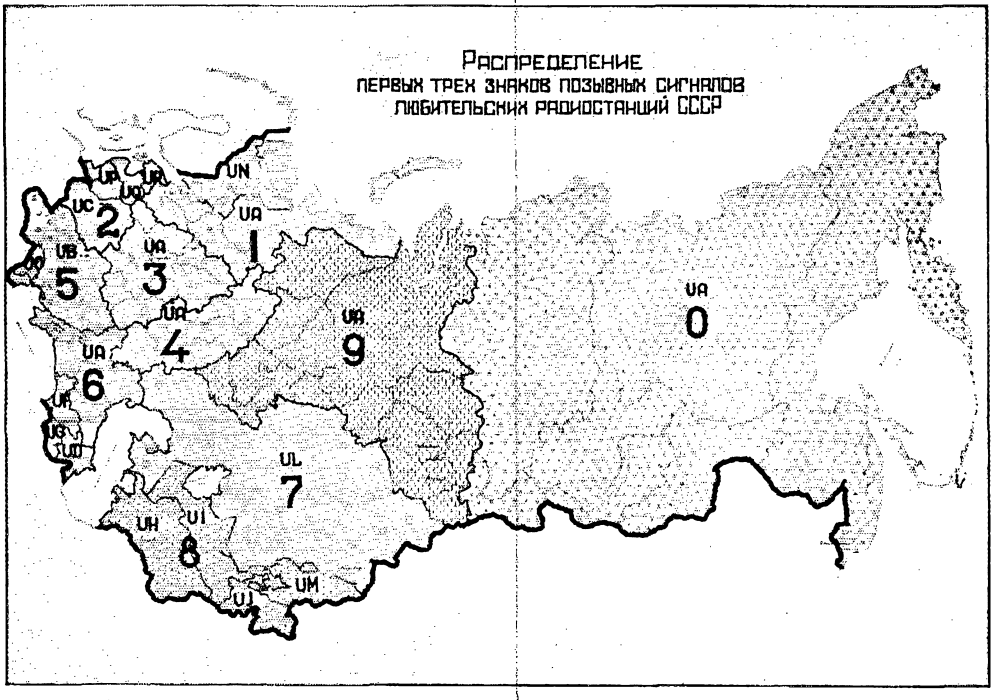
"1. The retention of the present Cairo allocation of 1715–2000 kc. shared between amateur, fixed, and mobile. For the information of members, the ARRL reports that it is still taking issue with the U. S. government's proposal to exclude amateurs from this band of frequencies, and at this writing has reason to feel that there will be a revision of the U. S. proposal so as to include amateurs in at least part of this range.

"2. The retention of the present Cairo allocations of the 3.5-, 7-, 14- and 28-Mc. bands. It is here to be noted that there is a great deal of pressure to assign 3900–4000 kc. to the aeronautical mobile service in Europe, and high-frequency portions of the 7- and 14-Mc. bands to the international broadcasting service.

"3. Inclusion of a proposal by each government to institute a new amateur band 21–21.5 Mc. It is encouraging to note that three of the five powers at the Moscow meeting proposed some sort of amateur allocation at this point in the spectrum, but it will be necessary for many governments to advance and support the full 21–21.5 Mc. proposal if we are to be successful in finally obtaining the assignment.

"4. A liberal set of assignments in the region above 30 Mc., similar to those proposed at Moscow. While most of this portion of the spectrum will be considered by an international conference for the first time, and compromises of actual band limits will undoubtedly be necessary, each member-society should ensure that its government is made aware of the necessity for amateur allocations at approximate octave in-

(Continued on page 134)



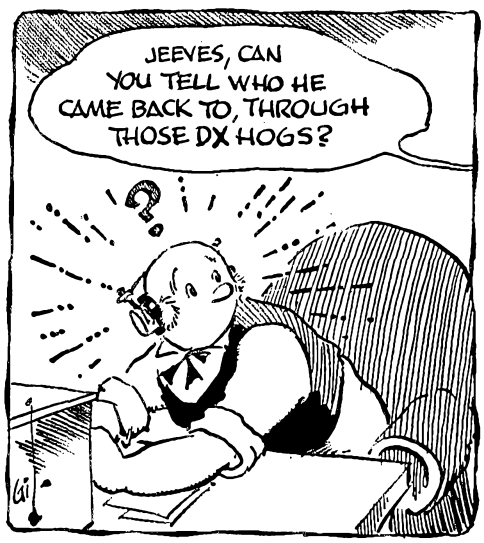
From the Central Radio Club of Moscow, courtesy URSA-3-1, we have this map of the call districts and prefixes used by amateurs in the Russian sphere.

How's DX?

CONDUCTED BY JOSEPH E. GRAHN, * W1CH

How:

With one-half of the first postwar C.W. International DX Competition a fond memory as this is written, it appears that the contest will go down in history as the maddest scramble of all. Activity seemed to be at an all-time high. Signals were ten deep for every kilocycle on the dial — and then some! In a two-hour listening period we logged 47 countries, while in another of about 40 minutes we heard 21. Did you fellows hear XU6GRL making hay with QLM and QML and refusing to answer calls on his own frequency? He was one, among several foreigners, who put these signals into operation, to the gain of many of the smart boys on this side. We have the word, gang, that J3AAB, CR9AN and CR9AG have made a compact to never answer anyone calling on their own frequencies. Nuff sed?



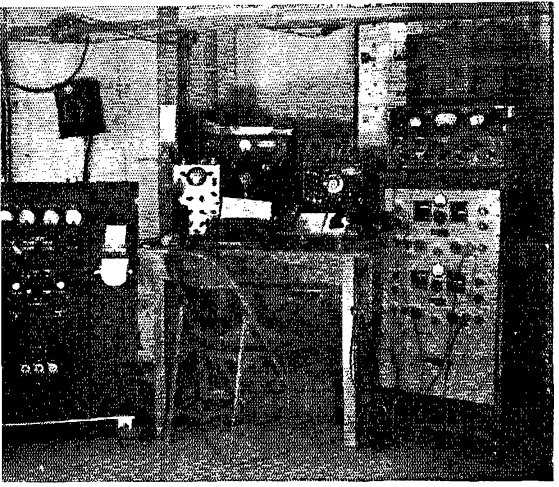
What:

Eighty is still giving the gang an easy ride . _ . _ . _ W2PNB, with 45 watts into an 815, latched onto F3MS, VP6AE, G6RB, G8TK, G5LI, G2HFO, GW8CT, GW5YB, HB9SS, HB9EI, HB9FL, OK1LM, ON4AU, ON4HC, OZ4FT, G3AXT, KP4CO and K4IFL — all between 3500 and 3600 kc. . _ . _ . _ W3HH worked HB9EK, G5JU, YU7KX and G2AVP, between 3525–3550 kc. . _ . _ . _ W1GKA, using 60 watts and a 400-foot wire, QSOed G8CK, G2SO, G5KT and PAØDC, all on the l.f. end of the band . _ . _ . _ W7BED, with forty watts and 7600 feet elevation, grabbed ZL1NF (3680) with a wire fifteen feet off the ground. He uses an antenna!

Forty offers plenty of thrills for those willing to dig . _ . _ . _ W6TI sez his biggest came the other day when he worked three Gs . . . 2PL, 5LI and 5DQ . . . all in thirty-nine minutes, making his total six, one before the war and five since . _ . _ . _ W3JKK, with one rock and 80 watts, raised G4IF (7150), G5LZ (7150), SM5IZ (7150), CM2BU (7210), and is hearing plenty more with an abandoned telephone lead for a receiving antenna . _ . _ . _ W2QUJ got VK2MN (7085), ZL2GS (7175), HB9DA (7100), HH3ES (7115), LX1AS (7115), YR5M (7135), CR9AD (7240), PAØAB (7125), G2ITS (7125), KA1EA, KH6-MNA and KP4ABK . _ . _ . _ W4DXI grabbed HB9CS (7140), HB9FP (7160), G6TM (7050), ZL2MM (7110), G8TK (7140) and F9BC (7140) . _ . _ . _ W2RDK claims 40 is his best band and proves it by clicking with ZL2NT (7165), HK5CR (7099), J2AAM (7100), PAØMM (7170), XE2FG (7090), KH6FG (7130), GI3AXI (7097), SM7HT (7100), SM6HN (7070), UA3AF (7110), UA3DQ (7130) and LU9AX (7070). Charlie wants to apologize to the gang, especially to the three W9s and the W6 who waited for his 35-minute QSO with CN8AS to end, while he was trying to arrange skeds with an old friend of his in CN. (Gang, there is an example of real hamming.) . _ . _ . _ W4LAC, using ten watts, had a fine contact with ZL2QM . _ . _ . _ W7RT had a night of it on Jan. 24th, knocking over W6VSO/J9, XE2HQ, KA1ZU, W6NQG/KM6, XU6GRL, KP4CC and KP6AB. He is using a new Signal Shifter and sez he is off xtals for life. Proper handling of that VFO will make us all happy, John . _ . _ . _ VE3ACS, with two rocks and plenty of patience, worked ZL2GO, KZ5AG, OH2X, and several KH6s and Europeans. After listening to the ungentlemanly way VFOs are being used on the bands, Morgan says he's disgusted (an understatement if we ever heard one) . _ . _ . _ W3LNE (ex-W8DWV) jawed with HA8F, UG6AB, TR1P, SM3WZ, TI4MAR, SM7FN, ZL2MM, HB9CS, KV4AA and UA3KA, on or near the low-frequency end.

Twenty, the band that keeps the DX gang happy, is still up to par . _ . _ . _ W9RBI, with XYL and other QRM, is tickled to have worked VP8AD (14,070), VS1BX (14,025), UB5KAE

* 53 Quinapoxet Lane, Worcester, Mass.



W5IBE/J, located at Itazuke Army Air Base, Kyushu, Japan, is another G.I.-operated station that has been putting out a nice signal all over the U.S.A. The rig runs a kw. into a BC-610-E. Receivers are BC-799s and an SX-28. Antennas include a three-element rotary for 20 meters, a five-element ten-meter rotary, a V beam with 8 waves to a leg, a half-wave horizontal doublet, a half-wave vertical doublet, and a long wire. The call belongs to Lt. John B. Landress of Dallas, Texas.

♦

(14,085), **XU6GRL** (14,070), **ZK1AH** (14,145), **CR9AN** (14,085), **EP3D** (14,197), and **PK1RX** (14,135) ._._._ W6SAI, an ex-W2, sez working Europeans from California is really tuff, but he managed to snag **HA4EA** (13,995), **UA9DP** (14,-070), **HZ1AB** (14,100), **TF3A** (14,025), **OQ5BR** (14,103), **FF8WN** (14,040), **UN1AO** (14,112) and **KV4AD** (14,112) ._._._ New ones at W8RDZ are **GC4LI** (14,038), **VS7ES** (14,065), **ZD2G** (14,079), **I6USA** (14,095), **ZE1JI** (14,077), **SP1-KWK** (14,050), **VU2AV** (14,067) and **VQ5TWJ** (14,090), for a total of 100 ._._._ VE1EP, who sez phooey to high power and beams, did work **LQ4LA** (14,030), **TA1DB** (14,040), **VQ2HC** (14,-035) and **ZC1AN** (14,040), and his list of heard ones really makes our eyes pop out. Better build that beam, Art, and get in on the real fun ._._._ W9ENQ contributes his first, with CE3DZ (14,090), PY1HZ (14,090), OK1AW (28,020), ZL1HM (3720), **YV5AB** (14,150) and **CX1DZ** (14,085) ._._._ W6SN must have his antenna problems licked. Bill sends in a hot list, the choice ones of which are **PI1L** (14,035), **UA6BC** (14,095), **CN8BK** (14,005), **YO5WZ** (14,025), **PK4IP** (14,055), **SV1RX** (14,015) and **PZ1AL** (14,025) ._._._ W1KMY sez he struggled along with **WØMCF/C1** (14,025), **OH4P** (14,085), **ST2AM** (14,030), **VQ2GW** (14,040), **ZB1A** (14,040), **VK7DW** (14,040), **J3AAD** (14,030), LX1AO (14,-020), KZ5NA (14,025), **PZ1AL** (14,030) and **PZ1MY** (14,070) ._._._ W2MPA, on 'phone, knocked off a string of stuff a mile long, the choice ones being J9AAW (14,180), J3DN (14,190), PK1AW (14,360), **KA1SS** (14,180), **EK1MB** (14,350), **VQ8AB** (14,325), **ZS4P** (14,070), VK6RU (14,390), **ZE2JD** (14,200) and VK4HG (14,160), making a total of 107 postwar. W1GKK partook of these meaty ones: **J2UVW** (14,255), **C7AA** (14,390), VK7LZ (14,190), ZS6DW (14,195), **CT1UU** (14,285), KP6AB (14,235), KV4AD (14,265), **UA1AB** (14,240) and VK6DO (14,-335) ._._._

Ten has paid dividends to W8NBK, who in the last 14 weeks has snagged 82 countries, the latest of which are **ZC6FP** (28,030), **CR4AA** (28,045), GC4LI (28,070), **UB5KAE** (28,100), **CT1JS** (28,025), TF3A (28,010), **ZB1AB** (28,125), VR-2AB (28,005), VQ2GW (28,175), CR9AG (28,-025), HA7AD (28,200), **OE1AX** (28,110) and ZE1JS (28,175) ._._._ W7JHB landed C7AA (28,280), W8URU/C7 (28,115), W4HUR/C7 (28,260), SU1BD (28,509) and XU6GRL (28,-240) ._._._ W9AWO's nineteen watts to an 807 snagged KZ5NA (28,140), HP1A (29,400), PY6AV (28,400), **FA8DX** (28,400), PZ1RM (28,120), VO6H (28,200), TI2EA (28,120) and HC1FG (28,480) ._._._ W2CYS kept busy working UA9CF (28,020), YT2AT (28,005), OH-8NX (28,140), **VQ5FCA** (28,000) and, on 'phone, **FK8VB** (28,100), CT1YT (28,400), **J9AGT** (28,380) and **J2AMA** (28,400) ._._._ W1LQO's dreams of postwar DX have come true. For the past thirty days his string of DX QSOs is very imposing, totaling 69 countries ._._._ W8ZBK took four hours to snag G6LX, I1GX, GW3UO, EI3J, I1WG, G3RK, G2AV, G4QB, D4ASU and several VEs ._._._

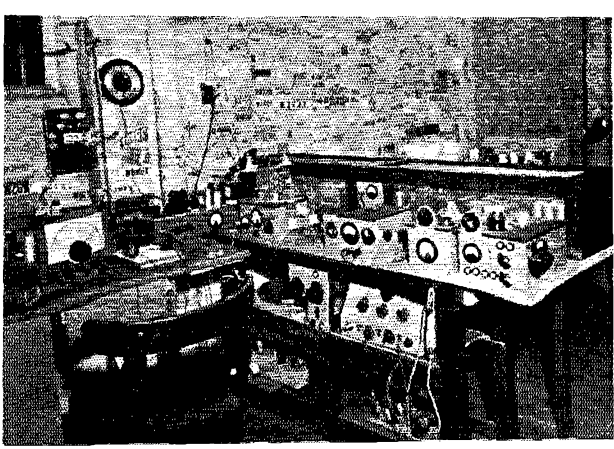
Where:

The new J QSO Bureau is: Maj. Lloyd D. Colvin, J2AHI, Hq. 71 Sig. Ser. Bn., APO c/o PM,

(Continued on page 136)

♦

The rig at OZ7UU, Charlottenlund, Denmark, consists of 4 stages: a Philips 4654-pentode xtal or VFO, an 802 buffer-doubler, a German 12p35 in another buffer-doubler, and Taylor T40s in the final. Power supplies, which are contained in a screened box on the rear of the transmitter table, deliver 300, 400, 600 and 1200 volts. The modulator is a four-stage job ending up with 6L6s in AB_2 plate modulating the T40s. Antennas in use are a voltage-fed Hertz and a W8JK rotary.



The Staggering Band Theorem

A Design for Living in Amateur Radio

BY LARSON E. RAPP, WIOU

• Once again Rapp, the fearless April scientist, walks boldly in "where angels fear to tread" and locks horns with the greatest problem of all amateur radio, the 'phone *vs.* c.w. controversy. Attacking it with his usual logic and analytical skill, he comes up with a solution to all of the frequency-subdivision situations. Here is enlightening reading for all students of this basic amateur question.

THE "circular-band theorem" described [1] a year ago put many thinking amateurs to work devising ways and means for best utilizing this very logical system for reducing interference in the amateur bands. The work of Shuart [2] and Sexton [3] was particularly outstanding, and it is safe to say that, had conditions remained as they were in 1946, or, better yet, 1936, there would be no need for further attacks on the problem. However, in the year that has elapsed, three factors have contributed to increased interference in the amateur bands to such a magnitude that other solutions must be sought.

The factors responsible for the augmented QRM are the increased number of amateurs, the surplus equipment now available, and 'phone operation. The most reliable figures on the growth of amateur radio indicate that the number of amateurs will be increased by 50 per cent within one or seven years, or possibly sometime in between.[4] Taking the most optimistic attitude, it is still apparent that something must be done. The surplus market, which is just beginning to get under way, now makes it possible to build a complete 1-kilowatt transmitter complete with pilot lights (three colors) for $47.85, and it is difficult to estimate how many kilowatt rigs there are lurking throughout the world, just *waiting* for a receiver before they can start working other stations. Some idea can of course be obtained by listening to the number of stations testing each night, obviously with no thought of ever listening, but these figures will vary with the locality, and nothing definite is available. Conservative estimates of the surplus market, which take into consideration the present amateur practice of stocking up on spare parts, all agree that it will be roughly 37 years and 4 months before an appreciable dent in the stock becomes apparent. It is interesting to note that the custom of storing the large spare tubes in the final amplifier — it is not at all unusual to find a conservative 1-kilowatt amplifier that uses four 450-THs in push-pull-parallel — may have some effect on the number of licensed amateurs in the near future, according to the FCC. Radiotelephone operation, in this and other countries, has increased instead of dying out and, although apparently a more attractive form of communication to many than "talking with their hands,"[5] it is a great devourer of kilocycles.

As a matter of strict fact, amateur 'phone is undoubtedly the greatest contributor to amateur interference today, both in the amateur and in the broadcast bands. Some of the foreign countries, with whom we enjoy the most friendly relationships otherwise, have developed 'phone techniques that require several times the channel space required by the more primitive domestic 'phones, but information on the exact methods used is difficult to come by. At least nothing on the subject has appeared in the domestic press in the past few years, so the secret must be kept fairly well guarded. However, it is not the purpose of this treatise to engage in a discussion of the relative merits of 'phone *vs.* c.w., but only to propose a solution to their working together in closer harmony with no mutual jealousies or demands for more frequency assignments.

Reasoning along the lines of more band edges for everyone, a major objective of the Circular Band Theorem,[6] careful study of the "Ten-Meter Plan"[7] was made and many observations of students of that band were carefully analyzed. Regardless of the merits of the proposal, the concensus seemed to be that it was too complicated and that the average amateur, already overburdened by weighty problems about his standing waves and an S-meter that will only hit the pin on strong signals, could not be expected to remember where one allocation within a band leaves off and another begins, even though it is to his best interests to acquaint himself with these details. This weight of opinion discouraged a plan

[1] Rapp, "The Circular Band Theorem," *QST*, April, 1946.
[2] Shuart, "Vertical Modulation," *QST*, June, 1946.
[3] Sexton, "Putting Circular Bands to Work," *QST*, June, 1946.
[4] Harkness, "The Pros and Cons," *Ossining Golf Digest*, Oct., 1946. Also, latest report of the Gallop Pole.
[5] Miller, Joe, *The World's Funniest and Oldest Gags.*
[6] Rapp, *ibid.*
[7] "A Plan for the Ten-Meter Band," *QST*, Dec., 1946.

that the author was about to propose for all of amateur radio, namely, to stagger the 'phone and c.w. assignments every 100 kc. throughout the spectrum. However, it was this very discouragement that gave impetus to a new and even better plan, so it appears that the "Ten-Meter Plan" served a very useful but unexpected purpose.

Research

From intimate discussion with well-informed representatives of both factions, the author has reached the conclusion that if the subdivision of the amateur bands were left up to the 'phone men, all of the amateur frequencies would be made available exclusively to 'phone. Likewise, members of the brass-pounding contingent would be only too happy to see all of the bands made exclusively c.w. That this is basic will be agreed by all and, indeed, it is confirmed by the traditional greeting between 'phone and c.w. men.[8]

Obviously the best solution to the problem would be the development of some new form of 'phone and c.w. that would allow the two to work independently on exactly the same frequency. It would then be possible for the bands to be thrown open in their entirety to both 'phone and c.w., and both factions could go along blissfully unaware of the other on the air, in much the same fashion that they do now off the air. While this attack is still being carried on in the laboratory, it may be some time before the solution is obtained. Another very promising approach is based on a communications method involving the inverting of the normal speech frequencies into corresponding "contrapolar"[9] frequencies — i.e., frequencies less than zero — modulating the carrier with these frequencies and then reinverting them back to normal after reception. Since negative sidebands are obtained, the signal disappears entirely with modulation, and the higher the modulation frequencies the more it disappears. Thus the more high-fidelity 'phones active on the air with contrapolar modulation, the more room there is, and the only problem, aside from the technical ones, is to guarantee that there be enough 'phones talking all of the time to insure the existence of the frequencies. Present experience indicates that this problem is insignificant. Stations in neighboring countries will undoubtedly supply large portions of the bands to us and will thus be helping to make room for many more stations, a very worth-while step in the right direction.

Staggering the 'phone and c.w. assignments, as mentioned before, brought out some interesting possibilities. Obviously 100-kc. segments are too large and, since all of the international assignments are not necessarily even multiples of 100, there would be some disagreement by the two factions. The next step was to reduce the idea to 50- and then 25-kc. segments, and by the time 8-kc. segments were reached a general equation was developed that permitted one to study the effect regardless of the segment widths. The actual equation is beyond the scope of this paper but, suffice to say, it does show that, for an upper audio limit of 4000 cycles, 'phones always take up more room than c.w. stations. The reciprocal of this equation, incidentally, is the factor by which 'phone men think their assignments should exceed the c.w. assignments. However, in a broader sense, such as 'phone, by using the theory of limits one can visualize reducing the segments until the 'phone and c.w. portions are superimposed. This is the principle of "imposition" which has been hinted at by other workers but never fully explained. Suffice to say, however, it shows the impracticality of staggering assignments in frequency, or "space" on the dial.

The Staggering Band Theorem

The other approach, the new Rapp plan, is one that requires no great technical progress and can therefore be put into effect almost at once. It too is derived along the general basic space-time-frequency canons, and it is so simple and so logical that it seems unfortunate, and somewhat amazing, that no one has suggested it before this time. Known as the "staggering band theorem," it consists simply of staggering frequency assignments in time rather than in space (frequency)! Stated another way: During alternate 24-hour periods, make the bands exclusively 'phone or exclusively c.w.! For example, on the day the plan goes into effect, the 3.5-, 14- and 50-Mc. bands would be exclusively c.w. throughout the world, and the 7- and 28-Mc. bands would be exclusively 'phone. At the end of the 24-hour period, 80, 20 and 6 would be exclusively 'phone for a day, while the c.w. men held forth on 7 and 28 Mc. At the end of that 24-hour period, conditions would revert back to those of the opening day for another 24-hour period, and so on. The periods would be concurrent throughout the world, the calendar being based on GCT or some other well-known time. WWV is already prepared for the move, since time signals as well as standard frequencies are a part of the regular schedule.

The advantages of the plan are obvious. No 'phone man could ask for more frequencies, because they would *all* be available to him. The c.w. man would similarly be content, with no 'phone interference to interrupt his activities. Progressive old-timers, who have camped on one frequency for so long that they have worn a hole there, would have an opportunity every other day either to go on another mode of communication or go to a movie. In either event, they would find out what is going on in the world, an im-

(Continued on page 136)

[8] "Drop dead!"

[9] Wildenhein, "Contrapolar Frequency Spectrum," *QST*, March, 1944.

Hints and Kinks For the Experimenter

COMBINATION B.F.O. AND A.N.L. FOR THE SKY BUDDY

THE combination b.f.o. and a.n.l. circuit used in the new S-38 receiver can also be used in the Sky Buddy by substituting a 6SQ7 for the 76 b.f.o. tube originally used. The 76 and its socket are removed, and an octal socket for the 6SQ7 is installed in place. The circuit connections are shown in Fig. 1. The two diode plates are tied

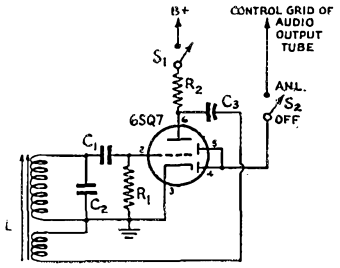


Fig. 1 — Circuit modifications required for the addition of a noise limiter to the Sky Buddy receiver.
C_1 — 100-$\mu\mu$fd. mica.
C_2 — 470-$\mu\mu$fd. mica.
C_3 — 0.01-μfd. 400-volt paper.
R_1, R_2 — 47,000 ohms, ½ watt.
L — B.f.o. coil.
S_1 — B.f.o. switch.
S_2 — S.p.s.t. toggle switch.

together and are connected to the control grid of the audio tube through a switch. The triode section of the tube is then wired as the b.f.o.

In operation no trouble has been experienced with the performance of the new b.f.o., and the limiter works very well. With the limiter switched into the circuit it is possible to hear signals plainly that were previously not even audible through the noise. — *Fred R. Mumma, W3KEK.*

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CUTTING MATCHING STUBS

OF ALL the methods tried to determine the correct length of a piece of RG-8U cable used here as a matching transformer for feeding a beam antenna, the process described below seems the simplest, involving less of the old cut-and-try methods used in the past. In addition, it permits the stub to be adjusted before the antenna system is put up in the air, thus saving a lot of scrambling around on slippery roofs.

A piece of cable was cut slightly longer than the calculated length for a quarter wavelength at the desired frequency. A *small* one-turn coil was then soldered to one end of the cable, and the other end was stretched out and left open-circuited. The rig was then tuned up on low power without an antenna, and the final tank coil brought to exact resonance. Coupling the one-turn coil to the final tank circuit will cause a slight increase in plate current, which is brought back to its original level by retuning the tank condenser. If *more* capacity is required to bring the tank back to resonance, the length of cable is too long. If the tank stays in resonance, the cable is the correct length, and if *less* C is required to produce resonance, the cable is too short. The length I arrived at for 14,200 kc. was 9 feet, 10 inches. This figure checked with results obtained by trimming the cable while using a Q-meter to observe similar adjustments. — *R. B. Haner, W2FBA*

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BAND-EDGE MARKERS FOR V.H.F.

A SIMPLE crystal calibrator for use in the v.h.f. bands can be made using nothing more complicated than a crystal, a piece of wire, and a switch, as shown in Fig. 2. The "antenna"

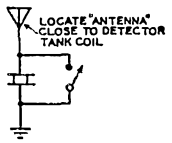

Fig. 2 — Simple crystal calibrator for v.h.f. band-edges.

shown in the diagram is a short piece of wire located close to the tank coil of a superregenerative detector. When the switch is open, the superregenerative hiss is blocked out as if a carrier were being received, when the receiver is tuned to a harmonic of the crystal. Thus, by proper choice of fundamental crystal frequencies, "markers" for band-edges can be set up, eliminating guesswork. — *William L. Detwiler, W9NZL*

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SELENIUM RECTIFIERS AS A BIAS SOURCE

WITH several manufacturers including midget selenium rectifiers in their postwar lines, the amateur now has a means of obtaining protective bias for his rig without having to build separate bulky supplies. The compactness of these new

(*Continued on page 138*)

Correspondence From Members-

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

WORLD CONFERENCE

3446 Walnut St., Philadelphia, Pa.

Editor, *QST:*

I have been giving some thought to the forthcoming telecommunications convention, which I understand will be held in Atlantic City commencing May 15th. . . . I doubt whether there are more than a handful of amateurs in this country who understand the situation and who have any inkling whatsoever of the tremendous pressure being brought to bear by all other radio interests for frequencies, and I think it is very necessary for the ARRL to start an educational program through the medium of *QST*.

. . . I, of course, know what fine work you people are doing and with what problems you are faced, and, therefore, regardless of the results of the convention, I know that the amateur fraternity will be represented in the most magnificent way and that everything possible will have been done to retain our frequencies; however, I am one of a very few who realize this full picture, and I believe the future welfare of the ARRL depends in a large measure on getting this story across to a great majority of its members. . . .

— *Henry H. Pemberton, W3DPU*

[EDITOR'S NOTE: Mr. Budlong's article in this issue is the first of a planned series before and during the coming conference. Our thanks to W3DPU, wartime head of the Frequency Section of the Army Air Forces, for his endorsement of the policy.]

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112 Edward St., Schenectady, N. Y.

Editor, *QST:*

It has come to my attention that there is a possibility the American amateurs may lose all their present frequencies below 200 Mc. . . . If such a vicious rumor is being circulated and there is a foundation to substantiate it, I feel that every American amateur should be informed of these possibilities. . . .

— *Ward Alexander, W2NHY*

[EDITOR'S NOTE: The rumor is indeed a vicious one. There is absolutely no truth to it.

No one knows precisely what will be the outcome of the world conference. Meanwhile, we are bound to have rumors, which will travel like lightning, particularly in the 'phone bands. Remember that most, if not all, will be untrue — and that the more awful they sound, the greater chance they are based on misinformation. If any wild stories come your way, please don't spread them over the air. Check with your director or SCM, or directly with Hq. Or check with W1AW's nightly bulletin service — the *absence* of any confirming data will be sufficient evidence that the stories you hear are untrue.]

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826 2nd St., Santa Monica, Calif.

Editor, *QST:*

. . . Listening to the short-wave broadcast stations occupies a considerable portion of my free time. . . . The short-wave broadcast bands are crowded. Why? Suppose you had a 100-kc. band to divide into ten channels. There would be room for ten stations broadcasting, say, five different programs; but if twenty stations tried to broadcast the same five programs there would be a good deal of interference. This is actually what is happening especially among the larger government-controlled propaganda stations. These stations are not content with merely being heard well. They want to be so thick on the dial that one can't help hearing them.

It is my belief that the usefulness of short-wave stations for propaganda purposes is greatly overrated. Exchange programs of music and cultural material are desirable as are broadcasts designed to reach people in isolated locations; but quantities of lectures, biased news broadcasts, and similar items all with a definite propaganda aim are of very questionable value in any case, and I doubt if this type of broadcast enjoys the audience our opponents would like to have us believe. The number of regular listeners claimed probably includes DX fans writing for verifications. These are not regular listeners and they probably constitute the large majority of those writing to the stations.

The channels in each broadcast band should be proportioned out to the various countries more or less like the regular broadcast band is divided between the U.S.A. and Canada. If this were done intelligently there would be plenty of room for all present short-wave programs and more besides. Listeners relying on s.w. broadcasts for program material would enjoy better reception than is possible at present because there would be less interference.

Let me urge you to do all that you can to prevent these broadcast stations from taking any frequencies from the amateurs. Their wants are unlimited and would grow until the whole frequency spectrum were broadcast stations if allowed.

— *Donald S. Teague, jr., W6AKI*

4415 Davison, Pittsburgh, Pa.

Editor, *QST:*

It has been brought to my attention that at present we have no direct representation in Washington, D. C. Since the new world conference is soon coming up, we had better get on the ball and act before it is too late. If we don't, I am afraid we will lose some of our frequencies. So, what do you say — how about sending a few of the boys down to Washington?

— *Joseph F. Skeehan, W3LHC*

[EDITOR'S NOTE: More misinformation, OM. ARRL began making plans for the coming conference as long as five years ago, has been actively engaged in pursuing those plans for nearly three. ARRL Assistant Secretary Budlong has been almost a permanent resident in Washington for nearly a year; President Bailey and Secretary Warner make trips there as often as necessary; General Counsel Segal resides in Washington.]

QSLs

Box 102, Grampian, Pa.

Editor, *QST:*

All these years I have been looking at pictures of ham radio stations with their wallpaper made up of many, many QSL cards from far corners of the world. Ah, me! Wonder how they got them?

Home from the wars I eagerly pound brass, get promises on QSLs, rush to my typewriter and air mail my newly-made cards that very evening. Then go to the post office twice a day only to find an advertisement from some radio store. So far, the ol' shack still has the plain blue wall.

By the looks of like complaints in recent *QST*s, guess I'm not the only "sad sack." Have a heart, gang; it doesn't take long to reach into the back of the old desk and drag out the dusty cards. Old-timers did it for you.

— *Sherwood Doughman, W8KNK*

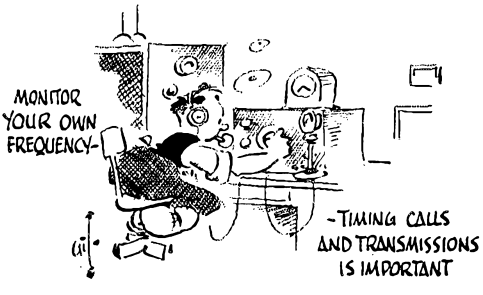
Operating News

F. E. HANDY, W1BDI, Communications Manager
E. L. BATTEY, W1UE, Asst. Comm. Mgr. ♦ GEORGE HART, W1NJM, Communications Asst
J. A. MOSKEY, W1JMY, Communications Asst. ♦ LILLIAN M. SALTER, Communications Asst.

On Avoiding QRM. Interference is everybody's headache. One method of dodging it is to use an ECO or VFO, and along this line we have made considerable postwar progress. Admittedly use of a *single* frequency channel by two operators or a score of netters, in traffic handling or casual round tables, tends to reduce the over-all band congestion. It steadily raises our efficiency in the use of amateur frequencies.

But these remarks are dedicated to the possibility of work with minimum QRM. How to avoid QRM? Working through it makes the world's best operators! It's a blessing in disguise. But if while we are operating a channel gets uncomfortably hot, we don't like the interference any better than you do. One way to avoid QRM is to operate in and as part of a systematic network. The second way, if you don't belong and aren't up to enjoying net operations as such, is to move to clear spots *away from* the published frequencies of nets, or off those observed to be occupied either by net QSOs or round tables. These remarks are equally applicable to c.w. and voice work.

Traffic nets, rag-chew nets, and DX round tables — for relaying traffic, taking turns conversationally, or passing a guy around in the friendly fashion of communicators — make their own channel in each case by constant occupancy. These fellows through their very bunching up use only *one channel.* That leaves more holes in the rest of the band; helps us to find nice spots for individualized uses — for looking for stations for WAS, WAVE, WAC, directional traffic-moving CQs, meetings with new and old RCC brethren, etc. W2EC, in discussing these matters, points out that even in the busiest hour 80 per cent of the 3.5-Mc. c.w. band is free of nets. *Rule One: Listen before transmitting* (Sec. 1, sentence 1, operating booklet). *Rule Two: If a frequency is busy, QRX or shift to another spot.*



Why waste time and power? Check first to see if other stations or nets are busy on the frequency you are set up for. Round tables or nets often work periods of one-half to one hour, and state nets sometimes turn over their frequency to a regional net. If you attempt to bust in without listening, your chances of working through the group QRM are slight. (There may be a dozen stations to your one.) Note in the network table published herewith that even at the busiest hour (7 P.M. EST) only ten channels are being used by traffic nets. By a little advance listening or a noting of these times, it is easy to avoid this QRM. Monitor your own frequency!

FCC Checking. Not so long ago LA amateurs told us of a routine checking project FCC had established to visit and check the power levels of alleged California Kilowatts. Of course it didn't bother any honest people to find an FCC representative knocking at the door with his wattmeter! FCC men have to travel all over in the course of fulfilling their duties. Recent letters lead us to believe that the claim-jumping of Class B operators to bands where Class A license endorsements are required is leading up to more calls by FCC Engineers. It's a cinch to call in log evidence and round-table witnesses to catch this type of offender. We have it on good authority that major FCC monitoring stations still devote a good part of their time looking over amateur emissions within and between our bands, and issuing necessary citations where justified. The new ARRL Official Observer harmonic notification form is now in distribution, helping amateurs to avoid FCC citations on such grounds. Recent check has shown some bad *third*-harmonic radiations in addition to the *seconds* that have received attention.

G.T.P. and Net Times. For the benefit of those who want to move traffic but have no skeds, we ask the fraternity in general and netters in particular to note and patronize:

The General Traffic Period.....Daily, 6:30–8:30 P.M. EST
The General Traffic Channels....3575–3600, 7150–7175 kc.

To add to the general knowledge of network facilities which might be called on for regional

emergency communications, and to supplement the above discussion, we publish a condensed survey of the times of operation of the different nets reported to us, 'phone and c.w. It is hoped that traffic movement over all nets and lines may be assisted by the data given:

Starting Time	*Frequencies & Nets*
6:00 A.M EST	3637 (Hit & Bounce — Transcon.)*
7:00 A.M. EST	3665 (Great Lakes)
10:45 A.M. EST	3865 (Ariz.)*
1:30 P.M. EST	3970 (Iowa)**
5:30 P.M. EST	3930 (Mich.)
6:00 P.M. EST	3663 (Mich.); 3860 (Vt., Ohio, Ind.)*
6:30 P.M. EST	3740 (Vt.)*; 3750 (W. Pa.); 3770 (W. Va.)
7:00 P.M. EST	3540 (R. I.); 3550 (Maine); 3630 (N.N.J.)**; 3640 (Conn.); 3663 (Mich.); 3700 (S.N.J.)***; 3720 (N. Y. State)*; 3745 (E. Mass.); 3760 (W. Mass.)***; 3775 (Wisc.)
7:15 P.M. EST	3735 (S.C.)***; 3765 (Ill.)
7:30 P.M. EST	3525 (No. Dak.)***; 3656 (Ind.)***; 3730 (Ohio)
7:45 P.M. EST	3640 (New Eng.); 3610 (Kans.)***
8:00 P.M. EST	3755 (Mo.)*
8:30 P.M. EST	3635 (Rebel Net—Southern States); 3710 (N.Y.C.-L.I.); 3750 (W. Pa.); 3790 (TLC); 3810 (Ky.); 3555 (Nebr.)
9:00 P.M. EST	3723 (Alberta)
9:30 P.M. EST	3515 (Ariz.)*; 3565 (TLA); 3630 (TLAP); 3555 (Nebr.)
9:50 P.M. EST	3854 (Mission Trail Net—Calif.)
10:00 P.M. EST	3705 (Tfc. Outlet—Northeast States); 3725 (Pioneer Net—Northern Calif.); 3615 (Central Calif. and S.F.)****
10:30 P.M. EST	3965 (Golden State Net—Calif.)
11:00 P.M. EST	3743 (Idaho)***
1:00 A.M. EST	3615 (Central Calif. and S.F.)*****
6:30 P.M. Alaska Time, daily . . .	3940, Alaska 'Phone Net

Only active nets meeting at least three days per week are listed. All dates are Monday through Friday unless otherwise indicated. *Daily; **Mon. through Sat.; ***Mon., Wed., Fri.; ****daily except Sun.; *****daily except Mon.

Local *vs.* DX Bands. From a recent letter: "Too many locals use high-power 14-Mc. 'phone for local QSOs instead of 144-Mc. operation or wire telephone. Some are men who have worked 2 meters. I think all hams should observe the FCC rules on using minimum power and keep this a DX band." It is, of course, highly improper for any amateur to work *local* when conditions permit DX to be contacted on 14 or 28 Mc. Common sense, and allowance of a sporting chance to others to enjoy out-of-town QSOs as propagation conditions permit, should govern here! Let's confine our local rag-chews to the times when the bands have gone dead — or better yet, shift to v.h.f. for operation.

— *F.E.H.*

♦

W1AW Operating Position

The wheels turn at W1AW. Jim White (JE—W1PHW) is punching tape on the Kleinschmidt perforator, getting ready for an official bulletin run, while John Rameika (JR—W1JJR) knocks off a few contacts during a general c.w. operating period. The McElroy automatic unit used for all tape transmissions is seen in front of the rack at Jim's right. Bill Matchett (BM—W1KKS), also of the W1AW staff, was busy with other duties when this picture was taken.

F.C.C. CLAMPS DOWN ON ILLEGAL STATIONS

W9ELA's call was bootlegged . . . but FCC walked in on the unlicensed man (one J. J. Burnet, garage mechanic) after using a mobile direction finder. Burnet was impersonating the amateur, W9ELA, but his voice was a dead giveaway. He was arrested for violation of the Communications Act . . . is said to be a third offender. Conviction of operating a radio station illegally carries with it a fine of up to $10,000 or two years imprisonment, or both.

FCC likewise has been running down bootleg stations at many other points. An illegal station operated by a Robert A. Sperry at Cedar Rapids, Iowa, was closed Jan. 11th by FCC investigators using a mobile unit.

Unlicensed stations are potential sources of interference to the amateur service, as well as to all authorized radio services. Watch for illegal operations — on suspicion, *ask FCC to investigate.*

How would you like to have *your* call bootlegged? Several calls have been sent in to ARRL to check with any data OOs might send in. Data from "unexpected" QSLs, giving possibly the frequency or time of operation of unlicensed people who have "borrowed" one's call, should be forwarded to FCC for investigation.

WACC

The Oakland Radio Club offers an attractive certificate to any operator who makes two-way contact by amateur radio with every county in the State of California. There are fifty-eight counties in all. Mobile stations are ineligible for the award. However, stations worked do not have to be permanent, but can be portable or mobile units. Contacts may be by 'phone, c.w., or both. The award is available to amateurs everywhere. California applicants must make all contacts from one county QTH. QSL cards confirming all contacts must be presented to the Secretary, O.R.C., S. C. Houston, W6ZM, 3164 Bona Street, Oakland, Calif. Check over your QSL cards and see how you stand. Only seven Worked All California Counties certificates have been awarded to date. The *Postal Guide* will help you in determining county locations.

ILLINOIS EMERGENCY

During the last week of January, the worst storm of the winter hit Illinois. Communication was disrupted with 12 towns served by the Illinois Northern Utilities Company, which has its general offices at Dixon, Illinois. SCM Marriner, W9AND, and F. G. Eakman, W9AHV, both of Dixon, were instrumental in establishing emergency communication channels. First call from the utilities company requested contact with Aledo, Illinois. An emergency call by W9AND on 3.5-Mc. c.w. was answered by W9QKL, Springfield, Illinois, who telephoned the State Police. By police radio a squad car at Alpha, Illinois was raised, and the message pushed through to Aledo by the one remaining landline. Through this circuit, a 75-meter 'phone schedule was arranged between W9AHV at Dixon and W9TFY at Alpha. The amateur radio emergency circuits facilitated repair of lines and restoration of electric service to a large number of users. W9UQT provided valuable assistance at Springfield.

Members of the Illinois State Net (3765 kc.) established a railroad circuit to handle train orders and traffic between Freeport and Clinton, and towns in between, for the Illinois Central Railroad.

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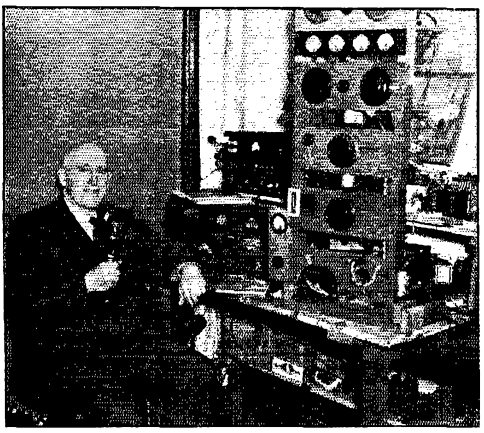


The Oldest Active Ham

Edward P. Kingsland, W2NA, Herkimer, New York, is believed to be the oldest ham active on the air today. In his 82nd year, "Ed" is full of the youthful spirit and vigor radiated by his smile. Twenty years a ham, his first license was issued in 1927 as 8ABQ, later becoming W8NA, and shifting to W2 when the districts were reapportioned. W2NA spends much of his time on 10- and 11-meter 'phone, but also taps out c.w. on all bands, 80 through 10. "Ed" was born in New York City on September 6, 1865. Recalling his early days, he writes, "About the time I finished high school, my father obtained for me a district of 110 gas lamps to light after sundown and put out about four o'clock in the morning." (Suppose there is any connection between W2NA and the song, "The Old Lamplighter"?) Always active in sports, "Ed" still goes in for swimming and skating. He doesn't say that ham radio helped him to stay young, but that's our conclusion!

IOWA ICE STORM

When a severe ice storm in late January brought down power and communication lines throughout much of Iowa, amateur radio stepped into its traditional rôle of furnishing emergency communications. An emergency network was established on 3970 kc., frequency of the Iowa 75-Meter 'Phone Net. Biggest user of the emergency facilities was the Iowa Southern Utilities Company. WØCPU set up his rig at the utility's offices and was the center of activity in routing many important messages handled relative to the restoration of power. Three mobile stations using Mark II tank transmitters were used to advantage in maintaining communications with the isolated towns. About 100 towns are supplied with electric current by the utility mentioned. Iowa stations known to have participated in the work are WØDMX, WØNMA, WØCFB, WØQLP, WØTNI, WØKZI and WØAUL. Many others played a part but their calls are not available. WØKZI of Ottumwa handled press from Des Moines for the local newspaper. Many other messages of importance were handled by the emergency network, including procurement of weather information for the Ottumwa Navy Base. Many outside stations assisted in monitoring and clearing the 3960-3980-kc. channels.

WPR CERTIFICATE

The Puerto Rico Amateur Radio Club has issued the first postwar "Worked Puerto Rico" certificate to W9VKF. Other holders of this award, in order of qualifying, are K4FKC, K4FAB, K4KD, K4EZR, K4FCV, K4ESH, W8JIW, K4EIL, W3EDP, K4FOW, W9FFB, W4FIJ, K4DSE, K4HEB, K4HHR, W8SDR, W9ANS, and W9HGT.

PRARC offers the WPR certificate to any amateur submitting confirmations of contact with 25 Puerto Rican stations. Both prewar and postwar contacts count. K4, KP4, W/K4 and W/KP4 cards are all acceptable so long as there is no duplication of station under different calls. For example, cards from K4HEB and KP4BJ would count only as one inasmuch as they represent the same station. Similarly, cards from W4BZA/K4 (or KP4) and KP4CF would count as one, this also being the same station. Send your 25 verification cards with return postage to E. W. Mayer, KP4KD, P. O. Box 1061, San Juan 5, Puerto Rico.

BRIEF

Life would be so pleasant if we always could have W9NVJ's luck. He took a message from W6OCQ addressed to Haverhill, Mass. Deciding to answer CQs from W1s in hopes of landing one near Haverhill, W9NVJ first called W1CCF, who came back, "UR RST . . . HR IN HAVERHILL MASS." Oh boy!

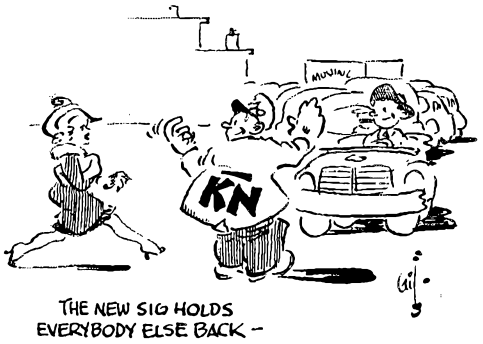
ENDING SIGNALS

Interpretation of just what is intended by the commonly-used ending signals (AR, K, and SK) has caused some confusion in amateur operating. The ultimate in effective operating is reached when each ending signal used conveys the wishes of the station using it and the status of the contact. Upon completion of a study of usage *vs.* interpretation, ARRL has prepared a list of recommended uses for all ending signals. For the most part only slight modifications, if any, have been made in suggested uses of AR, K, and SK. A new signal, KN, has been introduced to clarify the actual intent of an operator when concluding certain transmissions. The considerations in arriving at each recommended usage follow:

AR: No change is recommended in the use of this signal. It normally should be used after a call to a specific station, *before contact is established*, and at the end of transmission of a radiogram. It has been used improperly after CQ calls, thereby causing confusion. When AR is heard one of two things is taking place. The station is completing a call to a station (no contact yet established), or transmission of a radiogram has been completed. It is usually a waste of time to call a station heard signing AR since he is tuned to a specific station.

K: CQ calls should be concluded with the signal K, and with no other signal. K is used also at the end of each transmission during a QSO, *when there is no objection* to another station breaking into the contact. In other works, K when heard may be interpreted as an invitation to any station to transmit. To avoid calls from other stations when in contact with a specific station, and to avoid being called by another station upon completion of a call to a specific station, a new signal, KN, has been added.

KN: This signal is an invitation to the specific station you are calling or working to go ahead. Negatively, it tells all other stations to "keep out" and that you will ignore their calls to you. This signal will find particular application in DX work, when the DX station wishes it known that he is calling or working a certain station and has no intention of heeding calls from others. It also should find application in "schedule" work, where you are interested only in a specific station and will not answer calls from others. It is the "keep-out" signal and should be used only when your intention is to concentrate on a specific station at exclusion of all others.



THE NEW SIG HOLDS EVERYBODY ELSE BACK -

SK: This signal is used only at the conclusion of a QSO, and then is used *only once* by each station. When you conclude your final transmission to a station, use SK. The other operator will then use it upon conclusion of his final transmission to you. Once you have sent SK, *do not* make another transmission to the station concerned. It should be noted that SK *precedes* the signing of calls. Example: SK W8LMN de W5BCD. No signal should be transmitted after the call signs, unless you are *closing station*, in which case CL is appropriate.

CL: This operator's signal should be used after final transmission when you are closing down and

Ending Signal	*Meaning*	*ARRL-Recommended Use*
AR	End of transmission	After call to a specific station before contact has been established, or end of radiogram. Example: W6ABC W6ABC W6ABC de W9LMN W9LMN AR
K	Go ahead (any station)	After CQ and at the end of each transmission during QSO when there is no objection to others breaking in. Example: CQ CQ CQ CQ de W1ABC W1ABC K or W9XYZ de W1ABC K
KN	Go ahead (specific station), all others keep out	At the end of each transmission during a QSO, or after a call, when calls from other stations are not desired and will not be answered. Example: W4FGH de XU6GRL KN
SK	End of QSO	Before signing last transmission at end of a QSO. Example: SK W8LMN de W5BCD
CL	I am closing station	When a station is going off the air, to indicate that it will not listen for any further calls. Example: SK W7HIJ de W2JKL CL

will not listen for or answer any additional calls. It notifies the listening operator that any further calls to you will be wasted.

The various ending signals and their recommended uses are tabulated in the accompanying box. *Please note well* that each signal (AR, K, KN, and SK) is always used *by itself* and is never combined with another. A common and improper practice of a few operators has been to use AR K at the conclusion of calls. *Use only one signal at a time!*

HIGH CLAIMED SCORES A.R.R.L.-MEMBER PARTY

The following claimed scores are a preview of results of the Fifth Annual ARRL-Member Party, held on the January 11th–12th week end. For ARRL members only, the contest served as a "family reunion," first of its kind since 1941. It was good to hear so many "old reliables" with spirits undampened after the long intermission. You should recognize the top scorers, but in case a couple puzzle you, W4KFC is ex-W6KFC, and W8WZ is ex-W8OFN. Winners of the distinctive call-pin awards will be announced in the final report. The totals listed are unchecked and include score, stations worked, and sections worked.

W3BES	52930–370–67	W1RY	24426–208–59
W9RQM	50820–360–66	VE3WY	24416–218–56
W4KFC	49660–357–65	W3TWI/4	24244–184–58
W8WZ	48840–346–66	W2BBK	24186–184–58
W6HZT	46200–327–66	W1GKJ	23900–214–50
W1TS	45630–326–65	W1OJM	23509–205–51
W2IOP	43824–308–66	W9UTB	23072–206–56
W1BIH	36704–271–62	W5VT	23028–177–57
W3BXE	35910–260–63	W9ENH	22951–169–59
WØJRI	34190–263–65	WØGBJ	22880–195–52
W1BFT	34100–250–62	WØCFB	22848–204–56
W8RSP	33852–274–62	W3HUM	22790–190–53
W8UZJ	33550–250–61	W7QAP	22344–197–57
W1UE	33540–255–60	W2EQS	22240–195–51
W1LWA	33158–256–59	W1EOB	22176–173–56
W4BRB	32330–240–61	W1BDI	21924–181–54
W6EPZ/5	30500–250–61	W5KC	21504–194–48
W3KWL	29696–232–58	W9GMZ	21280–165–56
W1JYH	29592–249–54	W8NZI	21228–183–58
VE3EF	28329–224–57	WØENP	21112–157–56
W8SCW	28050–230–55	W6BIP	21004–153–59
W8ZFA	26564–204–58	W5AWT	20862–160–57
W1LLX	25422–200–57	WØIJK	20800–176–52
W9GFF	25144–200–56	W7ONG	20250–165–54

BRASS POUNDERS' LEAGUE

(January Traffic)

Call	*Orig.*	*Del.*	*Rel.*	*Extra Del. Credit*	*Total*
W7FST	106	84	552	—	742
WØTQD	5	494	14	—	513

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

W1UE 213 W9DXL 135 VE3HP 105 W6QXN 102

A message total of 500 or more, or 100 "deliveries plus extra delivery credits," will put *you* in line for a place in the BPL. The Brass Pounders' League listing is open to all operators who qualify for this monthly "honor roll."

CODE-PROFICIENCY CERTIFICATES

The next opportunity to qualify for a certificate or endorsement sticker in the ARRL Code-Proficiency Program is on April 18th. At 10:00 P.M. EST that date W1AW transmits the monthly qualifying run at speeds of 15, 20, 25, 30, and 35 w.p.m. Frequencies: 3555, 7145, 14,150, 28,060, and 52,000 kc., simultaneously.

The text copied, received successfully by ear at the highest speed you can copy, should be sent to ARRL for checking. To avoid errors in recopying, send your original copy. *Attach a statement certifying over your signature that the copy submitted is direct copy, made from reception of W1AW by ear, without any kind of assistance, personal or mechanical.* If you qualify by making perfect copy for at least one solid minute, you will receive your certificate, or an appropriate endorsement sticker for the certificate you already hold. Those who qualified in the past should submit copy only if the speed is higher than that indicated by present certificate or endorsement sticker.

QST lists in advance the text to be used on several of the 10:00 P.M. EST (Monday through Friday) CP schedules. This makes it possible to check your own copy. It also provides a means of obtaining sending practice since it permits direct comparison of one's fist and tape sending. To get sending help hook up a key and buzzer and attempt to send right in step with the tape transmissions. Adjust your spacing in the manner indicated as necessary for self-improvement.

Date	Subject of Practice Text from February *QST*
Apr. 2nd:	*Operating the BC-645 on 420 Mc.*, p. 15
Apr. 4th:	*A Stabilized 813 Amplifier*, p. 23
Apr. 8th:	"*Maybe It's Just Conditions* —," p. 30
Apr. 10th:	*A Quiet Break-In System*, p. 33
Apr. 14th:	*A Stacked Array for 6 and 10*, p. 38
Apr. 16th:	*The Old Stand-By*, p. 42
Apr. 18th:	Qualifying Run, 10 00 P.M. EST
Apr. 22nd:	*Direct-Reading Modulation Meter*, p. 55
Apr. 24th:	*Dishing Out the Milliwatts on 10 KMc.*, p 58
Apr. 28th:	"*I Just Put Up Another Antenna.*" p. 66

EXPEDITION KON-TIKI

Refer to page 71, March *QST*, for details on the ethnological expedition, Kon-Tiki. The expedition's call for work with amateurs is LI2B. Operation is planned on 14, 28, and 56 Mc. Follow W1AW bulletins for details relative to schedules. Dr. J. H. Dellinger, Chief, Central Radio Propagation Laboratory, National Bureau of Standards, Washington, D. C., advises that CRPL will be pleased to receive reports on contacts with the expedition because of their bearing on propagation conditions. Please send all such reports of two-way work, or reception, via ARRL for forwarding to Dr. Dellinger. The expedition should be leaving Peru by raft about the time this *QST* reaches you. Estimated time of arrival in the Polynesian island group is 100 to 130 days after departure.

(*Continued on page 70*)

NATIONAL CO. INC.
Malden. Mass.
United States of America.

1st. January. 1947.

Dear Sirs,

This is a letter that I have often promised to myself that I would write, if I were fortunate enough to come out of the War 'in one piece'.

The story begins in 1939, those remote days just before the storm clouds broke over Europe. A young 'ham' after saving 'pennies' after what seemed an eternity has managed to realise one of his pipe-dreams, he has become the proud owner of a HRO. This was no hasty decision lightly made, but the result of years of poring over copies of 'QST'.

Unfortunately the joy of using this receiver for 'ham' work (after years of Det and one L.F., and home-made supers) was short-lived. The ban on transmitting was imposed for my country was at war with Germany.

All through that winter and spring of 'phony' war, the HRO was used to get news bulletins from all parts of the world. With the summer it was being used for a grimmer purpose and was bringing in the signals from the Nazi tanks and planes as they over-ran one country after another.

It was at this time that the owner joined the [redacted] and made the decision to take the HRO with him, perhaps it would provide entertainment for himself and his comrades. It did, and more—it was used also for more serious work, for at that time we were woefully short of precision equipment. For the next year the set was used practically 24 hours a day and 7 days a week on its work official and unofficial. The messages that it handled would provide material for a book that would stand comparison with any work of fiction.

The next move was to an ocean liner once a link between our countries, now running blacked-out and full of troops. It was during this voyage around the Cape to the Middle East that the HRO enjoyed its only rest of the War years, its idleness was enforced as a security measure.

For two years the HRO spent most of its time in the back of a 3-ton lorry (from whose tailboard it fell to the ground more than a few times), along with petrol tins, ammunition boxes, heavy implements, etc. The climate varied from the Western Desert in blazing midsummer, though the rainy seasons of Tunisia, to the snow and ice of the Italian Appenines in midwinter. This was followed by service in Normandy, Belgium, Holland and finally into Germany itself. It was operated in dug-in tents, luxury hotels, and wrecks of bombed villages. The anecdotes of this period are far to numerous to relate, but it might be worthy of mention that in the Ardennes it enjoyed the treat of a new set of 6 volt valves and a vibrator unit (perhaps it would be unfair to add that an American Sgts. taste for tea developed in England prior to 'D' day and unsatisfied by American Army rations was not unconnected with this deal).

Now the HRO and owner have been demobilised are back at the really serious business of 'ham' radio which was interrupted by those long years of War. The HRO has been overhauled and re-aligned (though it does not seem appreciably better), the dents have been beaten out of the cabinet, foreign bodies have been removed from its interior (the locust legs that recall Benghasi, the dust of Sicily, the black mud of the Low Countries). It has had a coat of enamel and it looks and works like new. During all those years it never gave any trouble, not a joint came unstuck despite the terrific hammering it had at times in military transport, from concussion of explosives, etc. The owner had many opportunities, especially during the later phases of the war of trying other communication receivers of all brands, but never found better.

It would be appropriate at this point to suggest some improvement or modification born of hard experience, but it has not been honestly possible to do so. There is however one little gadget which has proved its worth over and over again in which you may be interested. On the back chassis was mounted an ordinary valve socket and connected to the heater and anode supplies. Into this outlet have been plugged a whole host of units at one time or another, especially when operating in the field from a vibrator supply. Some of them come to mind at once, a 100/1,000 kcs xtal oscillator, an acorn VHF adaptor, a signal-generator, a V.T. voltmeter, etc., etc. But you can no doubt imagine to yourself the uses that a Communications Section in the wilds can find for 6.3 v and a couple of hundred volts of D.C.

This is the end of the story, but not the end of the HRO which is going to put in many more years of hard work. It has not been written to flatter you, or with any idea of payment but rather to express in some small manner the gratitude of the owner for all the services that the HRO gave to himself and to his country.

I remain,
Yours Sincerely,

[redacted]

[redacted]

P.S. If you should want to publish any of this at any time please do, but don't add my name and address as I am still employed in [redacted] and they don't welcome publicity.

EMERGENCY AT 50 BELOW

By August G. Hiebert,* K7CBF

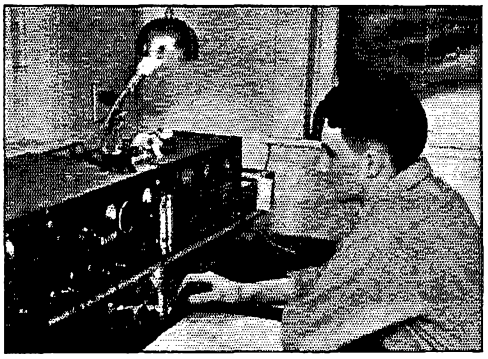
Alaskan radio amateurs have performed many outstanding individual services of emergency nature during the history of Territorial communications. A major fire on Christmas Eve, 1946, completely destroyed the Fairbanks Telephone Exchange and set the stage for another collective effort on the part of the Arctic Amateur Radio Club, which resulted in sincere editorial and civic commendation of the amateur fraternity.

At least 95 per cent of Fairbanks' downtown business structures, as well as practically all residential buildings, are of frame construction, and because of a 100-per-cent wartime increase in population, are badly overcrowded. Wintertime temperatures, which this season set a new low record for 25 days of minus 50 degrees and lower, meant overheated stoves and a resultant severe fire hazard.

Faced with no means of communication for an indefinite period, Mayor A. H. Nordale proclaimed a state of emergency, and gratefully accepted the offer of Willis Cowles, KL7AN, president of AARC, to help establish an amateur radio network throughout the city.

It was decided to use 3995 kc., since the Army-sponsored aircraft warning service during the early months of the war had used this frequency, and quite a number of crystals were available throughout the Territory. Cowles contacted W7JIJ in Seattle on 28 Mc. and arranged for the procurement of 10 additional crystals, which were shipped by air from Portland, Oregon, early on the morning of December 30th. In the meantime, K7CBF made 75-meter 'phone contact with KL7CX at Anchorage, who rounded up additional crystals there. Ladd Field military authorities offered the use of any equipment which could be used, and several receivers, crystals, handy-talkies and transmitters were acquired from that post.

Within a week 14 stations were on the air, standing by for emergency communications, and within 10 days the net consisted of 22 stations, in addition to 7 handy-talkies that were used by car patrols. Net Control Station was at the Police & Fire Department, where all key communications, including the regular police-car system, a powerful public-address paging system, a handy-talkie, and amateur stations could be controlled by one operator. Other stations were in operation at St. Joseph's Hospital, the Fairbanks Radio Company, Weeks Field airport, Ladd Field Communications, the Nordale and Pioneer Hotels, College Observatory, KFAR transmitter, and various residences in a zone distribution system throughout the city. Experienced service men, who were licensed amateurs, monitored the net from the Fairbanks Radio Company to help in case of equipment failure, while KFAR personnel were in constant touch with the net for the purpose of transmitting emergency traffic on the standard broadcast band if the need should arise.



Earle Grandison, KL7CF, at his home station, the first postwar Alaskan ORS. Grandison, 19 years old, did outstanding operating at KL7AN, Fairbanks police headquarters, during the recent fire emergency. When this picture was taken it was minus 54 degrees outside. Note the ice formations on window! The transmitter is crystal-controlled, with an 815 in the final.

The Alaska Communications System coöperated with the Fairbanks Telephone Company and made connections through their own exchange to important locations as fast as possible. Considerable delay was experienced, however, since all but one 200-pair cable suffered water soaking and could be spliced only after thawing.

A first-class test of the emergency set-up came shortly after it was established when another major fire broke out in downtown Fairbanks. At this time the network was used to good advantage for calling doctors, additional help, and for traffic in general.

By mid-January the telephone company had flown a small temporary telephone exchange to Fairbanks from Seattle, and began connecting lines into a multiparty system. As fast as telephone service was restored to important areas throughout the city, either through the Alaska Communications System board or through the new telephone exchange, the station in that area was dropped from the net. On February 4th, when service was restored, the network disbanded.

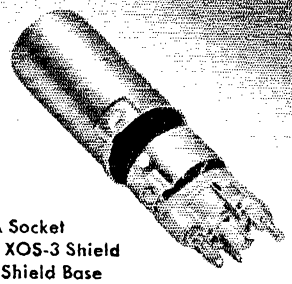
Considerable traffic of emergency nature was handled during the 5-week period of operation, including numerous fire alarms, hospitalization and doctor calls, and disorderly-conduct reports. Priority earthquake warning traffic was handled from KL7FU at College Observatory via K7CBF to the Alaska Communications System for regular telegraphic transmission to the States.

The Fairbanks amateurs who participated in the network, by donating equipment, helping

(Continued on page 72)

* ARRL SCM; Chief Engineer, KFAR, Box 910, Fairbanks, Alaska.

NEW



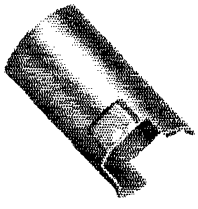
XOA Socket with XOS-3 Shield and Shield Base

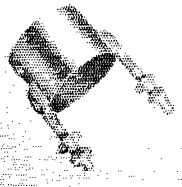
XOA Socket

XOR Socket

XOS-1 Shield for $1\frac{7}{16}$" high tube body (6AK5 type)

XOS-3 Shield for 2" high tube body (OA2 type). Also available: XOS-2 for $1\frac{1}{2}$" high tube body (6C4 type)





Shield Base for XOS-1, XOS-2 or XOS-3

SOCKETS AND SHIELDS...

for miniature button base tubes

These new National sockets are of mica-filled natural molded Bakelite with silver-plated beryllium contacts — designed for maximum dependability and adaptability. The contacts — either axially or radially mounted and removable for replacement — provide short leads and low inductance so vital to ultra-high frequency design. The sockets are built to JAN specifications and can be used with or without the shields.

Made in three sizes to accommodate the various sizes of miniature tubes, the shields are of nickel-plated brass, with cadmium-plated phosphor bronze spring to provide correct tension to hold both tube and shield in place regardless of angle or vibration. Shield bases are of nickel-plated brass, with two 4/40" spade bolts mounting both socket and shield base.

You'll find hundreds of other parts, both new and old, to improve your rig in the new 1947 National Catalog.

Est. NC 1914

NATIONAL

COMPANY, INCORPORATED

MALDEN, MASS.

THE MOST DISTINCTIVE NAME IN RADIO COMMUNICATIONS

(*Continued from page 70*)

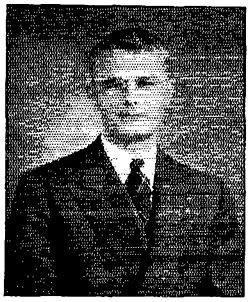
with installation, or being responsible for the operation of various stations, were: KL7AN, KL7BL, KL7CU, KL7GP, KL7BK, KL7DL, KL7AO, KL7FU, KL7FQ, KL7EC, K7CBF, KL7CM, KL7CF, KL7AC, KL7GE, K7IGW, KL7CT, KL7DT, KL7CV, KL7AG, W5KPY/KL7 and KL7CD.

MEET THE SCMs

William D. Montgomery, W8PNQ, our present Ohio SCM, was born in Minneapolis, Minnesota, was graduated from Central High, Oklahoma City, Oklahoma, and obtained his E.E. degree from the University of Cincinnati.

At present employed as radio engineer by the Cincinnati & Suburban Bell Telephone Co., he received his commercial radio experience by teaching and working with mobile radiotelephone installations for this same company.

Montgomery has held an interest in amateur radio for the past fifteen years and an amateur license for the past twelve. He is a member of the Greater Cincinnati Amateur Radio Assn., trustee of the Queen City Emergency Net club transmitter, W8VVL, and for three years was editor of the *Listening Post*, the official publication of Q.C.E.N. Throughout the war W8PNQ was zone radio aide in the WERS and actively participated in 1945 Ohio River flood emergency work.



Transmitting equipment in use at W8PNQ, located in the basement, is a 100-watt all-band 'phone-c.w. rig, VFO- or crystal-controlled, and consisting of 6L6-807-812 cathode-modulated. A 144-Mc. rig uses p.p. HY-75s; 235-Mc. a single HY-75. Receivers are an HQ-129X, 144-Mc. super, 28-Mc. f.m. super, Abbott TR-4, 3.5-Mc. battery-operated, and several 144- and 235-Mc. receivers and transceivers. Antennas in regular use are a 28-Mc. vertical dipole, 144-Mc. "J," 144-Mc.-and-higher "Discone" antenna, and a temporary long wire for 3.85 and 14 Mc. Portable gear comprises a BC-1306 on 3.85 Mc. and mobile 144-Mc. equipment.

Bill's other interests include home recording, photography, chess, bridge, playing with his five boys (all under nine years of age), musical instruments and mathematics. He holds membership in a number of fraternal and civic groups.

In addition, Bill actively participates in numerous sports such as golf (he once broke 100 on an easy course), baseball, wrestling (only with boys under nine), and ducking his wife's china.

In the "Meet the SCMs" column, February *QST* (page 83), we "promoted" SCM Gordon. We said he was transmission "manager" for A.T. & T., but Clayt hastens to point out that actually his title is transmission "man." Sorry, OM, but glad we didn't *demote* you!

ELECTION NOTICE

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

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

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

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

Petitions must be in West Hartford, Conn., on or before noon on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, and station call of the candidate should be included with the petition.

The following nomination form is suggested:

Communications Manager, ARRL (Place and date)
38 La Salle Road, West Hartford, Conn.

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

Elections will take place immediately after the closing dates specified for receipt of nominating petitions. The ballots mailed from Headquarters to full members will list in alphabetical sequence the names of all eligible candidates.

You are urged to take the initiative and file nominating petitions immediately. This is your opportunity to put the man of your choice in office.

— *F. E. Handy, Communications Manager*

Section	*Closing Date*	*SCM*	*Present Term Ends*
Maritime *	April 15, 1947	Arthur M. Crowell	.....
West Indies	April 15, 1947	Mario de la Torre	Deceased
Washington	April 15, 1947	O. U. Tatro	Resigned
Philippines	April 15, 1947	George L. Rickard	Oct. 15, 1938
Utah-Wyoming	April 15, 1947	Victor Drabble	May 1, 1947
N.Y.C. & L.I.	June 2, 1947	Charles Ham, jr.	June 9, 1947
So. New Jersey	June 16, 1947	W. Raymond Tomlinson	June 22, 1947

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* In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager Alex Reid, 169 Logan Ave., St. Lambert, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

ELECTION RESULTS

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

San Diego	Irvin L. Emig, W6GC	Dec. 16, 1946
Hawaii	John F. Souza, jr., KH6EL	Jan. 2, 1947
Southern Texas	Ted Chastain, W5HIF	Feb. 15, 1947
Maine	F. Norman Davis, W1GKJ	Feb. 17, 1947
Michigan	Joseph R. Beljan, jr., W8SCW	Feb. 17, 1947
Minnesota	Walter G. Hasskamp, WØCWB	Feb. 17 1947

(*Continued on page 74*)

BRIEFS

The hangout for amateurs who are police radio operators is 3715 kc. The "QPO Net" meets at no special time, but some of the "ham cops" will be found on 3715 kc. almost any time.

—•••—

Recent addition to the Rag Chewers Club is W9RCC. Another celebrity on the list is Joe Sock, W1LCH, probably some distant relative of "The Old Sock" himself!

JANUARY CD QSO PARTY

Members of the ARRL Field Organization held their quarterly QSO-shindig January 25th and 26th. Conditions were erratic, probably the worst ever experienced in a midwinter party. The bands sounded as tired as some of the operators surely must have felt after wading through the SS and ARRL-Member Contests. That's how we account for the absence from the high-score list of such veterans as W3BES and W1TS!

It was nip and tuck between W4EOP and W4KFC for top honors, with W4EOP edging Vic out by a very slight margin. We don't remember a closer race in any of these CD parties. Congratulations, Charlie.

The CD QSO Parties are open to all amateurs who hold any official appointment or office in the ARRL organization. They offer a quarterly check of stations and operators, provide the opportunity to contact others with like interests, constitute a form of ham fraternalism found in no other activity, and on top of all that are more fun than ham radio itself! If you are ineligible to participate, we urge you to determine which of the ARRL appointments best fits your qualifications and then make application to your SCM.

The next CD get-together falls on the week end of April 26th–27th. It will be the last before summer sets in. Let's make the most of it!

Claimed Scores (C.W.)

Station	*Score*	*Contacts*	*Different Stations*	*Sections*
W4EOP	484,160	350	223	49
W4KFC	480,130	355	218	48
W3JSU	259,515	231	182	37
W9EYH/6	259,376	162	125	47
W8ONK	256,680	242	160	47
W2AYJ	241,785	237	158	41
W3HUM	211,460	212	147	47
W9NUF	210,210	231	138	44
W8ZFA	188,240	202	136	45
VE3WY	171,700	196	130	40
W6ENP	170,720	170	143	51
W1OJM	169,420	191	130	42
W3KGI	169,150	199	132	38
W3TWI/4	166,600	190	130	40
W3AIZ	161,990	188	125	42
W1ORP	153,220	188	128	35
W4NC (W4GZE opr.)	149,625	175	129	42
W9ENH	144,800	175	119	41
W1BFT	144,255	171	122	41
W1BIH	141,680	170	121	40
W3ADE	135,300	159	124	40
W9FKI	129,000	166	111	39
W8DAE	125,160	162	110	39
W6CMN	122,760	110	81	43

Others with scores of over 75,000: W3BKZ 117,000, W2TNN 113,220, VE3EF 112,480, W2LFR 111,650, W1LHE 105,120, W1OUD 105,000, W4DXI 102,200, W7QAP 99,000, W6RBQ 98,828, W9LFK 97,995, W5VT 96,480, VE3SF 95,175, W1GKJ 94,500, W3KEW 88,320, W2GVZ 85,485, W8JM 81,900, W1FTX 76,835, W4FNS 75,710, W6AOA 75,101.

Claimed Scores ('Phone)

Station	*Score*	*Contacts*	*Different Stations*	*Sections*
W4DCQ	4370	23	23	15
W1KTE	2300	14	14	9
W8PSE	520	8	8	5
W6IWU	385	3	3	2
W1LKP	350	4	4	3
W9EDW	250	5	5	5
W7CZY	118	1	1	1
W5ECE	100	4	4	1
W3BWP	90	3	3	3

CHANGES & ADDITIONS — DIRECTORY OF ACTIVE NETS

Beaver Net (Ontario) *	3535 kc.	
CCN-SFN (California) **	3615	7:00 P.M. & 10:00 P.M. PST, daily except Sunday
Delta 'Phone Net *	3905	
Eastern Mass. Emergency Net *	3745	
Illinois **	3765	6:15 P.M. CST, Mon.–Fri
Inter-Mountain Missions Net *	3935	7:15 P.M. MST, Mon.–Fri. 8:30 A.M. MST, Sun. & holidays
Kansas Traffic Net *	3610	6:45 P.M. CST, Mon., Wed., Fri.
Md.-Del.-D.C. Section Net *	3700	10:00 A.M. EST, Sundays
Midwest & Western Outlet	3565	8:00 & 10:00 P.M. CST
Nebraska State Net **	3555	7:30 P.M. & 8:30 P.M. CST, Mon.–Fri.
New Jersey 75-'Phone Net *	3900	9:00 A.M. EST, Sundays
N.Y.C.-L.I. **	3710	8:30 P.M. EST, Mon.–Fri.
New York State (combining E.N.Y. & W.N.Y. nets) *	3720	7:00 P.M. EST, Mon.–Fri.
Power Company Net (Mass.) *	3575 & 3655	
QPO Net (Police Oprs.) *	3715	
Southern New Jersey **	3700	7:00 P.M. EST. Mon., Wed., Fri.
Susquehanna Emergency Net *	3910	8:00 A.M EST, 2nd & 4th Sun.
Western Pennsylvania **	3750	6:30 & 8:30 P.M. EST, Mon.–Fri.

* New listing; ** change in listing. (See page 82, February *QST*.)

A.R.R.L. ACTIVITIES CALENDAR

Apr. 4th–6th: VE-W Contest
Apr. 13th: CP Qualifying Run
Apr. 26th–27th: CD QSO Party
May 11th: CP Qualifying Run
May 17th: V.H.F. Relay and QSO Party
June 14th–15th: ARRL Field Day
June 19th: CP Qualifying Run

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Jan. 16th–Dec. 15th: 1947 V.H.F. Marathon
Jan. 1st–Dec. 31st: Most-States V.H.F. Contest
First Saturday night each month: A.R.R.L. OFFICIALS NITE (Get-together for SCMs, RMs, SECs, ECs. PAMs. Hq. Staff, Directors, Alt. and Asst. Dirs.)

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

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — HQJ, who has been hospitalized for some time because of an auto accident, has been on the air from his hospital bed. He used an S20R of HFD's and DPU's Field Day portable on 7 Mc. Doc is home now and is having remote control hooked to the big rig. EU has a BC-348Q and is building a portable for his summer QTH using a 117L7GT final. GMK is reorganizing the 3785-kc. net. Write him for details or contact him on 3705 kc. where he works into the T.O. Net. The Schuylkill Amateur Radio Club sends code practice daily from 8 to 9 P.M. on 3795 kc. and invites reports of reception. MLW delivered three messages which he took from 2NAW/South Pole. He uses only 60 watts on 14 Mc. New officers of the Electric City Radio Club of Scranton are MRQ, pres.; OST, vice-pres.; LJT, secy.-treas. FJU works DX on 14 Mc. but also shows a fine traffic total. AQN hooked D4ASU up with his mother via 28 Mc. and telephone. CAU is building a dual-frequency calibrator. JSU went to town in the CD Party. The Susquehanna Valley Amateur Radio Club meets every Friday and is looking for a club house in which to set up the 1-kw. rig. BFH worked XU6GRL on 14-Mc. 'phone. LYU won the SVARC low-power DX test for December with an average of 44½ miles per watt. VE2II is looking for schedules with Pottsville, Pa. The Schuylkill Valley emergency gang had a meeting recently at IGW's and discussed plans for expanding the activities of the net to include traffic handling. This will tie in with the traffic outlet net on 3705 kc. and the Eastern Penna. Section Net on 3785 kc. BXE, our SEC, attended the meeting. HFD's 7-Mc. beam is having element trouble (wind and snow). Frank worked ZK1AB for over an hour and gave him the DX Contest rules. GHD has been working out fine with his new beam, a three-element 14-Mc. plumber's delight. ENX has had a lot of grief with his rotary machinery. IXN, GYV, and HFD put up the beam for BES. FLH has repaired his 8JK 10/20 beam. QV is putting up several Sterba curtains. New officers of the Frankford Radio Club are BES, pres.; 2OXX, vice-pres.; IXN, secy.-treas.; 2PWP, act. mgr.; 3KT QSL Mgr. KT, GHD, MFM, BES took part in Frequency Measuring Tests. Traffic: W3EU 97, FJU 70, QEW 56, AQN 10, ID 10. CAU 7, MLW 6, JSU 5, OML 3, QLW 3, BES 2. 73. *Jerry.*

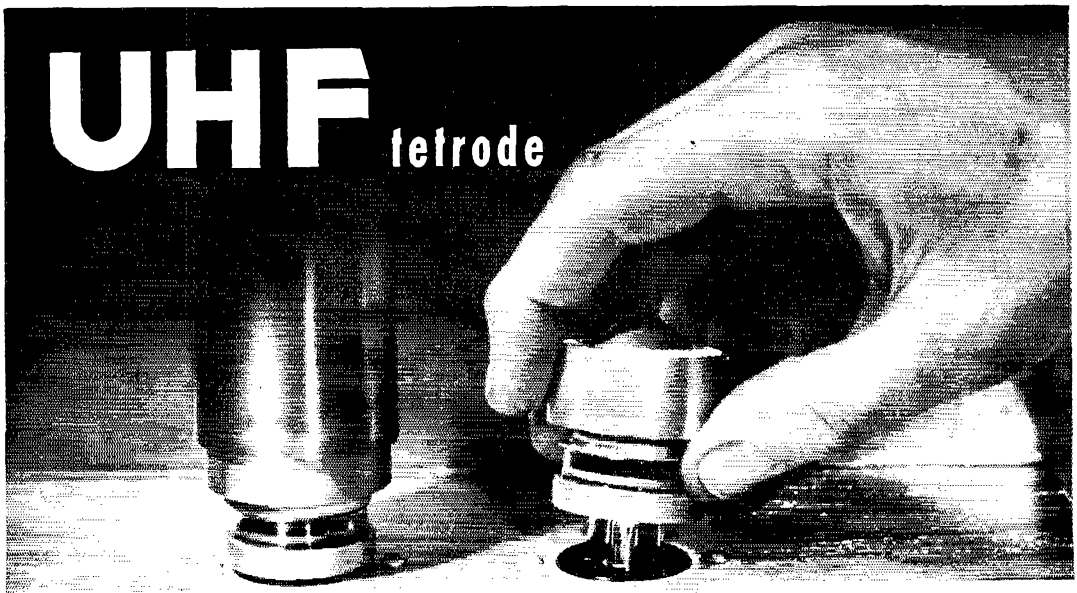
MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — Acting SCM, Eppa Darne, W3BWT — The Washington Radio Club's January 25th meeting was a Television Night in which homemade apparatus was demonstrated very successfully to about 160 hams and their friends. All hams in the section are invited to participate in the section net for traffic activities, emergency preparation, and section camaraderie. The net meets each Sunday at 10:00 A.M., with LVY as net control station, on 3700 kc. using c.w. LVY, despite extensive traffic activities, finds time to work lots of DX. EKZ transmits the weekly League bulletin on Tues. and Friday at 9:00 P.M., using 28,736 kc. EQK, EWC, and GFI are back on the air. MSL is on 14 Mc. with 100-watt rig. WN is on 28 Mc. and is organizing an emergency net in Frederick, Md., area. KGI is returning to New Hampshire and will be back on with old call, 1HJI. He asks the gang to give him a call when they hear him. WU, our QSL Manager, gets out nicely on 14-Mc. c.w. NB and BHV are also on 14-Mc. c.w. KHJ is on 7 and 3.5 Mc. and spent most of January in Tennessee. KMR is on 7 and 3.5 Mc. MGM, MNA, KUX, and PV are consistently heard on 144 Mc. IUU schedules J2FOX on 28 Mc. MKS schedules Guam regularly. ECP has been contacting Europe on 3.5 Mc. CDQ is now at new address: 3614 Morrison St., N. W. Washington 15, D. C. LSX is on 7-Mc. c.w. The Susquehanna Emergency Net, using 3910 kc., began regular drills on Feb. 9th. Will all members in the Section please include their addresses with each mail communication to the SCM to facilitate replies by him? Traffic: W3LVY 345, ECP 272, BWT 7, KMR 4, AKB 2. 73 to all hands. *Ep.*

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W2GCU — The Third Annual "Old Timers Nite" banquet, sponsored by the DVRA, was held Mar. 22nd. N. J. State 75 'Phone Net, 2QEM net control, operates on 3900 kc., 9:00 A.M. Sundays. PAM 2HX invites anyone interested to call in after roll call. Lakeland Radio Assn. officers are: RGV, pres.; RXJ, vice-pres.; DZY, secy.; SIV, treas.; AQY, act. mgr. Meetings are held in the Kossuth Home, Wharton, the first Wed. and second Thurs. evenings of the month. RG reports on the SNJ ORS Net, which meets Mon., Wed., and Fri. at 7:00 P.M. EST on 3700 kc. PAU is on 144 Mc. ORS worked I1FE, ZL2QM, ZL2MM, F9, KH6, and ON4s on 7 Mc. with 125 watts. QUH works regular schedules on SNJ and TO Nets. The Hamilton Twp. Radio Assn. has started the second group in code and theory under the tutorship of OYL. TDU, TXD, TGC, SVV, TAM, and 3MVG are graduates of first class. 3ARN now is 2UDA. 5MLU, ex-3GNM, is looking for contacts in Trenton on 28 Mc. TYJ is on 28 Mc. with 150 watts and an HQ-129X. 2PTT is erecting brand-new three-element beam. 3ANH/2 has "V" beams on 28 Mc. RNX has e.c.o. and beam on 28 Mc. and worked VQ4MNS with 100 watts input. SFT has brand-new 40-foot metal tower with new beam for 28 and 14 Mc. IEQ sports new BC-384Q. OSS is on 3.5-Mc. c.w. CFS is parking a pair of 100THs in his new final. WI and EEQ have new 28-Mc. beams. RBV will be technical director of radio club at Williams College. KNQ is erecting a new four-element 28-Mc. beam and rotator. D4AQW wants 28-Mc. contacts with Trenton. RXL sends code practice on 28 Mc. Traffic: W2QUH 131, RG 68, ZI 37, OXX 15, BEI 10, CFB 8, ORS 6, QCL 3, TNN 2. 73. *Ray.*

WESTERN NEW YORK — SCM, Charles I. Otero, W2UPH — A big hamfest will be held in Rochester by the RARA on May 3rd. Invitations will be sent to radio amateurs throughout WNY. The outstanding DX men of the Rochester area had a very interesting dinner. The group consisted of QCP, PYW, QL, DOD, QJM, CNT, MA, FBA, QCF, PUD, BJH, PUN, QEV, QEW, VTR, TXB, WPJ, PZU, PWY, and guests RSL, 3HBA, and UPH. After dinner the most unusual and interesting experiences in DX work were related. SJV is using a new e.c.o. and is working out on 3.85 and 28 Mc. PJF will take over Cattaraugus County in addition to Allegany County for EC work until an EC is appointed there. SB, EC, appointed RXT as his assistant in Dunkirk and RHJ as his assistant in Westfield. The Erie 144-Mc. fellows visited Dunkirk bringing along their 144-Mc. rigs. PE was speaker at the RAWNY meeting. Dr. McTigue gave an interesting talk on seismographs at the KBT meeting PE spoke on radar and ham radio at the Niagara Falls meeting. PNA now is RUG. SSK, RJH, TBA, SB, and RXT are on 144 Mc. SGZ has HQ-129X and 6L6 on 3530 and 3612 kc. TDZ has Mark II tank rig and is rebuilding to p.p. 807s. PST has surplus NC-100, 6L6 doubler from 160 v.f control, and is attempting 144-Mc. contact to 3QEW, Scranton. Fred wants to know the whereabouts of prewar 8JRY, Bramely, of Shavertown, N. Y. Listen, please, on 3720 kc. for WNY Net now functioning. SAG organized a radio club in Canton and the membership is 46. TBZ is back in the Signal Corps. IYC is looking for suitable space. SAG holds weekly classes in code and theory. Most members of the Canton Club are students of the radio and electrical department of the school, where SAG is an instructor in radio and electronics. RXW is rebuilding. PGU is busy DXing. QXE and VJP are working Syracuse and Rome on 144-Mc. mobile. Attention: For the present, Eastern and Western New York Nets have been combined on one frequency, 3720 kc., as the New

(Continued on page 78)

UHF tetrode



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Heater Current	2.7	amps.
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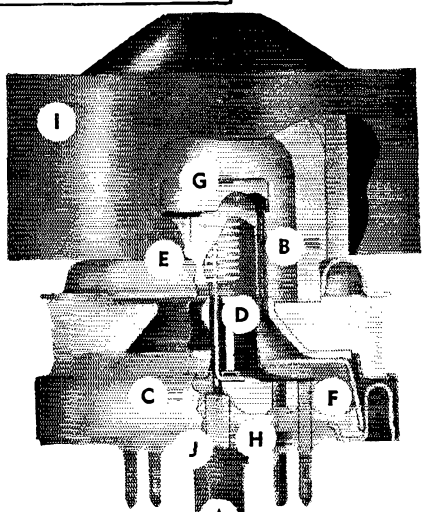
Direct interelectrode capacitance (typical)		
Grid-Plate	0.02	μμf
Input	12.0	μμf
Output	4.6	μμf
Maximum Ratings		
DC Plate voltage	1000	volts
DC Plate current	200	ma.
Plate dissipation	150	watts
DC Screen voltage	300	volts



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York State Net. This net is meeting daily at 7 P.M. on 3270 kc., with ITX acting as net control station. ORS and others interested, please get in touch with Ed Preston RIZ, Tully, N. Y. for bulletin. All traffic inquiries should be addressed to Ed. Traffic: (Dec.) W2OVT 4. (Jan.) W2SAB 84, RIZ 41.

WESTERN PENNSYLVANIA — SCM, R. R. Rosenberg, W3NCJ — Section EC: AVY, RM MJK is in charge of reactivated 8:30 P.M. Western Pennsylvania ORS Net. KWA is alt. NCS. This net is in addition to the one held at 6:30 P.M. with TOJ as NCS and KWL as alt. NCS. Both nets operate on 3750 kc., Mon. through Fri. New operators at YA are OSI, BPA, MQH, and MEM. Those taking part in traffic net are WVN, KCI, MLN, and LFG. KCI and KBO operated YA during ARRL Member Party. WVN has constructed 144-Mc. three-element beam antenna. SHY has completed 100-10 kc. frequency standard, and participated in ARRL Frequency Measuring Tests. LMS has new f.m. exciter for 28 Mc. Oil City amateurs have organized as the Allegheny Radio Amateurs Club, with meetings held every Tuesday evening at the YMCA. Code and theory are being taught by KEQ, LST, KXQ, and MLG. DIL is running 1 kw. on 14 Mc. KXQ, KEQ, MLG, and LID have new receivers LOF and LID are operating on 3.9 Mc. 'phone. TWI is official member of TL-AP and TL-C. QEM converted two BC-645s for 420 Mc. BWP maintains daily schedules with 4GVC, 9OTM, 7JFL, and 2ENX/4. MQA runs 40 watts to pair 6L6s on 7 Mc. band feeding half-wave Zepp antenna. RAT is running about 75 watts input on 14- and 28-Mc. bands. UHO built field strength meter with IN27 rectifier. GRZ, with p.p. 812s final, has confirmed 7-Mc. contacts with several British stations. VNE is working 28-Mc. 'phone. UVD is constructing c.w. monitor using 24A and 27 tubes. TVA is on with 807 final and SW-3 receiver. The Steel City Amateur Radio Club of Pittsburgh is affiliated with the ARRL. MFB, formerly 8GBC, is located at DuBois. Members of the Erie County AEC attended the Jan. 28th meeting of the Dunkirk (N. Y.) Amateur Radio Club. The Erie amateurs demonstrated their 144-Mc. equipment from the Dunkirk Armory. Through an error MJK was listed in BPL in February *QST*. Traffic: W3KWL 245, MJK 197, KWA 185, TOJ 120, TWI 86, YA 58, MOM 23, NCJ 16, BWP 12, LOD 11, RAT 6, OFO 3. 73. *Ray.*

CENTRAL DIVISION

ILLINOIS — SCM, Wesley E. Marriner, W9AND — RMs: Northern, EVJ; Central, SXL; Southern, JTX. VES operates from NUF and is attending E. E. School at U. of Ill. PHE had harmonic trouble. JVI is on 14 Mc. looking for DX pals. JMG has new e.c.o. and doublet on 7 Mc. 3FZA sends photo of newly-elected officers of the Chicago Technical College. They are: 3FZA, pres.; KDG, vice-pres.; KBO, trustee; C. North, director; K9AAB, treas.; R. Aladay, asst. mgr.; A. Flowers, secy. ARN is interested in OES appointment. He has held the same call and has had continuous ARRL membership for twenty years. Look for him on 144 and 50 Mc. QLZ is assistant director and has 250-ft. wire on 3.5 Mc. TAL doesn't like ARRL plan for 28 Mc. The Centralia Radio Club became officially affiliated with ARRL in December. New officials are: QLJ, pres.; EPD, vice-pres.; QMJ, secy. treas.; PCI, act. mgr.; HAB, program dir.; CHQ, Official Observer; QKF, QRM Committee. Other members are: QHM, QEQ, CYP, VLS, WED, VZM, DVL, OLN, and BKE. JAU has new S-42. CDG is agent for FB QSO index. ATA rebuilt f.m. unit into e.c.o. QLZ reports that a package of radio parts has been sent to PA0VB in the Netherlands. The Starved Rock Radio Club has a news sheet, *Static*. DBO has 25 watts on 14 Mc. His brother, LNI, will be on 7 and 14 Mc. NUF went to Rose Bowl game. EOL is interested in 3.85-Mc. 'phone net. QKK is a new ham. Look for him on 144 Mc. GMV is doing swell DX work and received a letter from FCC stating WLGO soon will discontinue operation on 14 Mc. JVI has moved to Joliet. The annual meeting of the Chicago Area Radio Club Council was held on Jan. 22nd. QFF is another new ham in Belleville on 3.5-Mc. c.w. Like new-comer QKK, he also is a physician. MLU has 25 watts on 3.85-Mc. 'phone and reports QIT is a new ham in West Chicago. SHB and MUZ also are there. YMZ, a studio engineer with American Broadcasting Co., has an HT-9 on 28-Mc. 'phone. The results of Joliet Amateur Radio Society election are ALF, pres.; CNP, vice-pres.; JVI, secy-treas. MMU, ex-3KMM, is on 28-Mc. 'phone. HOD has VFO on 3.85-Mc. 'phone. DNP has new beam. CQJ won an 807 in a raffle. ODT has new crystal 144-Mc. rig. MWI has an FB 144-Mc. portable. The River Park Radio Club, CQY, has a rig on the air on 7199 kc. Code and theory classes are held on Monday nights. SYZ sent the above dope. TZQ runs 500 watts on 7170 kc. FUR is building and soon will return to the air. PYY and KMC had three-hour and thirty-one-minute QSO. BIK has been ill in the hospital with pneumonia. He and CEO are Class "A". BFZ is new in Bloomington from Peoria. SXL is studying the Illinois map and new home plans. ENH writes to say he soon will be under new call, NH. UPW is on 7 Mc. after seven-year layoff. Ice damaged the beam at YBY. FKI is trying to get going on 50 Mc. Friday night is VHF night in Champaign-Urbana. BRX is waiting for 100-kc. crystal for his standard. JIO has n.f.m. on 28 Mc. While waiting for parts for the big rig, GBT uses exciter on 14-Mc. c.w. MBI moved to Coleta and is on 28 Mc. Overtime work held activity down at EBX. HON applies for ORS appointment. He has 300 watts VFO on 14, 7, and 3.5 Mc. DTZ just got going when sleet storm took antenna down. QBH is OBS on 144- and 28-Mc. 'phone. A large group of amateurs of the Dixon area met at GNU's home and formed the Rock River Radio Club with AWA, pres.; OMA, vice-pres.; 6TDT, secy-treas. Traffic: W9EVJ 226, DXL 211, FKI 107, YTV 73, JTX 59, SXL 46, UQT 35, AND 26, JMG 20, QLZ 19, FST 16, EBX 8, NUF 8, YBY 4, SYZ 2, WFS 2, MBI 1.

INDIANA — SCM, Ted K. Clifton, W9SWH — AB, MBL, and a number of others lost their beam antennas in the ice storm. NXU visited HUV, who has a new 100-kc. crystal standard to spot band edges and a new e.c.o. NZZ made the CD Party. Ex-SHG now is K9AAD on 14-Mc. c.w. QLW has Meissner pre-selector. DGA has 47 countries. SVH described his syphon tape recorder to the Michiana Amateur Radio Club at the Jan. 29th meeting. KYM is working the ZSs. The Michiana Club code and theory classes are in charge of YWE. They are held each Wednesday night at 7:30 P.M. at 528 East Colfax Ave., South Bend. CYC has new final with 812s in p.p. with 250 watts input on c.w. RJY is new call of the Fort Wayne Radio Club. On Jan. 19th a new Indiana 'phone net on 3905 kc. was started by BKJ. Time of operation is 10:00 A.M. CST. BKJ also won a prize for the name, *Ham Splatter*, for Ft. Wayne Club's bulletin. BKH and your SCM spoke before the Elkhart Radio Club. The club president is FWS. New in Fort Wayne are PRO, JYD, PTG, TNP, GPA, 8TZQ, 8WXH, 8ZDG, 2TP, 2PZO, 4FTL, and 6PSC. JDW has been unable to send official bulletins because he lost his 3.85-Mc. antenna. DHJ reports working Gary, Valpo, Hobart, Hammond and others within a radius of 30 miles. PIQ has the 3.85-Mc. rig going at Garrett. FBL has a new antenna on 3.85 Mc., a 90-foot vertical. UIA has a 522 rebuilt for 144, 50, and 28 Mc. with 12-Mc. and 456-kc. i.f. MHE is the first New Haven Radio Club member to use narrow-band f.m. DET is at the State Sanitorium in Rockville, and would like to hear from some of the boys. KCD has the rig on 28 Mc. FEI reports that the Angola boys turned out during the sleet storm emergency. UKV built a crystal rig for GWE to take back to school. MXU graduated from Purdue and is working at Pittsburgh. MDJ is professor of mechanical engineering at the U. of Pittsburgh. DUY worked 68 sections in the SS Contest. Don now has over 100 countries on his list. Traffic: W9RCB 338, ENH 45, UKT 33, SWH 21, DHJ 18, HUV 18, PMT 5, QLW 4, NXU 3, NZZ 2. 73. *Ted.*

WISCONSIN — Acting SCM, Ralph Klein, W9DKH — PFH reports Racine Meg. Club QSO Contest was a big success with KZZ, BVG, and ORV the winners. Congrats to PFH on his 146-Mc. operation during the Contest. From GPI we hear of another Contest on 27 and 28 Mc. staged Jan. 24th by MRAC for Milwaukee County stations. Good scores were made, with LQR the winner. Other clubs are urged to initiate some contests of their own. SZL informs us that YXH is on at Bridgeport, Ind., and ex-HSK now is 3MHH at Philadelphia. Ex-DUY gave an interesting talk on beams at the January meeting of MANCORAD. GFL, LBC, and BZU are interested in 50-Mc. work. Any others? QIX is on 3.85- and 28-Mc. 'phone. YZR is on 3.85 Mc. 'phone. NWM has left us for school in Ohio. Our new director, ARE, is making the rounds of clubs. CIH is doing a fine job as OO. NGM now is Class A. PYE is the new call we have been hearing on 3.5-Mc. c.w. lately. YPP is a new member of the "29ers." KQT is the latest of the Madison locals to try narrow-band f.m. on 28 Mc. VMZ is new engineer of f.m. station at Green Bay. VNC is QRL new XYL in Milwaukee. VMZ wants 144-Mc. contacts in Green Bay area. YUA is firing up for return to the air. VOV is sweating out results of Class B test and DXing with 3 watts to 8JK beam. QJC now is an easterner on Long Island. VVU is

(*Continued on page 80*)

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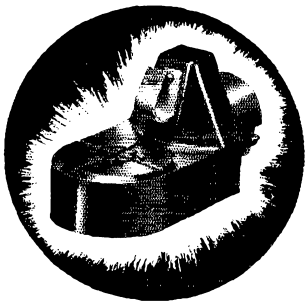

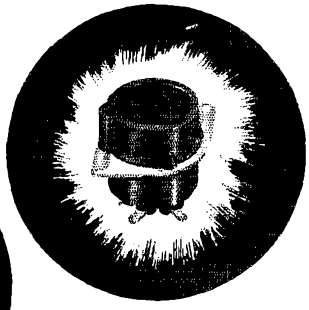

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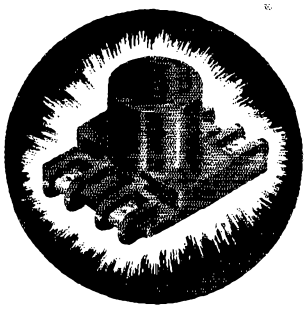

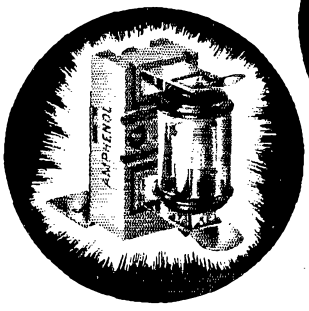

A few of Amphenol's complete line of industrial tube sockets are illustrated

(Continued from page 78)

boning c.w. for Class B exam. ARE schedules EL5B and D4ARP for G.I. traffic. The Central Wisconsin Radio Club was organized Jan. 8th in Wisconsin Rapids with twenty members in attendance. Monthly meetings are held the 2nd Wed. of each month. Visiting hams are welcome. Traffic: W9LFK 152, DKH 74, SZL 27, ARE 20, HUJ 15, MUM 13, SIZ 13, NWM 8, IQW 2.

DAKOTA DIVISION

NORTH DAKOTA — SCM, Raymond V. Barnett, WØEVP — The Red River Valley Club at Fargo has been reactivated with TSN as president and SHI as secretary. RM PDN gave a talk on ARRL and field organization. PPK substitutes for PDN on net schedules when PDN is working. Interest is picking up and we will have several new appointments. Much traffic is being handled. Send me your reports for credit in this column. GJJ is building portable-mobile rig. ABP and EVP have PE103 dynamotor supplies for mobile and emergency work. D4AOT is back home and hopes to be on soon with 300 watts to 814s. His old call was 9JPW. ZRT is proud owner of new four-element beam. SSW is looking for Nevada and North Carolina. PDN, running 500 watts, will call "CQ North Dakota WAS de WØPDN" Sunday nights at 7:30 P.M. CST on 3750 kc. and will comb the bands if no call on the spot frequency. Traffic: WØPDN 38, EVP 23, SSW 11, GZD 9. 73. *Ray.*

SOUTH DAKOTA — SCM, P. H. Schultz, WØQVY — TI, at Milbank, AZE, at Bellingham, Minn., and BJU, at Watertown, have a 145-Mc. net in operation. They report FB results. BJV works KQO, at Conde, regularly on 50 Mc. GLK, at Rapid City, is handling considerable trunk traffic. Will anyone please offer services as net manager or volunteer to join up with a section net? OLB at Glenham is anxious to make South Dakota contacts for a net. Your SCM visited the Rapid gang via YOB on one of their nightly 28-Mc. ragchews. Sorry could not get to see all of the gang in person. The club uees Scout Cabin for meetings twice monthly. Hope Field Day results and questions are settled between Bear Butte Club and Rapid Club. WUU reports results of LO Nite and urges others to join in the fun. We could use lots more reports. How about a 1947 hamfest? 73. *Phil.*

MINNESOTA — Acting SCM, Norman Beck, WØEPJ — New officers of the Minneapolis Radio Club are: KIS, pres.; PTY, vice-pres.; IRM, secy.; GDL, treas. DNY is on QMW Traffic Net. HCC now is CO. Ex-CWI now is EG. TPN has worked 40 states on 7 Mc. with 30 watts. Ex-CSJ now is CST and is running 100 watts to a 6L6. Ex-UYZ now is RQX at Jackson. RRP is a new ham there. GBZ took a crack at the Frequency Measuring Test but found prewar equipment needed lots of going over. WUQ reports Missabe Radio Club met with VHF beam experiment by GFC and DUS. RJF was active in CD Party. The St. Paul Radio Club issued its *Ground Wave* and it is very interesting. CWB had his car smashed up by a big 15-ton ore truck! UWG is working on 1-kw. 'phone job. HEO has been having his share of troubles and then some. ITQ is building a 7-Mc. rig. KIS is getting a 28-Mc. emergency rig going. New appointments are: SEC, BHY; PAM, JIE: RM, NCS: ORS, BBL, ITQ, NCS, RPT, and DNY. The Minnesota 'phone net and the c.w. nets are very active and doing a splendid job. Acting Net Control of the 'phone net is being rotated so that each member gets a chance. The traffic report this month is a dandy, fellows, and let's keep up the good work. There is a lot of rôom in the BPL and Minnesota should be represented. The Fairmont Radio Club got a big write-up in the local newspaper. The club reports several new hams in the making. Plans are being made to set up a 28-Mc. 'phone emergency net and anyone interested should get in touch with BHY. EPJ has 28-Mc. 'phone rig going — the first 'phone rig in about 25 years of ham radio! Traffic: WØDNY 254, ITQ 54, NCS 37, EPJ 34, BBL 30, HEO 20, CWB 19, KIS 13, BHY 11, PNQ 10, RPT 8, JIE 7, CCF 6, RJF 6, IRO 5, UTR 5, MKI 3, HEN 2.

DELTA DIVISION

ARKANSAS — SCM, Marshall Riggs, W5JIC — LVO has p.p. 807 on 14 and 7 Mc. with vertical antenna. LPY is on 28-Mc. 'phone with 20 watts and is doing fine. KIP has p.p. T40s 300 watts on 7 Mc. and is doing O.K. FRV is on all bands with 25 watts c.w. ICN is on with 25 watts. HDR is on 7 Mc. with p.p. T20s. LSH is having all the trouble with wind storms, blown plate transformer, etc.

(Continued on page 82)

KEN-RAD Radiogram

Lighthouse Larry Comments:

WHEN last we were talking about metal tubes, the point was made that the 6AC7/1852 may not actually give you a pepped-up receiver, contrary to the belief of many hams who think they have received more signals by plugging in this tube. *Cross-modulation,* not increased sensitivity, usually is the result of using a 6AC7/1852 in the r-f stage.

The question was put—how about using a 6AB7/1853? Isn't that the ticket? . . . Let's see.

The 6AB7/1853 is a metal tube with remote-cut-off characteristics. That's strongly in its favor, since the sharp-cut-off design of the 6AC7/1852, as explained in our last chat, is the gremlin that causes cross-modulation in your receiver.

Type 6AB7/1853, also, has a higher g_m than the 6K7 or 6SK7 which we're thinking about replacing. Higher g_m means more gain—when you can get it. At fairly low frequencies, or up to about 7 mc, the greater gain is easy to secure. However, above 7 mc the input impedance of a 6AB7/1853 diminishes more rapidly with increased frequency than is true with a 6SK7.

Lower input impedance means a mismatch which results in signal loss. The faster drop in input impedance with the 6AB7/1853 may have only a small effect, and in such cases the tube's gain will not be lowered appreciably. Generally speaking, use of a higher-g_m tube, even at the higher frequencies, means a net gain. A comparison of gains between the 6AB7/1853 and the 6SK7 indicates approximately 6 db in favor of the former, under *favorable* conditions. However, the gain may be accompanied by a decrease in receiver stability, due to the high grid-plate capacitance of the 6AB7/1853—approximately five times that of the 6SK7.

And 6 db gain is a generous figure! You may not get this by using a 6AB7/1853. Furthermore, certain adjustments in your circuit will be needed, in all probability, if the new tube is to function well.

You may have to increase the screen voltage from 100 on the 6SK7, to 200 on the 6AB7/1853. Also, due to differences in plate currents, it may be necessary to change the cathode resistor in order to maintain the same bias.

Whether the game is worthwhile under these circumstances, each ham will have to judge for himself, once he's aware of the various factors involved. I've tried to name these factors, along with their "why" and "how" . . . Soon I'll have another message for you—helpful, I hope—to guide you in applying Ken-Rad top-quality, top-value metal tubes in your rig. CUL!

Lighthouse Larry

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(*Continued from page 80*)

AUU is narrow-band f.m. and is still playing with antenna. He had only five at the last count. LLO has quite a collection of antennas. AYH has that gleam in his eye; maybe some 250Ts. LQN is on 14 and 7 Mc. DNX is back in circulation after four years. AUU, LSH, and LCZ all have new modulation monitors. The Texarkana boys are operating 28-Mc. net, and have worked into Horatio and Hope. Fort Smith 28-Mc. net is on every night and works into Hartford and Paris. The Little Rock Club is building 28-Mc. 'phone rig. The club also has a kw., all-band c.w. 73. *Marshall.*

LOUISIANA — SCM, W. J. Wilkinson, jr., W5VT — SEC: KTE. RM: KUG. PAM: CEW. The Caddo Amateur Radio Club has elected BFX, pres.; LET, vice-pres.; and JHY, secy.-treas. Meetings are held 2nd and 4th Fridays. JVT is interested in CAA Net. ANA has new rig on 14-Mc. c.w. EGK has worked YR, EI, ZS, ZL, and other DX. HOS has completed new 450-watt 'phone rig for 28 Mc. KHH is operating from HGT. LLF is on 7 and 3.5 Mc. with 6 watts. DXL has new e.c.o. FJW has rig on 7 Mc. GHF, EC, has new SX-25 receiver and home-grown e.c.o. MO improved audio. QH, CEW, JFF, IJJ, CNG and JNQ are on 3.85-Mc. 'phone. KTE, SEC, is working hard on emergency setup. LAE is building eight-element stacked beam for 28 Mc. LDH is keeping schedules. MFH is ex-9JWB. OY is ex-5GDU. LJY has BC-610. GTB is building for 28 Mc. ILX is newest portable. DAQ is on 3.5-Mc. c.w. IOP has 47 countries. KTQ, LAX, AEN, ZS, and LQV are active. LQO is rebuilding. KWY is ex-8VKF. LSZ has 28-Mc. rig. HOS worked J2 on 28 Mc. HEJ and HEK are on 7 Mc. in Natchez. EGK works 14-Mc. c.w. consistently. The OVARC has swell meetings. We need ECs for Alexandria, Baton Rouge, and other localities. Write KTE for information. ORS, OPS, and OBS appointments are still open. Traffic: (Dec.) W5DAQ 4. (Jan.) W5KUG 163, KTE 143, VT 121, JPJ 71, GHF 44, BSR 18, LDH 17, FPX 10, FYS 8, DAQ 7, KWY 3, JET 3. 73. *Dub.*

MISSISSIPPI — SCM, Harold Day, W5IGW — CUU has new kw. final for 14 Mc. DNV has new dipole for 3.85 Mc. DEJ has T55s in parallel, modulated with 811s. Welcome to new ham, MFJ, in Meridian. MFJ is blind. FQ passed away in January. His many friends throughout the country will mourn his loss. WZ made 11,250 points in the ARRL Party in January. A big hand for the Jackson radio amateurs, who certainly planned an excellent program for the big meeting there February 9th. More on the meeting in next month's QST. Thanks to WZ and DEJ for the news this month. Traffic: W5WZ 328, IGW 313, DEJ 5. 73. *Hal.*

TENNESSEE — SCM, James W. Watkins, W4FLS — AQR and DQH are having a hot battle for local DX championship on 14 Mc. The Midsouth Amateur Association holds regular monthly meetings. AQR is its new president. MP, in Key Largo, Fla., has a 60-watt rig for keeping schedules with ERJ. AAW WACed in one afternoon on 28-Mc. 'phone. CDU had a two-way scheduled contact with Germany and Shanghai on 28 Mc. JJP, GYE, and GXX are working at WDKA. Oak Ridge Radio Operators Club, an ARRL affiliate, boasts a membership of 76 hams from all sections of the country and Hawaii and about 30 non-licensed members. 3TWI/4 keeps schedules with the TLAP, TL-C, Ohio, W. Pa. and S. C. Nets and needs contacts in West Tennessee, Kingsport, and Chattanooga. Look for him on 3750 kc. at 6:30 P.M., 3790 kc. at 8:00 P.M., and 3630 kc. at 9:30 P.M., Tues., Wed., and Fri. MGT, FRM, BBL, LHB, JUX, and 3TWI/4 are active on 3.9-Mc. 'phone. EOC, EYW, LHB, JUX, 9OZJ/4, and 3TWI/4 are active on 14-Mc. 'phone. Tennessee 3.85-Mc. 'Phone Net meets every Sunday at 9:30 A.M. CST with QT as net control and ERJ alternate net control. Those desiring to participate are requested to call in after roll call. ENL is new OO and LHQ is new ORS. LBA is ex-5HFN's new call. FZ is Tennessee SEC. Those interested in forming a c.w. net should contact PL on 3.5 or 7 Mc. Traffic: W4PL 468, 3TWI/4 86. 73. *Jim.*

GREAT LAKES DIVISION

MICHIGAN — SCM, Harold C. Bird, W8DPE — SWF is running schedules with J9AAI and handling plenty G.I. traffic. TLL is back on 7 Mc. with 200 watts. He worked G8JJ and HB9FP. SS worked 1POD and 5KOU with a 6L6 and 24 watts on 3.5 Mc. using half-wave Hertz fifteen feet off the ground and then blew his transformer. ZGZ reports he is working 28 Mc. with 200 watts to a pair of 811s. UKV is running the Early Net now and doing a fine job.

(*Continued on page 84*)

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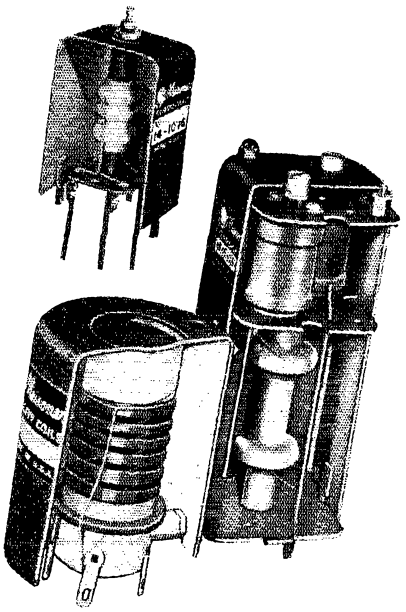

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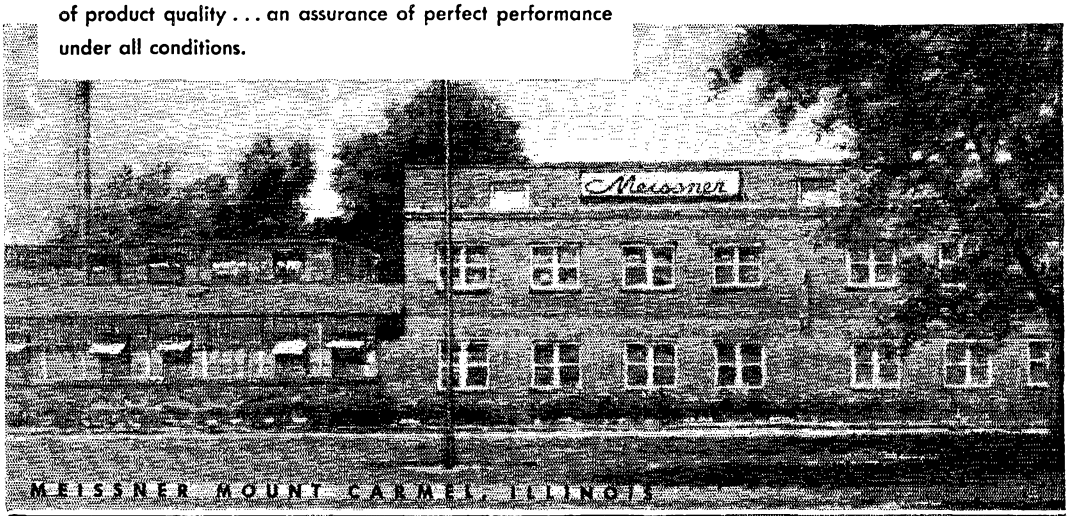

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(Continued from page 82)

Dale is working on electronic portion of a tape puller and is trying to stimulate traffic in his neighborhood. UCG reports the Michigan Emergency Net operating on 3930 kc. at 9 A.M. every Sunday. CLL is finishing 50- and 144-Mc. rigs and his next project is to build f.m. exciter for 28 Mc. UGR is having harmonic trouble so is operating on 3561 kc. FWU is working 3663, 3613, and 3708 kc. ONK is running the QMN 7 O'clock Net on Tuesdays and doing a swell job. SFA hopes to have SH at MSC on QMN as soon as transmitter is completed. FX reports his XYL fell and cracked her shoulder. RJC is keeping up his good work on traffic. YCD finished the new rig, 6L6 to pair 809s running 160 watts input. WET is directing early QMN Net now in place of UGR. YCT is handling traffic for all parts and took one for Italy recently. QQK is back and hopes to be regular reporter on QMN. TYE is doing nice work on the various nets. DNM radios his report and asks for ORS appointment. TBP is traveling a lot so cannot get on often. ZHB is doing fine job on Early Net of QMN gang. TRN worked a foreign station and got a QSL card, the first in ten years. He schedules Baffin Island and also reports working Moscow and a VK3AE. YEF worked KHY on ground wave of 28 Mc. for two hours and two minutes. ABH is working QMN Net and acting as NCS. SCW can be heard any night in the week on QMN or plugging away on the Trunk Lines. PVB is located in Muskegon and can be heard on QMN regularly. JUQ reports radio class at high school with twelve fellows and girls in training. FXL and JUQ send code practice on 3555 kc. at 7:20 P.M. Monday through Friday. SAY had to cut down his activities a bit so is working 7 Mc. The Oakland County Radio Club held its regular meeting Feb. 3rd. Traffic: W8SCW 364, PVB 55, URM 37, JUQ 34, ABH 32, DNM 26, TYE 25, XHB 22, TBP 21, RYP 11, TRN 11, SHI 7, QQK 6, YCT 3. 73. *Hal.*

OHIO — SCM, William D. Montgomery, W8PNQ — New appointments this month include PUN as OBS; WDQ, TKS, and UPB as ORS; and WAV as EC for Guernsey County. All appointees are cautioned to send certificates in for renewal a year after they are issued. The Buckeye Net on 3730 kc. is going better each month under the direction of the Route Manager RN, and the NCS and Asst. Route Manager MPG. The net now has regular outlets into the TO, QMW, QMN, TLAP, W. PA., and GLEN Nets. PMJ and ZAU alternate in the QMW; MPG, RN, and PIH alternate into the TO net; EBJ handles the TLAP, and UZJ the GLEN Nets. 3730-kc. crystals may be purchased from MPG. The Coast Guard Net is to meet nightly at 8 P.M. on about 7050 kc. WYN reports the following new officers of the Intercity Radio Club: TTS, pres.; ALC, vice-pres.; WYN, secy-treas.; LYQ, master at arms. WXV won the prize offered by the club for the highest score in the SS Contest with 42,000 points in 25 hours. LYQ has passed the 100 mark in countries worked. All hams within traveling distance of Mansfield are welcome at Intercity Club's meetings on the first Friday of each month, at Liberty Park Pavilion. PFC reports the Piqua Radio Club's code classes got off to a good start with WKN as chief instructor. QHV changed from a three-element beam to a five-element beam. JDQ is satisfied with nothing less than a rhombic, which works out quite nicely. The Piqua Club transmitter was exhibited at the local school during a hobby show and messages were handled as part of the demonstration. The Fort Steuben Radio Club's new officers are: MAM, pres.; AS, vice-pres.; SFI, secy-treas.; ERR, trustee; AYR, act. mgr. The club is located at Steubenville, and all neighboring hams are invited to meetings. A new club, the Cleveland Brass Pounders Assn., has been started in Cleveland. All hams interested should get in touch with ROX. The club will cater to traffic handling, contests, and DX. Another new club at Delaware, the Central Ohio Radio Club, announces its officers as CNY, pres.; ERE, vice-pres.; G. R. Cryder, secy.; ZLR, treas.; CNO, OUR, and LEH, trustees. Meetings are held on the 2nd Friday at Old High School Bldg. WJC has worked Erie, Pa., on 144 Mc. ten out of eleven nights in a row, and has worked stations in Detroit; Akron; Canton; Westfield, N. Y.; and Andover. MFV says he gets better results with an "untilted" horizontal beam than when he tilts it in. WXY won honorable mention in the Westinghouse Science Talent Search. WSC reports the following have new Class A tickets: WQR and VCJ. TTS has a limited amount of his famous "Megacycle Mixer" left from the last brew. A sample may be obtained on request. The Findlay Club has been reissued its old call, FT. YEJ and 4HAV have rebuilt the exciter on the QCEN

(Continued on page 86)

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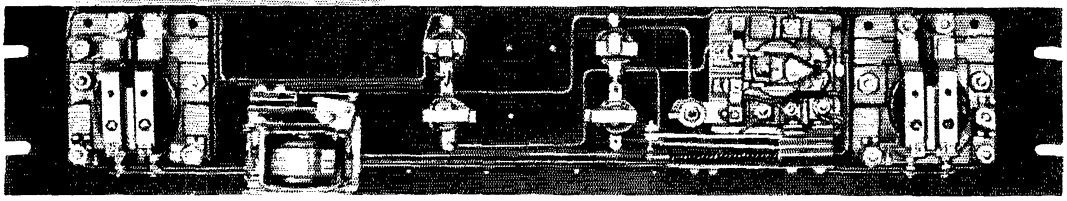

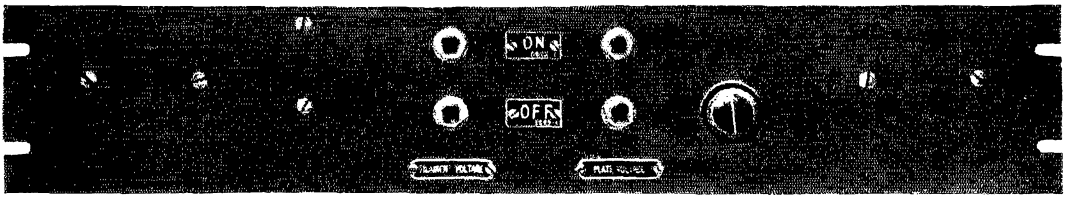

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(*Continued from page 84*)

transmitter, VVL. The new one does not take a corps of engineers to tune as did the old one. High winds around Cincinnati toppled many famous beams, including that of JIN, the GCARA's DX leader. MGR reports that the GCARA roster of members now is 191. ZPP, formerly 9UUR, wonders what he did to rate his new call letters. 144-Mc. activity has started again in Cincy, with drill periods on Thursday nights at 8:15 P.M. It is rumored that all the 50-Mc. boys are converting to 144 Mc. now because of alleged better coverage. Traffic: W8ZAU 141, MPG 113, UPB 109, RN 103, PZA 71, PIH 55, CBI 36, WE 31, IVC 19, PNQ 17, PMJ 16, QIE 14, TGU 13, VWX 13, DAE 12, UZJ 10, FFK 6, PUN 6, MFV 5, AQ 4, LCY 3, THJ 3, PBX 2, BUM 1. 73. *Bill.*

HUDSON DIVISION

EASTERN NEW YORK — SCM, Ernest E. George, W2HZL — Through the splendid efforts of ITX, the ENY and WNS traffic nets are now combined into one, "QNC-NYS." Listen for the NYS Net at 7:00 P.M. on 3720 kc. Mon. through Fri. and call in with your traffic. These combined operations should render a fine serive to the State. ITX and SAG are net control and alternate net control, respectively, until organization is really under way. EQD asks old Southern NY AARS stations to monitor 3545 kc. QUJ reports several new antennas going up in his territory, but most of them now rest in the trees awaiting more ham help. Apparently no one around owns a jeep. They sure make a good antenna-raising and tightening medium. Ask KLM and the Schenectady gang how it's done. 50-Mc. schedules are held regularly between GYV in Schenectady and Massachusetts and New Jersey stations. A rotary beam (four-element) superhet receiver and a good transmitter sure make a big difference, not to mention 28-Mc. lower in frequency. Traffic: W2ITX 106, EQD 14.

NEW YORK CITY & LONG ISLAND — SCM, Charles Ham, jr., W2KDC — Queens: BSP reports UFV is the newest station in the 144 EC Net. Suffolk: OQI, acting EC, reports interest in the 3.5-Mc. c.w. EC Net. EBT, FCH, ADW, US, and OQI are on regularly for 144-Mc. net drills. TIA keeps West Nassau in contact with East Nassau so KNA can report. SAH brought about a family reunion in arranging a schedule with several persons on each end of the Rome-Islip QSO. UX works 3.85-Mc. 'phone but will try 28 Mc. in order to contact his brother, SM7OG. ADW's 60-foot poles are going up. CJZ has a natural QTH for 144 Mc. overlooking L. I. Sound. FSK keeps trans-Atlantic 28-Mc. schedules with G6DH. The XYLs of EGK and SAH have formed a club for the purpose of getting ham tickets. LCK is on 144 and 3.5 Mc. at NMY. GFX also is at NMY. WH is QRX for rotating mechanism which will take care of his six-element 144-Mc. beam above his four-element 28 Mc. beam. DOG can be heard on 144.05-Mc. crystal with an 815 in the final. PDU is giving code practice to local aspirants. In Brooklyn regular 144-Mc. EC drills continue every Monday night at 9. 235-Mc. operation included AUF, GWL, KU, OHE, NXT, and JSJ. 3.5-Mc. c.w. EC stations are needed to augment BO and PWJ. 3.5-Mc. c.w. net stations reporting on Sundays at 3 P.M., 3600 kc., are BO, LNO, KTF, PWJ, PF, NVB, KCA, HQB, BDN, OBU, EQD, PDU, and BGO. ATI, secretary of the Astoria Radio Club, reports meetings are held the 2nd and 4th Thurs. of each month at 58-11 39th Ave., Woodside. Officers are BAA, BTE, and ATI. TUK shares the shack with GG; Harry is on 3.5, 7, and 144 Mc. CET has resigned as Nassau EC, and FI takes over. RXO and OUT have applied for OO appointments. AOD is converting a BC-406 to 144 Mc. LPJ is converting a 1068A receiver to 144 Mc. LRI WACed. GXC is on 7 Mc. with 6L6. KPA worked an OK using 12 watts to his e.c.o. on 7 Mc. LUX replaces GXC as secretary of the Queens Radio Amateurs. BO heard 6NQG/KM6 on 7080 kc. at 5:30 A.M. EST recently. MWB is on 425 Mc. every Tues. from 8 to 9 P.M. He uses corner reflector rotating it N E S W with 15 minutes on each quadrant. If interested contact him on the air, or write to 9121 82nd St., Woodhaven. JSV, IAG, MYR, and ONA have a certificate available to any 28 Mc. station working all four of them. TUF, formerly EC2YD and OK2AG, is on 14 and 28 Mc. PWJ works closely with BO. JXH schedules several KPs every A.M. and Cuba regularly on 28 Mc. OHE and KU had first 235-Mc. contact due to the efforts of GWL. AUF, NXT, and JSJ are on 235 Mc. PF uses 20 watts to a 6L6. AYJ is portable at Eastern L. I. FI uses the official bulletins to

(*Continued on page 88*)

NEW 5516 INSTANT-HEATING VHF BEAM PENTODE

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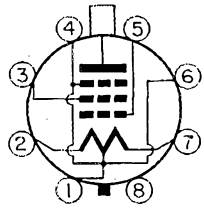
WHAT THE 5516 DOES FOR YOU . . . 5516 useful power outputs at 165 mc of 18 watts f-m, 12 watts a-m (more at lower frequencies) are not theoretical but are based on actual tested transmitter designs. Low internal tube drop gives high output at low plate potential, with simplified power supply requirements. Instant-heating filament permits tremendous savings in battery drain — mobile or aircraft. One 2E30 doubler or tripler drives a 5516 in plate-modulated class C to full output at 165 mc. Ratings — designed for mobile use — are CCS and equally suitable for the fixed station. Also the 5516 requires no neutralization in properly designed circuits. Write today for complete data sheet.



BASING — BOTTOM VIEW

Pin	Connection	Pin	Connection
1	Fil. center tap & beam plates	5	Control grid
2	Filament	6	Same as pin 1
3	Screen grid	7	Filament
4	Same as pin 1	8	No connection
		Cap	Plate

HYTRON TYPE 5516
INSTANT-HEATING VHF BEAM PENTODE

GENERAL CHARACTERISTICS

Filament	oxide-coated, center-tapped
Potential (a-c or d-c)	6.0 ± 10% volts
Current	0.7 ampere
Grid-plate capacitance	0.12 max $\mu\mu$f
Input capacitance	8.5 $\mu\mu$f
Output capacitance	6.5 $\mu\mu$f
Maximum overall length	3-21/32 inches
Maximum diameter	1-7/16 inches
Base	low-loss, medium-shell, 8-pin octal

ABSOLUTE MAXIMUM CCS RATINGS

		Mod.*	Unmod.	
D-c plate potential	80 mc	475	600	v
	135 mc	395	500	v
	165 mc	355	450	v
D-c plate power input	80 mc	30	45	w
	135 mc	26.5	40	w
	165 mc	23.5	35	w
D-c plate current		75	90	ma
D-c screen potential		250	250	v
Plate dissipation		10	15	w

USEFUL POWER OUTPUT (CCS) — TYPICAL OPERATION#

Service	*Up to:* 165	135	80	mc
Class C unmod. or f-m	18	24	30	w
Class C plate-modulated	12	16	20	w

*Carrier condition with max modulation percentage of 100. #Useful power output to load equals plate power output less circuit and direct radiation losses.

5516
CONSTRUCTIONAL ADVANTAGES

- Zirconium-coated plate, gold-plated control grid, carbonized screen grid enable maximum possible vhf ratings, despite compact size.
- Special, rugged filament suspension avoids short circuits and burn-outs in rigorous mobile applications.
- Three separate base-pin connections to filament center tap provide for lowest possible cathode lead inductance.
- Dishpan stem and compact structure give short, heavy leads with low inductance and capacitance.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON
RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

(*Continued from page 86*)

open the EC net each week. He is on 14-Mc. 'phone. ORZ has crystal mobile. SMX, FQW, and PCV are using sharp superhets on 144 Mc. QYZ is active on NYC-L. I. Net. BDN is on 3.5-Mc. c.w. using 10 watts. BO schedules Ronnie Expedition, AYZH, taking traffic on 7 Mc. The Sunrise Radio Club officers are LFY, pres.; BKZ, vice-pres.; MFK, treas.; and TZV, secy. TZV is using TR-4. TWJ copies 35 w.p.m. on Super-Pro. The Sunrise Radio Club meets every Friday night at 222-34 141st Road, Laurelton. SXT is a member of the RCC. PRQ works good DX on 7 Mc. PMA, secretary, reports the YLRL of N.Y.C., has round table on 29,200 kc. the first of each month and meets at 8 P.M. the 3rd Friday of each month at 17 E. 67th St. Traffic: W2BO 171, OBU 65, QYZ 61, PWJ 36, BDN 14, HXT 14, LGK 11, TUK 10, AYJ 5, OUT 5, MZB 2, PF 2, JBP 1, RQJ 1.

NORTHERN NEW JERSEY — SCM, John J. Vitale, W2IIN — Asst. SCM, T. J. Ryan, NKD. SEC: GMN. NNJ Net 3630 kc., NCS CGG, 7:00 P.M. Mon. through Sat. The MCARA celebrated its first anniversary. New Officers are BAT, pres.; HKY, vice-pres.; George Bennison, secy.; QQH, corr. secy.; RVU, treas.; ABL, chief engineer; SPB, news editor. SOX, division director, installed new officers. Club publication is the *MCARA News*. Meetings are held at the Vail Homes in Eatontown on Thursdays. SOV worked his BC-610 on 3.9-, 14- and 28-Mc. 'phone during recent illness. LGX is on 28-Mc. 'phone. QEM has a "Monmouth" kilowatt on 3.85-Mc. 'phone. IXY, NVD, and NTU kept 24-hour schedules on 7, 14, 28, and 144 Mc. on Christmas and New Year's Eves. EOH worked 66 countries on 3.85-Mc. 'phone. HEQ is on 7 Mc. NKD is OBS on Tues., Thurs., and Sat. at 6:30 P.M. on 3630 kc. Clubs are urged to appoint a traffic man to work into the NNJ Net for club traffic. The NNJ 3.85 Mc. Emergency 'phone Net is holding drills on Sunday mornings. The Hudson County 144-Mc. Emergency Net is in operation. Those interested should see NLE and APL. SOX would like to hear from any amateurs interested in handling traffic to or from SOX on 3630 kc. in conjunction with NNJ Net. NIY holds traffic schedules with 1UE, SUP, and GWY. OJT is on 14 Mc. BZJ revamped the rig with an 810 in final, 400 watts. PPH rebuilt the rig. The MCARA is getting ready for next Field Day. HZY has worked 88 countries. GFW is on 14 and 28 Mc. LFR reports that TLAP can handle traffic for the Byrd Expedition. NCY is rebuilding to p.p. 813s, VFO and f.m. 500 watts on 28 Mc. CJX has been handling D4 (GI) traffic for families here. GVZ has 25 countries. QHS is secretary of North Newark Radio Club. NXE is c.w. on 27 and 28 Mc. The Irvington gang is playing with electronic keys. The Fort Monmouth Radio Club conducts code and theory night class for new members. Maj. J. M. Moss is secretary. RZZ is new member of Bloomfield Radio Club and is on 14 Mc. SVX is on 7 and 3.5 Mc. GFG won the c.w. speed contest at the Bloomfield Radio Club Annual Dinner. OST is looking for an antenna site. OYD is listening on 3745 kc. for the old gang. GC revamped his BC-312. CO is making changes for break-in operation. FEA is DXing on 3.5 Mc. OAE is on all bands, 'phone and c.w. AQG is on the air again. FDL is on 28-Mc. f.m. PQC, on 7 Mc. with 807, worked England. NEH has a BC-610. The Hudson Division officials meeting was held in Elizabeth Feb. 11th with Director SOX presiding. Those attending were DSY, alternate director; NJF, assistant director; IIN, N. N. J. SCM; NKD, N. N. J. Asst. SCM; GMN, N. N. J. SEC; KDC, N. Y. C. – L. I. SCM; and PRT, secretary to SOX. Traffic: W2LFR 249, LTP 186, CGG 180, MLW 124, ANW 109, CQB 79, NKD 77, NCY 71, NIY 55, OCC 32, PQC 29, CJX 24, APL 22, IIN 21, BZJ 19, GVZ 9, HZY 6, LX 5, BRC 2, ANG 1. 73. *John.*

MIDWEST DIVISION

IOWA — SCM, Leslie B. Vennard, W9PJR — ØVFM is having fun on 144 Mc. and wants more activity on that band. SEF has a new S-38 receiver and is working DX on 7 Mc. NMA renewed his EC appointment. The recent storm showed the need for more ECs, so ØCPU has consented to act. He sure carried on in fine style during the emergency. ØMFX had a fire in his ham shack and is rebuilding. TWX reports with messages from Iowa 75 Net. The Nish-A-Boyer-Amateur Radio Club meets the third Thursday of each month. Contact ØNXW for information on the meeting place. GKS is a member of the Old Timers Club. DPB sends Official Bulletins on 14 Mc. Tues. and Thurs. at 6:30 P.M. and on 28 Mc. Wed. and Fri. at 12:30 P.M. PJU is

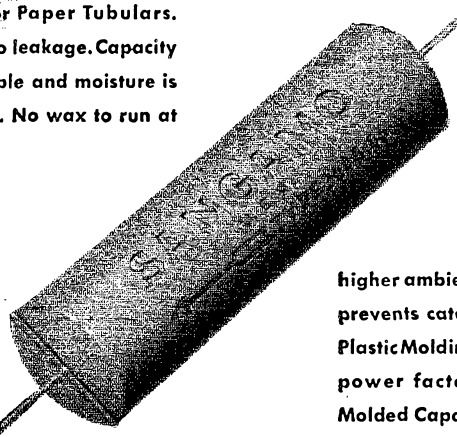
(*Continued on page 92*)

SANGAMO PAPER TUBULAR CAPACITORS

ARE NOW MOLDED IN PLASTIC

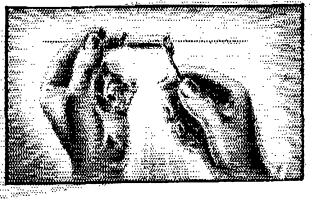
...just like micas!

Paper Tubular Capacitors, molded in Thermo-Setting Plastic! Designed for use in all circuits calling for Paper Tubulars. Plastic Molding means no leakage. Capacity values remain more stable and moisture is completely sealed out. No wax to run at higher ambient temperatures. Smooth finish prevents catching dirt and dust. All in all, Plastic Molding assures longer life and lower power factor. Specify Sangamo Plastic Molded Capacitors wherever you use Paper Tubulars.

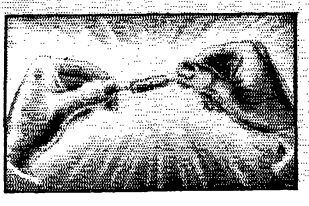


...try these tests WITH SANGAMO PLASTIC TUBULARS ....

WRITE NOW for the New Sangamo Capacitor Catalog for full information on the Sangamo Line.



NO WAX TO MELT....even heat as intense as is encountered in soldering, will not cause leakage in the case or at the lead joint.



LEADS WILL NOT PULL OUT...Plastic Molding so tightly seals the leads in place, that under all conditions of normal use, leads will stay put.

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BRAND NEW EQUIPMENT NEVER USED BEFORE

Sensational VALUES FROM RADIO SHACK

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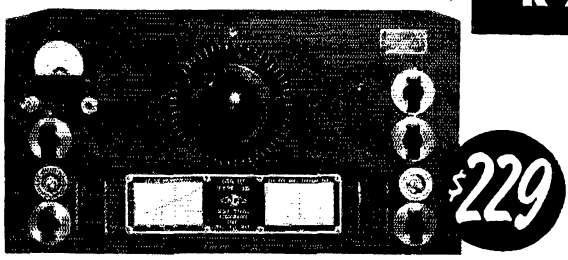

$229

Brand new, first quality HRO receivers, packed in their original, *never opened cases* — ready for immediate delivery! Built for the U.S. Signal Corps, these military type sets incorporate all the extra safety factors demanded by global service — give you superb plus features for extraordinary performance. The 110 A.C. power supply allows fixed station operation; the 6 V D.C. supply permits operation in an automobile without the use of extra batteries.

Warning — *quantities are limited.* While they last, we'll ship the same day we receive your order. Act today!

SEE ALL YOU GET:

Receiver complete with tubes — plus a full set of spares and some spare parts.

Two National HRO Power Supplies; one for 110 v. a-c, one for 6 v. d-c.

Two 33-page instruction books, including complete parts list and detailed servicing instructions.

Nine sets of coils covering frequency range from 50 KC. to 30.0 MC.

RANGE OF FREQUENCIES	
50— 100 KC.	1.7— 4.0 MC.
100— 200 KC.	3.5— 7.3 MC.
180— 430 KC.	7.0—14.4 MC.
480— 960 KC.	14.0—30.0 MC.
900—2050 KC.	

HERE'S YOUR OPPORTUNITY to make a real saving on a COMPLETE RADIO STATION

for regular or emergency service

★ FIXED STATION ★ PORTABLE ★ MOBILE ★ MARINE

$350

It's the U.S. Navy Model TCS-12 Radio Telephone and Telegraph Transmitting and Receiving Equipment — built by COLLINS and now offered — brand new — *in its original, unopened, export packing* — at an astoundingly low price.

This is an ideal communications equipment for municipalities, utilities, airports, and commercial users– it's complete and furnished with enough spare parts for a lifetime of normal maintenance; 203-page manual gives detailed data, photographs, diagrams, and instructions for operation and service.

The Complete Equipment Includes

#52245 7-tube Radio Transmitter —

25 watt telegraph; 10 watt phone; band switching 1.5—3—6—12 mc; provision for 4, crystal controlled frequencies or continuous coverage with VFO; very stable and easy handling.

#46159 7-tube Radio Receiver

3-band superheterodyne using either crystal or master oscillator control; 6 milliwatts output at 15 microvolts input; ample selectivity and low distortion.

#20218 115-volt 60 cycle Power Unit

with two, full-wave vacuum tube rectifiers for plate supply and a dry-disc rectifier for filament supply in transmitter and receiver.

#23270 Remote Control Unit

for both transmitter and receiver; includes loud speaker, phone jack, and output selector switch.

Accessories

Antenna loading coil; telegraph key; microphones; and all necessary cables and plugs for interconnecting the various units.

Spare Parts

The spare parts chest includes over 200 items of transformers, capacitors, relays, resistors, switches, cables, plugs, insulators, etc.

Every part of this equipment is painstakingly and sturdily built to withstand the severest possible service. It's a heavy-duty, professional equipment of the highest quality. Price — as described $350.

SURPLUS *Values* PLUS *Satisfaction...* *all from* RADIO SHACK

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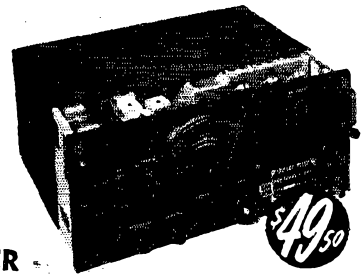


BC-348 RECEIVER

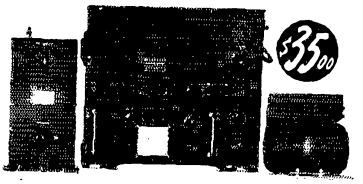
Acclaimed the best military receiver for amateur use, this easy-handling set covers six band-switched ranges from 200 kc. to 18 mc (less BC band), with constant sensitivity on all bands. Has Xtal filter, AVC, MVC, BFO, automatic noise compensator, temperature-compensated oscillator; output at 300 or 4000 ohms; vernier tuning on all bands. Furnished with built-in dynamotor, full set of tubes, and details of conversion to 110v. a-c.
Complete a-c conversion kit for BC-348 ..... $6.50

XMTG CAPACITORS

Nationally known, high-voltage, oil xmtg capacitors, all in rectangular cases, with stand-off insulators.

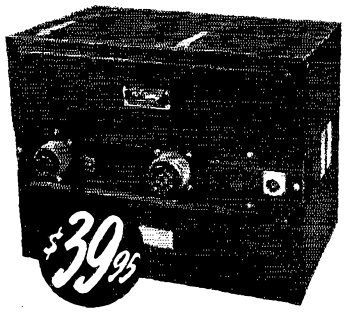
Mfd.	Volts d-c	Net Ea.	Mfd.	Volts d-c	Net Ea.
4	600	$0.71	2	1500	$1.20
6	600	.79	4	1500	1.59
8	600	1.19	6	1500	1.79
10	600	1.29	2	2000	2.95
2	1000	.71	8	2000	3.75
4	1000	1.19	2	2500	3.25
8	1000	1.49	2	3000	3.45
10	1000	1.79	4	3000	4.25
			2	4000	4.95

AAF XMTR BC-375-E



For a real bargain, you can't beat these used, but in A-1 shape, BC-375's. Furnished complete with five tubes, seven tuning units covering 200 kc to 12 mc (less BC band); antenna tuning unit BC-306-A with variometer and tap switch, dynamotor PE-73-C with relay, fuses, and filter. For detailed description of this 200-pound bargain, see our Feb. QST adv.

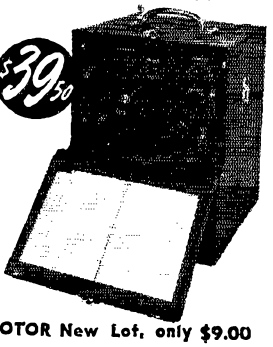
SCR-522 VHF XMTR-RCVR for all-purpose work at 100-156 MC



Used as standard equipment on all AAF and RAF planes, this set is now yours at but a small fraction of its original cost. Ten-tube crystal-controlled superhet has 3-microvolt sensitivity at 10 mw output. 7-tube temperature-stabilized xmtr delivers 15 watts. Remote control box gives push-button tuning on four crystal-controlled send-receive channels. Dynamotor (28-volt d-c) powers entire rig. Furnished with all tubes, plugs, and detailed dope on conversion to 110-volt a-c operation. Condition excellent. Weight about 100 lbs.

FREQUENCY STANDARD BC-221

This stable, heterodyne frequency meter checks up to 5th harmonic on most receivers and up to the 125th on the better ones. Fundamental ranges are 125-250 and 2000-4000 kc; stability is better than .005%; instrument works on 110 v.a.c., on vibrapack, or on batteries. Use it for a signal generator or make it into a VFO that's a humdinger. Complete with tubes, original crystal and calibration charts. Excellent condition. Order today!



PE-103 DYNAMOTOR New Lot, only $9.00

Brand new, in original Signal Corps packing; delivers 160 mils at 500 volts; operates from 6 or 12 volts d-c; complete shock-mounted assembly includes breakers, switches, relays, filters, and cables.

BUYS in TUBES

872A	$2.25	829B	$3.94	814	$4.50
807 West'hse	1.05	829B socket	.69	826	2.25
811	1.95	804-TH Eimac	9.95	832A	4.05
813	6.75	809	1.79	931A	1.88
211 GE	4.95	810	2.59	2AP1	2.25

Speed delivery and save C.O.D. charges — send *full* amount with order; 50% deposit required on all C.O.D. orders.

The RADIO SHACK Corp.

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(*Continued from page 88*)

working DX on 14 Mc. His best contact to date is ZS2G. KZI got in on the emergency work Jan. 29–31 and Feb. 1 and had his rig on most of the time. NMA proved that it pays to have a portable. In fact he had two rigs running in different towns. CPU handled traffic fast. One illness message made the round trip in ten minutes. The Sioux City Amateur Radio Club has applied for affiliation with ARRL. Traffic: WØFP 37, EFI 10, GKS 9, TWX 4. 73. *Les.*

KANSAS — SCM, Alvin B. Unruh, WØAWP — PAH, our SEC, reports there will be a number of new EC appointees shortly. REB, EC for Wichita and Sedgwick Counties, held a test mobilization on Feb. 7th in which at least twenty amateurs took part. New AEC members: REB, PGL, LFB, OZN, CVN, IKB, WBF, QEF, GUO, RHB, MAR, HCU, LSY, UNQ, ZKA, RVM, UUS, JBO, ZVP, OZK, and QCH are on 3.85-, 14-, and 28-Mc. 'phone. VBQ, NJS, and AWP worked in the CD Party. The Neosho Valley Amateur Radio Club has the call SHG. New officers: ZGB, pres.; FLZ, vice-pres.; MDI, secy.-treas. FON reports IWS has new kw. almost ready. FRK has new rig with 829. EEB has 6L6 rig until BC-610 gets going. At Haskell Institute QGX and QHA are new calls and OWT has Class A license. MDI has new 28-Mc. three-element beam. OAQ, YOS are new ORS. VWV and IJK are working lots of DX on 7 Mc. ZAT has four contacts on 28-Mc. 'phone. OAQ is OO Class IV. NOF signs into QKS Net when possible. BPL built new e.c.o. The KVRC has new officers: KSY, pres.; ICV, vice-pres.; KRZ, secy. DKK is new in Topeka. HBL has 40-watt 3.85-Mc. 'phone. WGM and KRZ have new rigs. EPX is active in QKS Net. WARC officers are: DMF, pres.; LFB, vice-pres.; QEF, secy.; ABJ, treas.; QMB, publicity director. Traffic: WØNJS 94, KSY 81, OZN 46, KPJ 25, YOS 25, EPX 20, VBQ 17, TVU 11, ZUA 11, BPL 6, OZA 6, KEI 3. *Abie.*

MISSOURI — SCM, Mrs. Letha A. Dangerfield. WOØUD — GCL completed new 14 Mc. 'phone rig — first QSL was from Grand Island about his 3rd harmonic. RAQ and QJN, in Advance, just received tickets and ROB and RFM are new Columbia hams. Parts shortage, flu and malaria kept DEA off the air. ARH's only DX was TI2FU on 14-Mc. 'phone. He has a daily schedule with Iowa 3.85-Mc. traffic net, has remodeled the rig, and enjoyed the ARRL Party. EYM could find no OPS on 3.85 Mc. in the CD Party. KIK spent six hours in CD Party with little luck and less power — signal is louder since last rebuilding. QXO, NCS for MON, tops traffic report. ZVS, alternate NCS, is second and is organizing St. Louis gang into traffic net. WIS has Class A; he is teaching code and theory in Kansas City. ZZW has 15 w.p.m. certificate. He worked 67 stations in 32 sections using 12 watts on 7 Mc. in ARRL Party. ZIS has new Collins VFO and is building bandswitching exciter. YHZ has BC-22AK Army frequency-meter to use in OO monitoring, and reports hearing too many bad 'phone signals. BEM works on 28-Mc. 'phone and sent in following report on HARC and the Kansas City gang. UID rebuilt the beam and ruined $100 worth of coax, then found the trouble was in a soft 812; DDX is experimenting with 144-Mc. beam at 8 P.M. each Tuesday; CXB is building 28- and 14-Mc. beam for ARA; ZJB keeps schedule with Kansas on 50 Mc. ground wave; MKX, INI, and RKM are full members of 3.85-Mc. Short Winded Club. BTC and JAP of Kansas City FCC office are regulars on MON. OUD moved the rig into the house where it is warm and has key clicks in b.c. set. She is on MON nightly. Thanks for FB reports, gang. Traffic: WØQXO 94, ZVS 49, OUD 17, ARH 11, KIK 10, ZZW 2. 73.

NEBRASKA — SCM, Roy E. Olmsted, WØPOB — TQD has prolapsed antenna because of the ice, but made BPL. DMY is in full cry on all bands. FAM, who keys Morse with his left while he throws out lingo with his right, will handle traffic on state net to and from northern points. See him on 3625 or 3555 kc. Ex-BNT now is 6UFJ operating for CAA at Ruby's Inn, Utah. RQS is on 28 Mc. with 4-section Sterba. FQB is satisfied with 3-section ditto. IFJ has cured BCI QRM with narrow-band f.m. QNP is on 3.5-Mc. c.w. with swell fist and note. DNW is home after a short course in wire telephony at Joliet. BBS has his binoculars trained on power line one-half a mile away. SAI has new phone-c.w. rig and wants to know what to do with the mike. UHT hired a well-driller to dig holes for those "salvaged" poles. OHU has degenerated from 7-Mc. c.w. to "intentionally operated f.m." on 28 Mc. EXP is experimenting with rotary beams. TMK, UBN, and GPX are on 28-Mc. 'phone. The North Platte Club holds monthly

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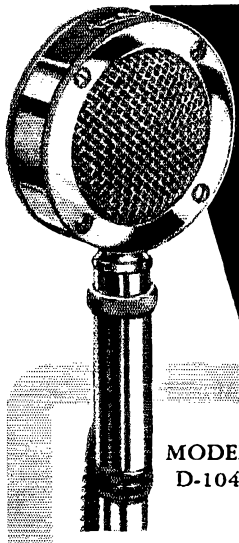

"W8MNJ" says D-104 has "TONE BRILLIANCE"

MODEL D-104

LIKE many thousands of other veteran hams, Al Adair, Radio Station W8MNJ, prefers and uses an Astatic D-104 Microphone because "the frequency response provides tone brilliance for voice communication." Mr. Adair, with almost fourteen years of short wave communications experience, continues, "The power consuming low frequencies below 500 cycles are attenuated and the response above 4000 cycles is reduced. The attenuation of the lower frequencies makes it possible to maintain a higher percentage of modulation at voice frequencies without affecting intelligibility.

"By limiting the response to 4000 cycles, a total band width occupied by the modulated carrier will be 4000 x 2 or 8 Kilocycles (4000 either side of the carrier), providing, of course, that the maximum modulation capability of the transmitter is not being exceeded.

"Since the band of frequencies available for phone communication is limited and since the frequencies taken up by the transmitter which is modulated with frequencies above 4000 cycles is quite wide, it is desirable to limit the response of the speech equipment. The result is less interference to adjacent stations."

THE Astatic CORPORATION
ASTATIC
CONNEAUT, OHIO
IN CANADA: CANADIAN ASTATIC LTD. TORONTO, ONTARIO

Astatic Crystal Devices Manufactured under Brush Development Co. patents.

(*Continued from page 92*)

meetings — the last two were at the homes of OHK and EXP. RQK sends swell monthly reports. Why don't you? Your SCM is usually on watch on 3745 kc. but can QSY. There is some interest in organizing a state-wide emergency net. MLB, our SEC, will coöperate. FMW and MPP are AEC. The official ARRL state net frequency is 3555 kc. 9NXF/Ø worked 37 states on 7 Mc. using a 6L6G final running 50 watts input. Traffic: WØTQD 513. Pop.

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — APA, using T-55 final, expects to follow with 250TH or p.p. 810s. KKY and LEP are active on 28 and 114 Mc. EFW is active in Nutmeg, ENY, "C," and "TO" Nets. ZL schedules GI5UR Saturdays on 3.5 Mc. and also has worked K6CGK, ZC1AN, ZD4AB, and ZB2B. FTX schedules 2TB and 2NNK now is WAC with J4AAC and UAØKTU QSOs. KKS and MHF visited JHN and KQY. Club News: MGX reports new officers of NAR Aare: MRP, pres.; MGX, vice-pres.; PEA, secy.; and Blore, treas. PQU is a new ham in Norwalk. NDS is making Field Day preparations. NARL: DXT reports club net meets Sundays on 3585 kc. Classes in code and theory are being organized to supplement code practice transmissions now being given non-licensed members. NHARA: ATH reports code and theory classes directed by AMM are very popular. The club has a new HQ-129X receiver, as has Lohse and NWC. TD is building p.p. 813 final. KAT heads the DX list of the club, followed by MVH and EUG. KQY has a pleasant hour QSO with OZ7BO on 14 Mc. using break-in at both ends. MVH completed VFO and exciter. NWC is on 14 Mc. with p.p. 812s. FMV has club rig on 3.5, 7, 14, and 28 Mc. using p.p. 812s. BARA: FC reports the club moved into new quarters at Round Hill, Easton. KAB has new transmitter on 28 Mc. LGN and GRU have new rotors for their beams. KUH has pair of syncro motors. FC is donating a year's *QST* subscription to the club member scoring the most points in the DX Contest. SARC: Joe Dietz reports at a church meeting OGQ, ODR, AZP, BRL, KPN, and PLI demonstrated the Red Cross Disaster Network on 144 Mc. OPY, Milford, and OHI, Bridgeport, visited the club. KUO contacted the Byrd Expedition USFA, on 14 Mc. MTC, OPY, and OHI are new club members, bringing the membership to 43. Thirty-six members attended BRAC open house. LLM, 188 Clark St., Milford, is new EC. Traffic: W1UE 360, VB 270, EFW 175, BDI 87, ORP 85, AW 66, JQD 42, KQY 11, FTX 9, ZL 8, BHM 6, APA 4. 73. *Ed.*

MAINE — SCM, G. C. Brown, W1AQL — FQ was in town recently. OAC is getting out with his new Zepp antenna. KKZ is back at Seawall and expects to get on 3.85-Mc. 'phone in Southwest Harbor. FAX, formerly of Boston, now is living in Portland. QH was in Bangor recently. BGG and family left recently to spend a few weeks in Florida. e.c.o. and has weekly schedule with 8UBF. OLQ reports 2HNP now is 1POY and is located in Presque Isle. BMS writes that he is on 3533, 3563, and 7066/7126 kc. with 6L6 pushing an 813 for 150 watts when he isn't pounding brass at WAG. NBK is on 3565 and 28,576 kc. and has schedules with OCU, NDV, MNI, and NSN. At the last meeting of the Eastern Maine Amateur Radio Club, Major Francis J. Brophy, communications officer at the U. of M., gave a very interesting talk on his tour of duty in the Pacific. Your SCM called on TO and BIG, Augusta, and OAC and DAS, Ellsworth, in January. NXX is on all bands with an e.c.o. and has weekly schedule with 8UBF. OLQ reports traffic with POY. EZR sends in the following: HZO and KFR are operating Fortin's Radio Service; AFT and AMR are on 3.85-Mc. 'phone and are in the Sea Gull Net; KYS is rebuilding; INW is on 14 Mc.; CES has moved to Searsport; PIX is a new-comer in Auburn; PTL is a new ham in Bingham; EZR called on AFT, CES, INW, and PTL. The gang at Boothbay have formed a club called the Northeastern Radio Club. Traffic: W1BIG 250, GHK 52, OHT 22, OLQ 10, BAD 8, NXX 1. 73. "*GC.*"

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — On Jan. 17th the various heads of all of the activities held a meeting in Boston. Those present were: FVL, KCT, IN, HIL, LMB, KTE, BDU, OUD, and ALP. The Eastern Mass. Emergency Net operates on 3745 kc. AAL is RM for 14- and 28-Mc. c.w. MIT has renewed OO as class 3 and 4. PLQ is new EC for Watertown. OJT now is an OES. The Submarine Signal Amateur Radio Club

(*Continued on page 96*)

NOW you can get Sylvania quality in TRANSMITTING tubes too!

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BEAM POWER TETRODE WITH ELECTRONIC GRAPHITE ANODE

First of Sylvania's new line of transmitting tubes, the 3D24 is a four-electrode amplifier and oscillator with 45 watt anode dissipation. An outstanding development is the electronic graphite anode, which allows high plate dissipation for small area and maintains constant interelectrode relationship and uniform anode characteristics.

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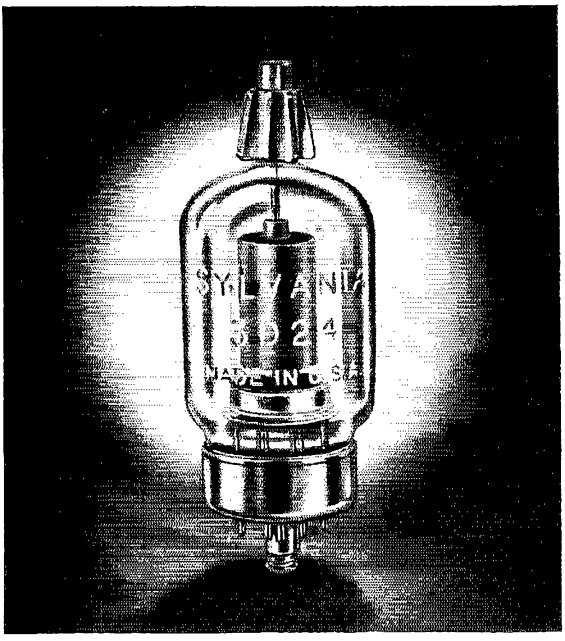

OTHER FEATURES INCLUDE:

1. **Top cap** providing for short path, greater cooling by radiation and convection, resulting in a cooler seal.
2. **Thoriated tungsten filament,** giving high power output per watt of filament power.
3. **Vertical bar grids.** #1 grid supplied with two leads for better high frequency performance. #2 grid provided with heat-reflecting shield for greater dissipation, low grid-plate capacity.
4. **Low interelectrode capacity.** No neutralizing needed with proper circuit arrangement.
5. **Hard glass envelope.** Permits high power for small size.
6. **Lock-In base.** Short leads, no welded or soldered joints.

The 3D24, a product of the Electronics Division of Sylvania Electric, has interesting potentialities in amateur, police, mobile and marine radio.

MECHANICAL SPECIFICATIONS

Type of cooling	Air—radiation and convection
Mounting position	Vertical, base down or up
Length overall	4.3 inches max.
Seated height	3.769 inches
Diameter	1½ inches
Net weight	1.3 ounces

ELECTRICAL CHARACTERISTICS

Filament Voltage	6.3 volts
Filament Current	3.0 amperes
Amplification Factor	50
Direct Interelectrode Capacitances	
Grid-Plate	0.2 $\mu\mu$f max.
Input	6.5 $\mu\mu$f
Output	2.4 $\mu\mu$f
Maximum Class "C" Power Input	180 watts C.C.S.

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MAKERS OF ELECTRONIC DEVICES; RADIO TUBES; CATHODE RAY TUBES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES; ELECTRIC LIGHT BULBS

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officers are: PAY, pres.; BSG, vice-pres.; NHN, secy-treas.; JLI, chief engineer; EQA, activities manager. The club meets on the first Tues. of each month. The Radio Club of Mass. State College, Fort Devens, has call PUO; JOU is trustee. The Framingham Radio Club meets on the 2nd and 4th Wed. at the Civic Club. The Yankee Radio Club now is affiliated with ARRL. The T-9 Club held a meeting at GGV's. LAZ reports a new radio club in New Bedford, the Southeastern Mass. Amateur Radio Assn., with BLX, pres.; PMA, vice-pres.; QX, secy.; ONK, treas. Meetings are held every other Thursday at the Y.M.C.A. LZW has call PVD at his place of work. PSC is new ham in Dorchester. NDA is J9ANG, Okinawa, on 28234 kc., and would like to QSO the gang. Ex-9LAG now is 1PRO. PRZ is on 144 Mc. MSM has 150B. GEO is on 144 Mc. OPV is going on 28-Mc. f.m. ALP has new rig going on 3.5-Mc. c.w. The Parkway Radio Club is rebuilding club rig. KTE worked K6CGK, VO2T, CO7CX, and G8AB on 3.85-Mc. 'phone. OUM has 6L6 on 3.5 Mc. OBN has Meissner on all c.w. bands. HUV says there is a 50-Mc. round-up on Tuesdays at 8 P.M. NKW bought an NC-240D. RCQ has applied for ORS. AKY has been working a lot of hams in Sweden. The Brockton Amateur Radio Club held its tenth anniversary with a banquet and hamfest. HPC is on TLAP. HIL has BC-654 for 420 Mc. BB has new beam for 14 Mc. KBQ has BC-645 and BC-406. AAR, LQQ, OBZ, NVZ, HUP, HRW, KUC, and KWU are on 28 Mc. NVB has new 28-Mc. beam. AYD increased power. JNE has 35 countries on 28 Mc. LMP is on 28 Mc. with portable-mobile rig. PFL has new super blooper on 144 Mc. JXM has T55s on 28 Mc. OHB is back on a.m. trying speech compression on 28 Mc. FED is going on 50 Mc. ECX has p.p. 810s, 500 watts, and five-element beam on 28 Mc. MON, JBP, and MQH built 28-Mc. preselectors. Hams in the Brockton area using crystal or e.c.o. on 144 Mc. are: LWI, OJT, LJT, CKW, HQY, IZY, IPE, and JQA. JHG's XYL is PQY. Ex-1HPC now is RM. FH is new QSL Manager. 5GRF, Weston, has 250-watt job on the air. Ex-KIC now is RL. BJB is on 50 Mc. with narrow-band f.m. CTW is on 50 Mc. The 144-Mc. Net, on 147.96 Mc., meets every Monday at 9 P.M. except the first Monday of the month. COX reports that the Lowell Radio Operators Club is getting going. PLU has 300 watts on 7 Mc. JCE has a BC-522 for 144 Mc. ANJ has new receiver on 3.5 Mc. LSD is working on all-band exciter. Traffic: (Dec.) W1MTQ 14. (Jan.) W1BDU 153, OUD 105, EMG 43, BB 34, LM 23, TY 17, LAZ 14. HPC 13, JDP 13, MDU 11, HA 10, MTQ 9, JCX 8, KTE 7, PKW 5, AAR 4, NXY 4, GDY 3, HWE 3, WI 3, HIL 2, AGX 1, ALP 1, NXJ 1.

WESTERN MASSACHUSETTS — SCM, Prentiss M. Bailey, W1AZW — RM: BVR. SEC: UD. BVR wants more conscientious traffic-handlers for our net. Report into the net on 3760 kc. Mon., Wed. or Fri. at 7 P.M. and Perce will make you welcome. He has been doing some good DX work. VK and KL are some of the juicy ones. HFO has a new HQ-120. BIV was in Tennessee in February. GZL is doing some nice 28-Mc. 'phone work and adds a little traffic work along with DX and rag-chewing. MIM reports Fitchburg's new club is well organized. The Fitchburg Park Dept. Recreation Radio Club officers are: EAX, pres.; MVF, vice-pres.; MIM, secy.-treas. The club is building a transmitter and has purchased an SX-28A. PQO is a new ham in Leominster. PQW is a new ham in Whalom. LXE and LDV are overseas working for Uncle Sam. MVF, EAX, MSV, and MND are out after DX and getting it, too. The 144 Club of Springfield is going strong and had two social get-togethers with HDQ as guest speaker at one. OFZ has new SX-42. JWV is working DX with the HT-9. KFV is operating at WACE. NH is active on 144 Mc. 3JEX/1 is on 3.5-Mc. c.w. FQX is active on 28 Mc. MBT has new 27-Mc. vertical. CJK is using NBFM. UD is using low power on 27 Mc. KZU, LRE, and MKD have built e.c.o.s to dodge QRM. ISN is working good DX with 300 watts on 7-Mc. c.w. and 28-Mc. 'phone. UD is looking for an EC for Worcester County. COI now has that elusive DXCC certificate. AZW won Pittsfield Radio Club WAS Contest, with BKG running a close second. MKR is at R.P.I. LUD and BKG keep busy timing ski races with radio. The Pittsfield Radio Club heard Mr. J. H. Proctor, G.E. plastics research engineer, talk on "High Frequency Dielectrics." *Traffic:* W1BVR 55, MIV 36, NY 12, GZL 9, AZW 7, BIV 3, EOB 3.

NEW HAMPSHIRE — SCM, John H. Stoughton, W1AXL — MUW came to our rescue this month with an

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FB bit of news from Manchester and vicinity. Norma now is well settled in her new home with the OM, JMY, at West Hartford. We are sorry to have Norma leave us, but our loss is Connecticut's gain. She was one of our best c.w. operators and recently received her ORS appointment. The officers elected for the Manchester Radio Club for 1947 are: AWZ, pres.; BT, vice-pres.; JSL, treas.; AUY, secy. The club will operate on nearly all bands. Code classes are held twice a week. NAZ, MLW, and an SWL from Nashua were recent visitors at a meeting. GDE is back in Manchester after being a K6 for some time. AWZ worked England on 3.85-Mc. 'phone. AXI, of Exeter, went him one better by working California on 3.85-Mc. 'phone with a Mark II with only 6 watts output! MIF is chief engineer at WKBR. HFO's XYL presented him with a new HQ-129 for Christmas. NXU is overseas as a government radio operator. OPL is handling a lot of traffic on 3.5 Mc. How about a traffic report, Bob? OCV is a new ham in Manchester. 30. #4.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — VE2II sent a copy of the M.A.R.C. bulletin. PRA officers are LYE, pres.; MIJ, secy.; AIE, treas. BTV and KYK are ORS and LWA is RM. Traffic reports may be forwarded in message form to LWA over R. I. Net. Active members of this net on 3540 kc. are BTV, DWO, QR, INU, JDX, NJY, KYK, and OJW. Stations in Westerly, East Greenwich, Pawtucket, and Woonsocket are needed. MQF has a BC-610 on the air. MJL is constructing an 813 band-switching job. CJH took part in ARRL QSO Party. BFB has 14-Mc. array for DX Contest. INU and QR are members of Trunk Line C. A new net for members of the PRA is being formed and 3600 kc. crystals have been ordered. DWO forwards a schematic of the oscillator section of new e.c.o. using 6AK5 using inductive (tickler) feedback instead of tapped grid coil, putting cathode at ground. KPR now is OD. MRV, 4322 Davenport St., N.W., Washington, D. C., is on 7-Mc. c.w. BBN is DXing on 14 Mc. NJY has QSOed 14 countries with 45 watts on 7 Mc. JFF and LPO have superhets on 144 Mc. Traffic: W1LWA 142, INU 77, KYK 43, DWO 25, BTV 9, HRC 5, OJW 4, NJY 3, AJQ 2.

VERMONT — SCM, Gerald Benedict, W1NDL — PTB is new ham on 28-Mc. 'phone. GAN has old call, AC, back and is on 3.85 Mc. MMN is on 28 and 3.85 Mc. His XYL, OAK, is on 7-Mc. c.w. and his brother, KRV, is on 14-Mc. c.w. KRV made 101 foreign contacts in 36 countries and made WAC twice from Dec. 16, 1946, to Feb. 1, 1947. EKU has schedule on 28-Mc. ground wave beginning at 7:30 P.M. with AAJ, MMN, MCQ, MMV, LTW, and NDL, and would like others to listen for them. EKU has new three-element beam. NLO is building 25-watt rig for 27, 28, 50, and 144 Mc. LWN, LVP, MZO, OAB, OHD, PCF, PDR, and PIT are attending U. V. M. MFL is on 14-Mc. 'phone. The Chittenden County Emergency Net meets every Sunday at 9 A.M. on 3543 kc. BARC meets Mondays at 7:30 P.M. at NLO shack. GKA is Vermont outlet for Trunk Line C. MEP is first Vermont OES. Traffic: W1GKA 23, FSV 9, PAL 2, EKU 2. 73. *Jerry.*

NORTHWESTERN DIVISION

ALASKA — SCM, August G. Hiebert, K7CBF — CF, an ORS, claims new traffic efficiency. He delivered a message Jan. 31st in Fairbanks that was filed Feb. 1st in New York. (AST is 5 hours earlier than EST.) He suggests giving Father Time extra delivery credit! BD reports QRN from Northern Lights, but DX is exceptionally good in late evenings. W7ISD/KL7 is active on 14-Mc. c.w. CC visited in Fairbanks en route from Moses Point to new CAA appointment at Galena where he will be on 7 Mc. W2SLW/KL7 operates Armed Forces station WXLB, Adak Island. He and BP, who works in Adak Ionosphere station, are hoping to beat new 50-Mc. DX record. Would be easier if Williwaws didn't blow down their beam? It's back up now for the 7th time. GV has a VFO and 100 watts on 3.5 Mc. New Alaskan appointments: BD, ORS, and W2SLW/KL7, OES. Traffic: W2SLW/KL7 27, KL7CF 11, BD 10, GV 5.

IDAHO — SCM, Alan K. Ross, W7IWU — Reports will be listed by towns this month. Kuna: EMT is new ORS. Firth: BAA, new ORS, watches the Gem Net. Boise: JMH relieves at KLIX for three weeks. Twinfalls: KEK sends in nice letter to report he is back on c.w. with beginner's rig per July *QST*. KRK and KFJ are on 7-Mc. c.w. from the same QTH but with different rigs. HKJ bought two police transmitters for conversion to 29-Mc. 'phone. Filer: IPO is on 29 Mc. with an 829-B rig. Boise: FOF, JUR, and IWU

(Continued on page 100)

Why DX is EASY with TEMCO TRANSMITTERS

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TEMCO TRANSMITTERS are top notch DX performers and here are the important reasons why. Every amateur knows that power *input* does not govern the DX capabilities of a transmitter . . . power *output is the determining factor.* That's why Temco stresses engineering for higher circuit efficiency — to assure maximum power output for every power input rating — *and every Temco is conservatively rated.*

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are on 144 Mc. APK is on 29 and 4 Mc. Nampa: IYG has new SX-42 and VHF152. JPV finally hooked VE8AO. Other 29-Mc. DX: W6VIB/C7 China, J9AAI, and W3NE/MM, off coast of Texas. Caldwell: EYR has rig ready but awaits a receiver. North Western SCMs are planning a round table at 6 P.M. MST on 4 Mc. every LO Nite. All reports appreciated. Please send them in. Traffic: W7IWU 14, EMT 10.

MONTANA — SCM, Albert Beck, W7EQM — Section EC: BWH. JUN's new rig puts out 225 watts on 7.2 and 3.9 Mc. IWC and HMT are working on new gear. BLU is rebuilding. GBI is in Polson. BHP holds morning schedules with gang in Oregon using emergency equipment. CT, OO, built multibrator and has frequency-meter calibrated every 5 kc.! ATN and JJT transferred from Everett with CAA in Helena. EWR is in Great Falls. HIZ, IXC, JKR, JOT, and IVY are on 28 Mc. BIS is on 3.9 and 14 Mc. FYN is in Panama. JRD and HQT are new in Great Falls. JHR flies and hams. JGG is on 3.5 Mc. BOG is active after ten years absence. BXL is on 28 and 3.9 Mc. DSS is busy as CPA. Bozeman reports new officers of MSC Radio Club are HSK, pres.; IXL, vice-pres.; JQY, secy-treas. AFY, an old-timer is ED again. CJN is on 51 Mc. Call CQ 144 Mc. in Butte and see what happens. EQM is building new 28-Mc. rig. KHC and KNH are new Havre hams. JEQ and GCC are on 28 Mc. GSV is back in Big Sandy. FGZ attended radio club meeting in Spokane. Thanks for all the FB reports, gang.

OREGON — SCM, Raleigh A. Munkres, W7HAZ — Congratulations to the Portland Amateur Radio Club on its affiliation with ARRL! The PARC is all set to go on future contests and get-togethers. KJE, Milwaukie, is on the air and really working out with 12 watts! HBO reports an active bunch at LaGrande: CHN is on 7 Mc., IMM and IGI are on 28 Mc. and change beams as often as their socks, JOD is building a beam, ARZ lives in a swimming pool! SCM gave exam to old-time ham, Tom Hughes, of Starkey. Tom has RME-69 and tank rig ready to go on 7 and 3.5 Mc. AKC made prolonged visit to his old stamping grounds, Salem. After second get-together at HAZ/JFM shack, the Baker hams organized a club. Charter members are AOL, pres., JFM, secy-treas., GVX, AMI, and HAZ. JLU, in the Army, was made an honorary charter member. AOL had a bad eye accident but will regain sight. IAN is very busy with new broadcast station KSRV at Ontario. IM, Lakeview, is putting out extremely strong 3.85-Mc. signal with about five watts! FXW is going into the lumber business. FBX reports the following active in Forest Grove: BFO, HDY, FBX, and MA. Several traffic nets advise they need outlets in Oregon. If interested, please contact the SCM. More reports, more news. What say, gang? 73. *Raleigh.*

PACIFIC DIVISION

HAWAII — SCM, John F. Souza, jr., KH6EL — DD has finally worked J9AAK, Okinawa, on 50 Mc. for a record haul. Bill used 500 watts to p.p. Vt-127As, S-36 converter into Super-Pro and 8JK twin-three rotary 45 ft. up. He also worked W6VDG/KW6 for five successive days with VDG confirming on 28 Mc. W7ACS/KH6 also worked J9AAK on 50 Mc. with AR and DW listening in. DW is looking for DX on 50 Mc. DR has FB home-built e.c.o. K6CGK is knocking DX with 5 watts to e.c.o. and is saddened to think of losing CGK for new KH6 call. The Maui gang is building 50-Mc. crystal-controlled net. DK has bandswitching exciter with par. HK24. FS, on Molokai, is using BC-610. EM is accumulating parts for kw. f.m. IL is using three-element beam on 28 Mc. atop Quonset hut. K6SDM has two-element beam for 28 Mc. II, IH, and JE are brand-new hams. 73 and Aloha. *Johnny.*

NEVADA — SCM, N. Arthur Sowle, W7CX — Asst. SCM, Carroll Short, jr., W7BVZ. RM: PST. SEC: JU. ECs: TJY, OPP, KEV, OBS: JUO. OES: TJI. JYS has VT-127A final with Sonar n.f.m. on 28 Mc. JNZ is on 28 Mc. with folded dipole in the attic which works plenty DX. TJY is handling lots of traffic via Mission Trail Net. Those attending Sagebrush Net meeting were 6AGW, 6WBZ, 6IT, 6GJO, PWE, RXG, GC, and CX. OPP's Russian Tank set is heard on 7 and 3.5 Mc. SXD is on with exciter while wiring his pair of 35Ts final. PGD works regular schedules on 7 and 3.5 Mc. JUO is working DX on 14-Mc. 'phone with a pair of 450Ts! JU is on 14, 7, and 3.5 Mc. with 700 watts. JLN has a pair of 807s for final and same for modulator. PWE and HHY are installing sheriff's radio systems. The Nevada Amateur Radio Assn. set up a new code machine and a BC-625A. Traffic: W7TJY 60, CX 17. 73. *Art.*

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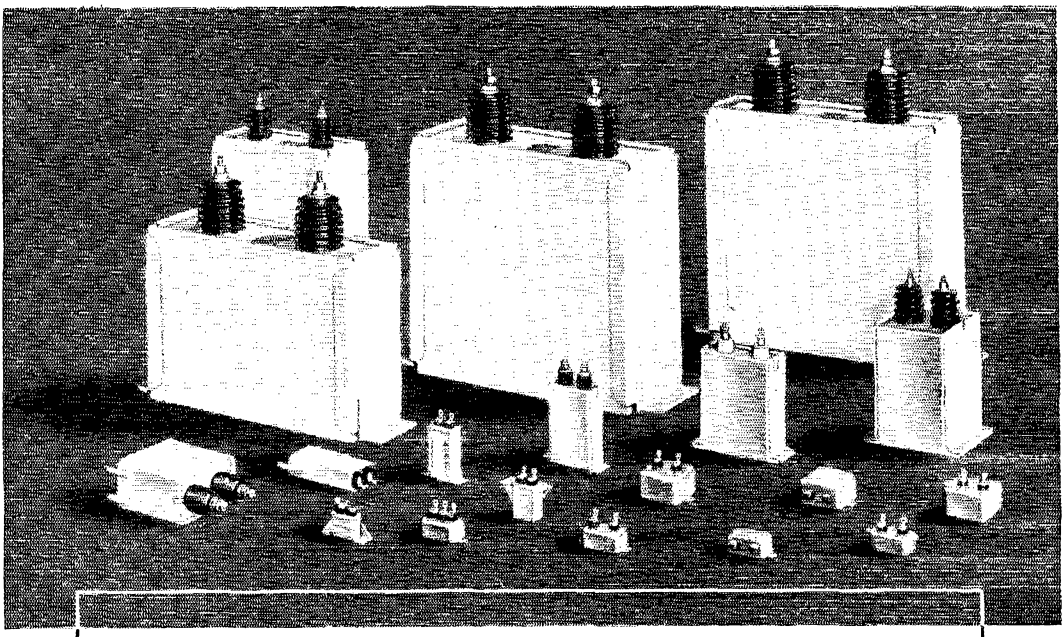
SANTA CLARA VALLEY — SCM, Roy E. Pinkham, W6BPT — Assistant SCM, Geoffrey Almy, TBK. RM: CIS. PAM: QLP. HJP is operating 144 Mc. from Mt. Tamalpais. CIS is keeping schedule with XU6GRL on 7 Mc. The CCN is resuming operation. Anyone interested in joining the net should contact CIS, our RM. TBG took unto himself an XYL. He worked on 7 Mc. SYW succeeded in working the KH6. Ed has a hard time getting over the hills to the west. ZZ now has a pair of #8s feeding a.c. to his BC-610. Miles still is DX-minded, having worked 51 countries. He wants to know if there is a half-DXCC. HC is on the air at last operating on 3512 kc. Harry has been appointed OBS so the gang can get the news on that frequency on Tues., Thurs., and Sat. at 1930 PST. Ex-9FAV has sold his trailer to FCC and took YPM in trade. LXA contracted a bad cold and was confined to his bed shortly after returning from the hospital but is much improved. LCF is making ready for the DX Contest. THV is working 7 Mc. using a folded dipole for antenna. YNX is new ham located at Mt. View. YQN is new call heard from Santa Clara. AOD is QRL building a new kw. rig. BPT is using a new converter, VHF-152, and spends much time listening on 50 and 144 Mc. KG is working with n.f.m. WUI has his new 14- and 28-Mc. beam in use and is knocking off the DX in FB style. OKQ has installed a dual operating position. Traffic: W6ZZ 18, CIS 14, TBK 3, HC 2, SYW 2. 73. *Pinky.*

EAST BAY — SCM, Horace R. Greer, W6TI — Asst. SCM, C. P. Henry, 6EJA. SEC: OBJ. RM: ZM. OO: ITH. EC: QDE. Asst. EC u.h.f.: OJU. On Jan. 17th the Mt. Diablo Radio Club was formed with CX as president and LGW as vice-president. The club meets the third Friday of each month at the Walnut Creek Grammar School. Officers of the SARO are CBX, pres.; EHS, vice-pres.; DDO, secy.; QWX, treas. MUC, comm.-mgr.; BS, news editor. EY is on 3.5-Mc. c.w. The Mission Trail Net on 3850 kc. celebrated its anniversary on Jan. 20th. Members of the Northern California DX Club, Inc., are all set for the c.w. and 'phone ARRL DX Contest. One week end of the 'phone contest ITH will sign TI9ITH from Cocos Island. MVQ and LMZ are new members of this organization. CRF reports that the new Mare Island Amateur Radio Club received the call YTL, and that the Vallejo Club is now well organized. WGM is building new p.p. 35T 28-Mc. job. WVK is going strong on 14-Mc. c.w. On Feb. 1st near midnight TI knocked over some good DX on 7-Mc. c.w. by working in order G2PL, G5JI, and G5DQ. CDA is running 300 watts on narrow-band f.m. with Sonar exciter. IKQ has new 1-kw. 'phone rig going on 28 and 14 Mc. QLH lost his beam and is rebuilding same. DUB has new 60-ft. steel tower up with three-element beam for 14 Mc. QDE reports that he is working on his 28-14-Mc. beam and is planning a six-element job for 144 Mc. The Oakland Radio Club, OT, moved to its new meeting place on Feb. 6th. They meet at the Oakland Chapter of the Red Cross, 9th and Fallon Sts., the first and third Thurs. of each month. EJA is working the usual DX on 14-Mc. c.w. NRM finished his new oscilloscope. QXN leads the section in traffic each month. LMZ hooked OX1Z on 14-Mc. c.w. for his best DX of the month. RMM completed a necessary contact with a ZS5 to land much sought-after WAC. UZX has some new beam antennas up for the DX Contest. ZM reports that the Coast Guard Net will soon be in operation. BUY is trying to work those hard-to-get DX stations on 14-Mc. c.w. AED is laying plans for new 28-14-Mc. beam. UPV is getting to be a first-class foreman on new beam installations. KEK has 750 watts p.p. 100Ts on 14 Mc. TYF is new ORS. Traffic: W6QXN 236, CRF 18, TI 13, QDE 12, KEK 5, NRM 5, EJA 4, UZX 4, RMM 3, LMZ 2. 73 and luck. "*TI.*"

SAN FRANCISCO — SCM, Sam C. Van Liew, W6NL — Phone JU 7-6457. Asst. SCM, Joseph Horvath, 6GPB. RM: RBQ. ECs: SRT, KNZ, DOT, KZP, LLJ, UHN, VGG, QFX. OOs: NJW, WB. OBS: FVK, KNH, DJI, OZC, BYS. ORS: RFF, BIP, ATY, RBQ, NL. OPS: OZC, NYQ, STY. HJP has his 250-watt rig on the air from the top of Mt. Tamalpais, where he is stationed at present. He was active in the last ARRL Party. ERS has been active on 14 Mc. Vern has worked considerable DX and also enjoys his chess game with G6JF. EYY is active on 28-Mc. 'phone and c.w. He reports the following: recent wind storm has been tough on beam antennas. FGP is rebuilding, putting in de luxe beam installation, motor-driven, Selsyn indicators and all. YEI, ex-4FQY, is having trouble getting his 'phone rig perking, but expects to be on with his kw. soon. WQO

(Continued on page 104)

HERE'S A *New Line* OF D-C CAPACITORS



BETTER IN *"Civvies"* FOR HAVING WON THEIR SERVICE STRIPES

It's an open secret among the trade that G-E Pyranol capacitors, which enjoyed such an enviable reputation before the war, are now better than ever.

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This new listing makes available a wider range of sizes, ratings, and mounting arrangements with characteristics for operation over wider temperature ranges (−55° C to +85° C), at altitudes up to 7500 ft.

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Organization.....
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(Continued from page 103)

is working out fine with his small rig and new beam antenna on 28-Mc. 'phone, having handled traffic to the East Coast and the Orient. YDG built the "Longfellow" from July *QST*. He operates on 7 Mc. and is well pleased with results. RFF has been active on 14-Mc. c.w. except when trying out cathode modulation on 28-Mc. 'phone. OZC has been trying out narrow-band f.m. with fine results. He had 100 per cent contact with C4AJ. RBQ has been active on 28, 14, 7, and 3.5 Mc. The RM informs us that the CCN and SFN Nets are about ready to go. Anyone interested in net work please contact RBQ. PHF is on 28-Mc. 'phone and c.w. with big rig. VQB and WCD have new mobile rigs on 420 Mc. using p.p. C40 modulated oscillator and are all set to try for record again. SRT now has new 28-Mc. 'phone portable rig and is working out fine. The San Francisco Radio Club monthly meeting in January brought out a good number who were favored with a very fine talk by Robert Helliwell from the Stanford Electrical Dept. on "The Ionosphere and Its Effect on High-Frequency DX." Mr. Helliwell has charge of the Research Dept. on Ionosphere Data. The SFNS Amateur Radio Club is growing rapidly and has moved into new club rooms at 953 De Haro Street. Our new director, RBQ, and WB visited the new Vallejo Radio Club Feb. 7th and report a fine club which soon will become affiliated. Thanks for reports. Traffic: W6RBQ 42, EYY 16, LV 7, OZC 4, RFF 4, WQO 4, RST 2, ERS 1. *Sam.*

SACRAMENTO VALLEY — SCM, John R. Kinney, W6MGC — OBS: AF, GZY. OO: OJW. RM: REB. OES: PIV. ORS: HIR, PIV, REB. New officers of the SARC, Inc. are: GZY, pres.; MIW, vice-pres.; MBY, secy.; EJC, treas.; RMP, sgt. of arms. REB gives dope on new 14-Mc. 900-watt rig with line-up RK-34 to 829B to p.p. 813s. AF reports that OXE is a radio service man, SLV is city electrical inspector, HDE is a locomotive engineer, MXE is road foreman of engines for W.P.R.R., OEX is on 7 Mc., BLB is on 3.5-Mc. 'phone, HDE will have 28-Mc. rig at Portola, and SLS is fireman on W.P. locomotive. ZF has acquired a frequency standard to go with his new T-350-XM 1-kw. transmitter and an HRO receiver. He also has a portable 250-watt c.w. rig which uses a 257 and he promises to run a series of calibrated transmissions on 3.5–4 Mc., 7–7.3 Mc. so that anyone interested can calibrate equipment. POB is active on 28- and 14-Mc. 'phone. PIV enjoyed CD Party on 3.5 Mc. and is testing gear on 50 Mc. and has had one QSO on 235 Mc. DBP has new 50-foot telephone pole for Zepp antenna. GUV has a 6L6 into a 807 and plans to add a 35T with an output of 150 watts. WTL worked VE6QS, VE6OS, and VE7CE on 3.5 Mc. with 30 watts input with antenna ten feet high. OJW rebuilt his final for 35Ts with 240 watts and scored 5376 points in ARRL Party and 19,748 points in CD Contest. Traffic: (Dec.) W6REB 256. (Jan.) W6REB 216, PIV 12, WTL 7, OJW 6, ZF 6. 73. *Jack.*

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Wortman, W4CYB — Thanks to GMM and DCW for the items sent in. NY is burning up 28 Mc. with a pair of 4-125s. GIV is active in Chapel Hill. BJV is a nightly addict to 3.85 and 14 Mc. GMM won't leave 7 Mc. HAK likes 28-Mc. 'phone. US has fired a new rig up on 28 and 14 Mc. GJX gets fine results with a single 812 on 14-Mc. 'phone and c.w., 125 watts to an Amphenol folded dipole. FDV is chewing the fat on 7-Mc. c.w. and says the Floating Club meeting is set for the third Sunday in May at Raleigh. LBV states that he is a new ham in Raleigh. WMI and HVV are running tests on 144 Mc. in addition to regular Sunday morning 50-Mc. schedules. Anyone interested in 50 Mc.? Contact HVV or WMI in Raleigh. KFM reports the reorganization of the Asheville Club. The Key and Mike Club is percolating in Winston. BCS is doing FB with new beam on 28 Mc. BYA works 28, 3.85, and 7 Mc. DGV is active on 'phone. IFS is on 7 Mc. and IZR is building between 28-Mc. contacts. JRZ is building new rig. KJS is on narrow-band f.m. NI works 28- and 3.85-Mc. 'phone. It is understood that there is a nightly rag-chew on 28 Mc. in Winston which can't get into high gear without everyone having a bag of peanuts — hence the name is "The Peanut League." New officers of Greensboro Club: AGD, pres.; HEH, vice-pres.; KYR, secy.; GG, treas.; and BML, member of board. DSO says he has an FB rig on 28 Mc., but it won't work. The newly-organized Fayetteville/Ft. Bragg Radio Club held a hamfest on Mar. 16th.

SOUTH CAROLINA — SCM, Ted Ferguson, W4BQE/

(Continued on page 106)

How often have you wished for a meter you could see *clearly*—the whole scale of it, wherever you were using it—in the dark, under low lights, or even in the kind of glare that causes reflections on the glass—a really illuminated meter for your transmitter? Well, here it is—the result of a new Simpson patented method of illumination.

On these new Simpson Illuminated Meters (A.C. and D.C. voltmeters; D.C. milliammeters; and Radio Frequency ammeters), every fraction of the dial face is flooded with a full and even radiance—there isn't a spot of shadow.

An ingeniously shaped Lucite cone carries the light from a recessed bulb in the back of the instrument through the front edge that surrounds the entire dial. This makes possible the use of the standard Simpson metal dial. Unlike translucent dials, it cannot fade or discolor so that reading becomes difficult. It cannot warp or buckle, causing the pointer to stick, or distorting readings. The bulb recess is neoprene sealed.

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Ranges: 0-15, 150, 750, 3000 A.C. volts; 0-15, 75, 300, 750, 3000 D.C. volts; 0-15, 75, 300, 750 D.C. milliamperes; 0-3000 ohms (center scale 30). 0-300,000 ohms (center scale 3000); 1000 ohms per volt A.C. and D.C.

(*Continued from page 104*)

ANG — Thanks to CZA for dope on Charleston Club. New officers are BIZ, pres.; CZA, secy.-treas., and BAT, publicity. AZT is occupied with the 3.85-Mc. S.C. 'phone club. FNT (J9AGT) reports a nice lot of East Coast stations. BSS lays claim to having made the first contact between U. S. A. and Germany, having worked D4ACH Jan. 17, 1946. FNS is running the 3.5-Mc. c.w. S.C. Net and worked England on 3.5 Mc. with ten watts. GTD has a new Meissner 150-B transmitter. GFP, HSM, and GTW are on 28-Mc. 'phone. FNS reports on the Greenville Club. Officers are KZ, pres.; ERF, vice-pres.; FNS, secy.; and KEC, treas. The SCM appreciated the club's vote of confidence. GBY has a brand-new YL. The following Greenville hams are on 28-Mc. 'phone: AIS, CPB, HEY, KMK, KEC, KED, IMW, ETC, IRU, GBY, HCZ, ILQ, and ILY. EGH is on 14-Mc. c.w. and is building a modulator for his rig. EMT works 28- and 14-Mc. c.w. WA and KGX report new jr. operators. BZX has a new vertical. CXO is kept busy with the P.D. of Rock Hill. DPN has a new final with 813s. Traffic: W4CZA 40, FNS 25, AZT 23. 73. *Ted.*

VIRGINIA — SCM, Walter R. Bullington, W4JHK — JFV has a new HQ-129X receiver and a pair of 812s on 28 Mc. KAK has a kw. on all bands and a new high-power 144-Mc. rig. JXE has 150 watts on 7 Mc. IUW has an 807 on 3.85-Mc. 'phone and is using a vertical antenna. JHI has an 803 on 7 Mc. and a 6L6 on 28 Mc. KQB has an 807 on 7 Mc. BTL is using a pair of 8005s on 3.85-Mc. 'phone. JDT is working 3.85-, 14-, and 28-Mc. 'phone with 300 watts to a pair of 8005s and a BC-342 receiver. KQC has an 807 on 7 Mc. and is building a pair of 813s for 28 Mc. KHE is on 7, 28, and 144 Mc. JGW has p.p. 6L6s on 7 Mc. IWF is using a 203A on 7 Mc. and can't get used to his new call. ISA is on 7 Mc. and is building a rig with p.p. 813s for 28 Mc. JQK has left the section. EPK has a new HQ-129X and is on 3.85-Mc. 'phone. JGO is on 7 Mc. with an 803 and RME-45 receiver. CZK has new BC-211 frequency-meter. He also is on 14-Mc. 'phone. JXQ has a pair of 813s on 7- and 14-Mc. c.w.; he also has a new SX-24 receiver. CA has an 807 on 28- and 7-Mc. c.w. FSP is on 14-Mc. 'phone with a kw. and RME-45 receiver. He is doing some 9000-Mc. work with JHI. BUR is on 7 Mc. with an 807 and RME-69 receiver. JSF has a pair of 813s on 14- and 28-Mc. 'phone. OT, a new-comer from Florida, has an 807 on 7-Mc. c.w. KFC and EOP battled it out in the CD Contest. WO is new Official Observer. IML has 350 watts to an 813 on 3.5, 7, and 14 Mc. and a BC-348 receiver. CLD has a new 28- and 56-Mc. converter and says it's red hot. He schedules AJA daily. V.P.I. has new station call 4KPV. The club is going again with 1MJH, 4IYR, 4INJ, 4JNC, 4JOS, 8VEN, 8VTN, and 2RCX. EOP is DXing on 14 Mc. with a new dipole. KYD is on 7 Mc. with a 6L6 and has worked Norway and Hawaii. Traffic: W4KFC 74, EOP 18. 73. *Monk.*

WEST VIRGINIA — SCM, Donald B. Morris, W8JM — The Charleston (KVARA) Radio Club is sponsoring a Club Contest for the best 50- and 144-Mc. rigs, with prizes for the winners. VAN has new 813 in final for 28 and 14 Mc. with 450 watts. DFC has increased power for traffic work in the W. Va. 3770 Net. KWL and VAB have mobile rigs running on 28 Mc. 3QG, now 8QG, and YGL are working on 144 Mc. rigs and TDJ is looking for 50-Mc. contacts from Morgantown. YAI has new BC-348 and 807 rig ready for 3.5 Mc. CXU is new OBS, but has trouble keeping his antenna up. VGN and USD have new receivers. MJJ has new beam for 28-Mc. work. YBI sends in swell report for his area reporting lots of activity. FMU has new VFO and exciter for all-band operation. The Morgantown gang presented the MARA with a hand-carved gavel. OXO, DFC, GBF, and CSF increased their traffic by consistent net operation. 3GEG attended MARA Club meeting. ZGX, new amateur in Fairmont, is operating at the b.c. station. GBF schedules 6VAQ, formerly of Fairmont. ESQ has new rig with 813 on 14-Mc. 'phone. Traffic: W8GBF 49, JM 31, OXO 30, DFC 22, CSF 6, FMU 5, VAN 1. 73. *Don.*

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Glen Bond, WØQYT — ACA is building a beam for 144 Mc. using an 829B in the final. The San Isabelle Amateur Radio Assn. has a new permanent home in the CAA Building at Pueblo Municipal Airport. Officials are coöperating in every way possible to make this project a success. LZY, in Colorado Springs, is on 7 Mc. with 23 watts to a 616 using an RME-45 receiver. KVD reports

(*Continued on page 108*)

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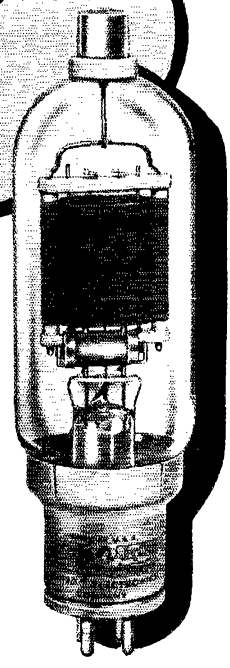

POWER like this is only one of the reasons why tube users are getting more and more enthusiastic about graphite anode transmitting tubes. This and other equally remarkable advantages are constantly winning new friends and convincing old ones for United Electronics Company. Using Speer Graphite Anodes, United puts these big advantages in every tube:

LONGER LIFE—Graphite anode tubes last longer than metallic anode tubes even under continued severe usage, because they operate at lower temperatures. Cooler operation means less heating of associated tube parts—reduced grid emission.

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LOW FREQUENCY-DRIFT—Cool-operating, non-warping graphite anodes maintain their characteristics—assure stability of tube inter-electrode capacitances—inhibit warping in other tube elements. The result: high stability of frequency.

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(Continued from page 106)

his Colorado Springs emergency net is all ready to go and drills will start soon. JVJ, in Pueblo, is installing a 66′ vertical radiator for 14 Mc. WAP, in Loveland, has a reliable schedule with 8URM on 7270 kc. and wants regular schedule with someone on 28 and 7 Mc. for QSP to Pacific Islands. BZV, in Akron, Colo., is on 14-Mc. 'phone and has 90 watts to 814 and a folded dipole. DX is J2AAT, CO8MP, VO2X, KL7AW, W3GIZ, KL7, KL7EU, and 39 states and Mexico and Canada. UZD is on with a 150B rig in Akron. HHM in Paonia is on 50 Mc. with ½-kw. and will have a kw. on 7 Mc. very soon. He will operate from the top of the Continental Divide this summer and would like a 50-Mc. schedule with Denver now. On Monday nights you can find 28-Mc. mobile rigs parked on the mountains around Denver for the Electron Club Emergency Net drill. Results are very good. DD, in Estes Park, is working the boys in Denver on 28 Mc. ground wave at night! All amateurs should send a station activity report to the SCM on the 1st of each month. If you need cards let me know. Traffic: W0WAP 57, BZV 11, IQZ 3. 73. *Glen.*

UTAH-WYOMING — SCM, Victor Drabble, W7LLH — DTB needs a few more parts to build his 50-Mc. rig. DLR has a 19-tube receiver 144 and 220 Mc. GBB is busy on the Pioneer and FARM Nets. KIY worked 41 states and 5 VE districts with 5 watts in 5 weeks on the 3.5-Mc. c.w. band. BED will change his 40-watt job for a new 500-watt job with a pair of 813s in p.p. The following was submitted by HDS: 3LTJ/7 is building a 28-Mc. rotary using pitch control for electric B-29 propellers as the drive units. OWZ is on 7 Mc. CEO will have a pair of 810s for 700 watts into a half-wave doublet on 3.85-Mc. 'phone. KGD is one of our u.h.f. boys. KIM is active on 14-Mc. c.w. with 28 watts to an 807. JET has his 813 all ready to fire up on all bands. JHE uses a pair of 807s on the 14-Mc. c.w. band. EVH is now an OPS. ICZ has a BC-348P and an ART/13 perking on 28-Mc. 2PDZ/7 is on 14-Mc. 'phone with 300 watts to a pair of 813s. EUZ has 125 watts on all bands with a 6F6 e.c.o., 6AG7 doubler, 6F6 buffer-doubler, and 829 final. Additional calls on the Wyoming 3760-kc. Net are: TJ, HRM, and AEC. New appointments: BED as ORS. Traffic: W7FST 742, KIY 65, DTB 35, GBB 24, DLR 8.

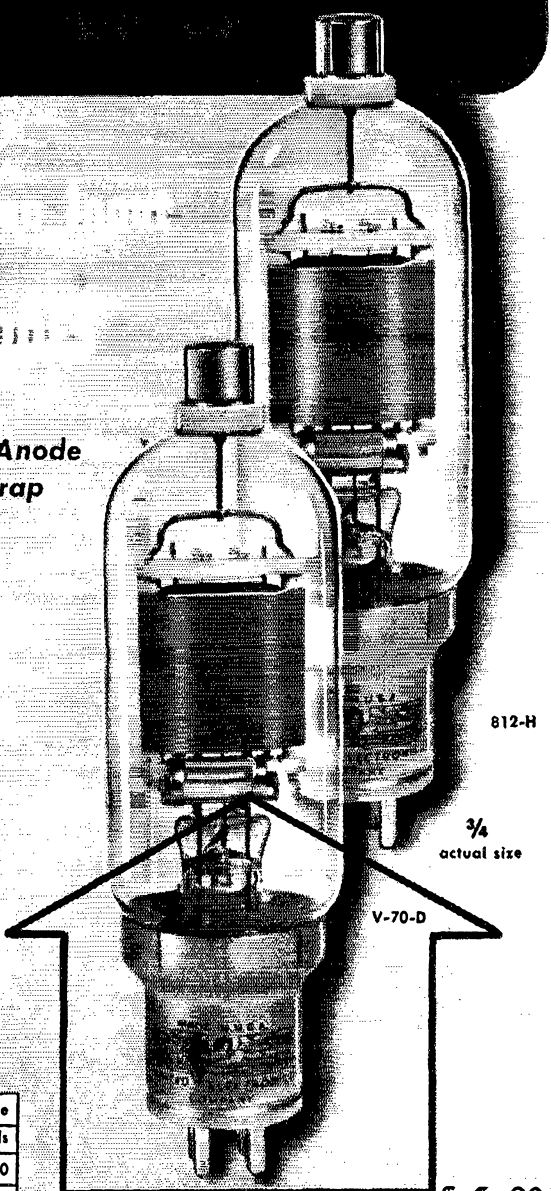
SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — The Birmingham Amateur Radio Club is again active. DEO is pres.; EBZ, vice-pres.; GMH, rec. secy.; BIT, treas.; and FIO, corr. secy. Meetings are held the first and third Thursdays of the month. Regular meetings are held at the National Guard Armory where the club will be allowed to use the National Guard equipment. Code practice will be sent on 28 Mc. each night. ECK worked California with 15-watt portable-mobile on 28 Mc. CYV received S9 report for working a G station with 6 watts. GXC worked ZB2AC on 28300 kc. GMH got caught by ZS2CI for a QSO on 7 Mc. 5FPZ/4 worked VQ3TOM on 28 Mc. DEO has been working Germany regularly on 28 Mc. GJW bought a code machine and has his XYL interested. BCU is still a regular on 3.85-Mc. 'phone. IRX is working on new rig with pair 100THs in the final. GVP has a pair 810s on 14 Mc. and is keeping schedule with HZ1AB. GKM is on 7 Mc. with 20 watts and is building 28-Mc. 'phone rig. GYD is on 14 and 7 Mc. with a new 300-watt rig and getting his share of DX. BA is building a new rig with 100THs final 24Gs buffer 805 modulator. GBP is on 3.85 Mc. and 7 Mc. c.w. with 8 watts.

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — The main topic of the day is the hamfest sponsored by the West Palm Beach Club, to be held June 15th. ACZ will give you a hand in getting lined up for this. ACZ now is SEC of this section. FWZ is his able assistant and is lining up the c.w. net for the section with the able assistance of JU. BNR is doing a good job of organizing the Tampa gang and it looks like we may have a nice c.w. crew, with FWZ in JAX, BNR in Tampa, and BYF in Miami. These spark plugs are out for members of their respective nets, so if any of you fellows are interested just let one of them or the SCM know. The Gator Net is in the making and some of you c.w. hounds ought to get in the Gator Net and do some brass-pounding. BXL is ORS and is active in the Gator Net. The Jacksonville Amateur Radio Society is active and represents some 150 Jax hams. JU will be on with his new set-up. Looks like DKA made the Century Club. According to ECV he is over the 100 mark on foreigners. The Dade Radio Club is thinking of going on 144 Mc. and also sponsoring a DX con-

(Continued on page 110)

Almost Unbelievable!



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Type	Filament		Max. Plate	Capacitances uuf			Max. input	Max. Plate	
	Volts	Amps	Dissipation	cgp	cgf	cpf	per tube	Volts	Mils
V-70-D	7.5	3.25	85 Watts	4.5	4.5	1.7	300 Watts	1750	200
812-H	6.3	4.0	85 Watts	5.3	5.3	0.8	300 Watts	1750	200

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(Continued from page 108)

test. ASR is back after a trip through Mexico and Texas. 9ZVO/4 is applying for renewal of his Wisconsin OPS and wants to work on 14 Mc. LAP is showing real activity in all the 7- and 14-Mc. c.w. activities. He has held the calls 8DHL, 3GTS/WLMG, and K6JPT, and has been ORS, RM, EC, a member of A-1 Operators' Club and now is a prospective member for the WPB ham club. IYO says the St. Pete ham club has reorganized with HUY, pres.; IYO, vice-pres.; 9LHI, secy.; KLF, treas.; and GA, station trustee. HUY, KTN, and 3NT all have new 29-Mc. arrays. New hams are KQR and JIK. BXL is a newly-appointed ORS. Any of you fellows interested in some good ORS or OPS appointments? Look for LJM on 3600 kc.; he needs a little QSO. Traffic: W4DQW 149, BYF 52, AAR 51, FWZ 13, AYV 11, JAL 9, BXL 5.

WESTERN FLORIDA — SCM, Lt. Comdr. Edward J. Collins, W4MS — JPA is on 28 Mc. with a converted ART-13. JBJ is ironing out his 813. DXZ, HJA, and BCC received Class A tickets. 5KXM now is GPC. KFP has two-element beam. QK is on 28 Mc. JJZ is rebuilding 7-Mc. rig. EQR is building bigger and better 50-Mc. rigs. HIZ has crystal-control on 144 Mc. MS is converting an SCR522 to go with his VHF152. DAO also has a VHF152. KIK has his three-element beam up. EGN schedules Gs. KAS is working on a three-element beam for 14 Mc. KXV has a regular antenna farm but plans additional antennas. DZX is getting high power ready. DXQ is returning to 7 Mc. FHQ keeps 7 Mc. going but is looking at 28 Mc. AXP keeps the Rebel Net moving. ACB has a new tower up. IIW keeps things humming with his mobile rig. BCC is looking at 144 Mc. Traffic: W4AXP 22. 73.

GEORGIA — SCM, Thomas M. Moss, W4HYW — The Cartersville Amateur Radio Society has been formed at Cartersville with GQR, pres.; GEG, treas., and Bob Schindel, secy. Meetings are held on alternate Fridays. The club station, GQK, is being reactivated. The boys at LaGrange have formed the Skyways Amateur Radio Club with KBA, pres., and KVO, secy.-treas. The club will coöperate in emergency work with HYN, EC for Troup. Atlanta Radio Club meetings are held at 8 P.M. the first Thurs. at Specialty Distributing Co. GEG is at Georgia Tech. IPF is in the wholesale business in Atlanta. ISI and JDR are with CAA in Atlanta. BTI is with Atlanta wholesale house. 8SYW now is 4JUF, 2PAF is 4KTG, and 3UO is 4UR. The Cracker Waves Net is on 3535-kc. c.w. GZF is in service business in Atlanta. He is EC for Gwinnett, and holds OBS, OPS and ORS. FII is serviceman in the same shop as GZF. TO has transferred his OBS, OPS, and ORS appointments to this section. BTI is EC for Cobb. VF took the appointment for Floyd and DWE for Stephens. Ultra-high work is being reported from Cartersville, Waycross, Atlanta, Augusta, and Savannah. HD is on at sea. Additions to Cracker Emergency Net are: GDR, GKI, HRR. GMP is with WSB. 9IIQ is on in Atlanta. INI, KOR, and UR are with FCC in Atlanta. Your monthly traffic reports are solicited. Traffic: W4KV 84, HYW 26, GZF 7, MA 5. 73. *Tom.*

WEST INDIES — SCM, E. W. Mayer, KP4KD — AM had the big rig down for refurbishing and used BE rig at AM QTH. No DX was worked but some DX was handled. BE worked four Gs and two OZs with some R9 reports on 28 Mc. 'phone. BK, our OO, and CF were transferred to North Carolina with CAA. BJ had his tonsils out, further delaying return to activity. W4KDQ/KP4 and W4ETE/KP4 are on 14 Mc. c.w. and 28 Mc. 'phone, respectively. W4AAO/KP4 now is KP4DV on 14 Mc. 'phone. AZ is active on 'phone and c.w. with new Temco rig. CC, CA, CG, CP, CV, CO, and KD are active on 7 Mc. c.w. as well as other bands. JA has new 20/10 rotary beam à la Jan. *QST* working FB. He operates at WAPA where BG is chief. Lots of cards at the QSL Manager's but very few envelopes. Traffic: NY4CM 39, KP4KD 13, AM 7. 73. *Es.*

SOUTHWESTERN DIVISION

ARIZONA — SCM, Gladden Elliott, W7MLL — TCQ has a new call, KNY, for Tucson. ROD has a Meck T-60 on at Thatcher. JMJ works the West Coast regularly on 2 watts. RIJ is on 3.5- and 7-Mc. c.w. Gert Pond is KOY. JYZ is Assistant SCM. UPR is new OBS for Tucson and Douglas. New calls: KNO, Devine; KRL, Mitchell, KRC, ex-5HMX; KLZ, Clemente; VOZ, ex-6VOZ. GYK has a new rig with 812s modulated by 811s. LJN is on 3.85-Mc. 'phone. SQN has a new mobile rig. PDA has a new XYL. QWG has turned to cathode modulation. 9UHI is ex-6RIA and is on

(Continued on page 118)

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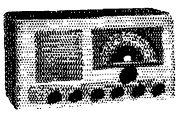

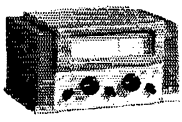

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(Continued from page 110)

28 Mc. in Tucson. KWC is ex-9KWC and has a new 129X. PBD, KAD, and UPR all boast 40-60 towers and four-element beams in Douglas. MDD has two 3.85-Mc. 'phone rigs. BMC is the proud parent of a YL. The "Sidewinders" on 3865 kc. are NRI, OAS, MDD, MWQ, OIF, QWG, JPY, DFE, LYS, SCK, SBN, LJN, and JYZ and they operate from 8–10 A.M. on Sundays. KGT is working mobile. UPY has a new daughter. MLL was high man in the second round of the Arizona QSO Party-Contest which takes place third Sunday each month. Radio Club of Arizona is completing plans for the hamfest in October. Make plans to go. Traffic: W7MLL 30, TCQ 20, QWG 2.

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — NDF is back on the air. GC participated in the ARRL Frequency Measuring Test in January. He has a new ART-13 transmitter. BDU/6 is on 7 Mc. with about 50 watts to an 807. LUJ reports he works occasional DX, including XU6GRL (Doc Stewart) in Nanking, VS1AF, and KA1ZU. MI sends in nice traffic report. MKW reports LDJ worked G6GO on 3.5 Mc. RKL is rebuilding. YBI is working some FB DX on 3.5 Mc. with Signal Shifter. 144-Mc. Club has been organized in Santa Ana. Active stations on Monday evenings from 7:30 to 9 P.M. are DEY, HWJ, MKW, PHJ, and VKN. CTP was injured in a traffic accident. ØBDU/6 gave an FB talk before the Orange County Radio Club on his experiences as translator-missionary among Mixtico Indians south of Mexico City. RWP, TMC, and SRD are on 144 Mc. DEY has HY75 on 144 Mc. and has plans to put 200 watts on the band. HWJ has HY75 on 144 Mc. with 807 going on 50.4 and 51.4 Mc. MKW has deserted 3.85 for 144 Mc. QZQ is on 28 Mc. PHJ divides his activities between 144-Mc. mobile and 28-Mc. 'phone. YDM is moving to Santa Ana from Trabuco Canyon as soon as new house is finished. LGO and PFQ visited HWJ and MKW in January. VAD is on 50 Mc. at Orange. We regret to report that GMU, of La Habra, was killed in a car accident. The Palomar Radio Club is planning for its birthday party. This is my last report and I want to thank all the fellows for the FB coöperation and hope you will continue to send reports to our new SCM, Irvin L. Emig, W6GC, 4852 Marlborough Dr., San Diego 4. Come on, fellows, let's give him all the support possible. Traffic: W6NDF 59, MI 22, LUJ 13, LDJ 12, CHV 4, LHN 4, ØBDU/6 3. 73. *Ralph.*

WEST GULF DIVISION

NORTHERN TEXAS — SCM, N. C. Settle, W5DAS — Asst. SCM, J. Bonnett, 5III. SEC: QA. PAM: ECE. RM: CDU. BSY, at sea, is on 29,200 kc. CHG, Amarillo Club, elected BFA, pres.; Pauline Benselinck, secy.-treas.; HVF, reporter. LEP has a pair of 814s at Canyon. HF has new HRO and n.f.m. HYT has a new HRO. BFA has new Super Pro. HUU has a new Panadapter. HVP, LGW, and BGT are on 144 Mc. IZW and JAD are on a trip. IWK has an 829 working. LTM has a new beam. LLZ is on with HT-9. AVM is on 14 Mc. IAN is on 3.85 Mc. WX is on 50 Mc. NJD is on 28 Mc. HF is HVF's OM. BII is back on 7 Mc. LOS is on 3.5 and 7 Mc. The get-together frequency of CAA hams is 7160 kc. BYX did a swell job as EC with the Mississippi boys who were isolated by recent blizzard. Here is a list of hams working for Braniff International Airways: EDW, HMH, KVS, KWL, LBU, HQS, LSP, JNK, KWZ, LMQ, JNS, IQT, DXR, BVM, CVB, IUA, LCT, CKK, LQQ, EEB, BII, ISS, ESC, LQQ, DJ, NSY, 2PCE, 9NXV, ØHQJ, ØOSI, ØDBM, ØEDX, and 9PDX, now 5PDX. HMH, IQT, JNK, and KWL are on 144 Mc. around 7:30 P.M. The exact frequency is 144.138 Mc. and they are using converted BC-522. The Dallas Amateur Radio elected FDI, pres.; JBD, vice-pres.; KJF, sec.-treas.; MA, finance; KI, technical; CDU, vigilance; DAS, program; JQY, entertainment; GOB, sergeant at arms. LFW is back on at Terrell. Traffic: W5HCH 87, LSN 77, CDU 39, JDZ 27, ASA 18, SIO 18, BYX 11, ECE 11, LOS 3, GZH 2, DAS 2. *Skippy.*

OKLAHOMA — SCM, Bert Weidner, W5HXI — Asst. SCM George Bird, W5HGC. I would like very much to hear from all appointed stations in this section since this office has no record of any previous appointments. Only three stations have been reporting regularly, AQE, EHC, and IGO. Please get in your reports and help your SCM. OCARC elected officers with JHO, pres.; AXM, secy. Officers of Bartlesville Club are GTU, pres.; AQE, secy. TARC officers are EGC, pres.; HKI, secy. No other clubs have been heard from as yet. HXJ, EEL, IEQ, JHO, CHE, and AFX, all of Oklahoma City, are hot on 144 Mc. JKS is

(Continued on page 114)

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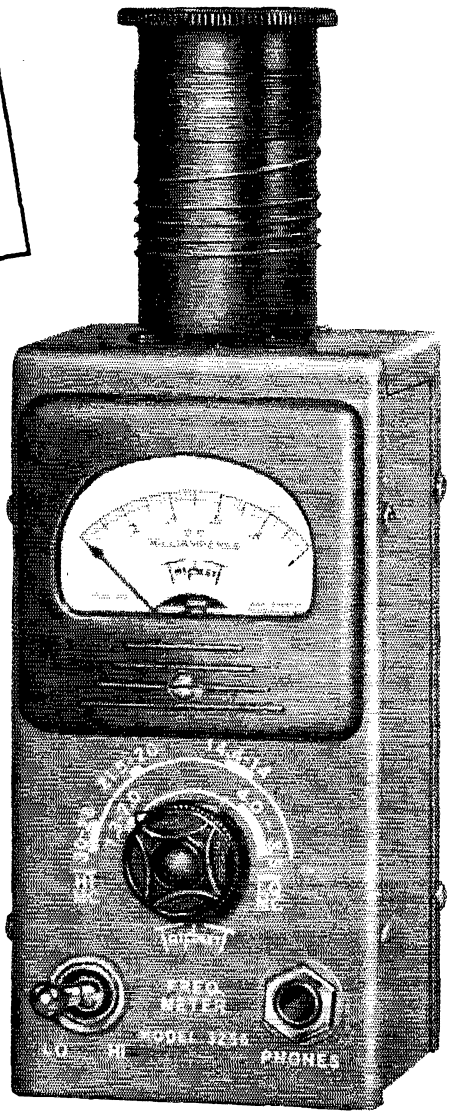

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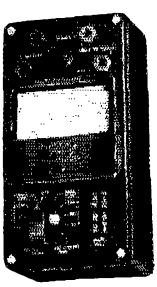

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(Continued from page 112)

working 3.5- and 14-Mc. c.w. FFU is on 7 Mc. with an 813. EST and DQN are on 3.85-Mc. 'phone. EAK is rebuilding but not off the air. ATJ is on 3.5-Mc. c.w. at night. HGC has a new tower and beam for 14 Mc. AHT is on 3.5-Mc. c.w. APG is on 3.5- and 3.9-Mc. c.w. and 'phone. If you want more, send me reports before the third of each month. Traffic: W5IGO 75, AQE 3.

SOUTHERN TEXAS — SCM, James B. Rives, W5JC — The Rio Grande Valley International Radio Club was recently organized at Brownsville with CX, pres.; FAH, vice-pres.; LVL, secy.; and LSO, act. mgr. They have an active membership of forty including several XE2s from Mexico. HIZ, FTA, FPL, GBT, JJC, and TI have been transferred from Brownsville to New York by Pan-American Airways. LDD is putting in a lot of flying time and is busy as OBS. The Brownsville Chamber of Commerce has provided QSL cards for all club members. The Corpus Christi Radio Club has adopted a PA0 and is going to set him up with a nice transmitter and receiver. HIF is active OBS. EUO has moved from Corpus to Victoria and LVU, LXA, MBD, and KZV are being transferred. FBC has a new beam and is getting good results. GMT and FZB have new kw. rigs near completion. The Houston Amateur Radio Club has changed meeting quarters to the Chamber of Commerce Building with meetings each Friday night. Amateurs in that area are invited to attend. New officers are: LI, pres.; KLG, secy.; FJA, treas.; and IGS, director at large. Among the attractions offered by HARC are interesting programs, door prizes, and air-conditioned quarters. IGS has given up 'phone operation for c.w. The following Houston stations are active on 144 Mc.: LGE, JIY, JMI, EAL, BHO, ON, IGS, GLS, HMN, FJA, and KFY. LP has moved from Houston to California with the C.I.T. cyclotron crew. FJA is building new modulator. IMF is away at school and KLG is using his 808 rig. BKW is renovating his prewar kw. LI, BDI, IOO, HFO, JNI, ADZ, and MDZ are active on 28 Mc. FWC is on 3.85-Mc. 'phone. HGG has a new ORS appointment. IZ is keeping the San Antonio hams well supplied with parts and just completed a new 813 rig for HYL. LXO and LGG are sporting new UH 152s. FNH, at Kerrville, did a nice job of furnishing emergency communication during the recent Central Texas ice storm. JPC has a new receiver. EWZ is erecting several new "V" beams and is enlarging the shack.

NEW MEXICO — SCM, J. G. Hancock, W5HJF — While LGS was attending his father's funeral his home was burglarized and his HQ-120 as well as his important papers were taken. LYQ is active on 3.85, 28, and 14-Mc. 'phone and is expecting delivery of an RME VHF-152 and will try 50 Mc. then. DER also is doing a little 50-Mc. work from Clovis using a 12-Mc. crystal, a 6A6 to an 807 in the r.f. 3LCK is operating portable out of Lovington with 32 watts on 3.85-Mc. 'phone and 3.5-Mc. c.w. using a BC-64A. Tom would like to work WAS with that set-up from his New Mexico location. AOH is operating 3.85 Mc. with a 14-Mc. rotary beam. 73. *Jake.*

CANADA
MARITIME DIVISION

MARITIME — SCM, A. M. Crowell, VE1DQ — EY, our RM wants all interested in traffic to give him a call Sun., Mon., or Fri., after his schedule with CD and FT. HJ schedules RB Sundays at 7 P.M. on 3505 and 3625 kc. KQ is active on 3.5 Mc. QZ made WAC using Millen exciter and open-wire folded doublet. OM uses 3682 and 14,124 kc. VN just got on 3.5 Mc. WJ has schedules lined up on 14 and 3.5 Mc. at 7 P.M. Tues., Thurs., Fri. Her frequency is 3682 kc. PV is on 14 Mc. with the VFO. HD is working on new 500-watt 'phone rig for 14 and 28 Mc. At the annual meeting of the HARC, following new officers were elected: FB, pres.; MZ, vice-pres.; EP, treas.; RR, secy. The local Halifax 'phone gang includes FQ, MZ, PX, PB, HV, RR, ET, KY, LY, HD, DS, TA, BC, OW, GR, and DQ. AO and TS are on 7 Mc. TE is doing well on 28 Mc. IL has worked 29 states on 14-Mc. c.w. since September. CO is going strong on 14 and 28 Mc. AP and PX are on all bands. BD is on 14 and 28 Mc. 'phone. HC is on 7 and 3.5 Mc. CW is active on four bands low power. GB is on 14- and 3.5-Mc. c.w. with 807 final. OJ and MC are low-power men. 8X has been using a 6V6 oscillator at 30 watts input to reach a G3 in Hull and as far west as Iowa on 7 Mc. Following are active on 50 Mc. QZ, SF, JK, QG, and VH. FB has 350 watts to an 813. VV has some very good DX on 28-Mc. 'phone. DQ, BC,

(Continued on page 116)

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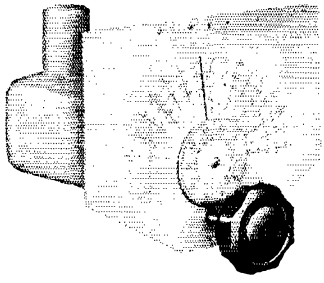

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(Continued from page 114)

ET, KY, FQ are members of the Nightowls. VO2AJ, at Gander Airport, would like schedule with Halifax. Look for him on 3810, 3525, or 7066 kc. Traffic: VE1HJ 74, QT 29, EY 17, DB 8, OM 6, PV 4, WJ 4. 73. *Art.*

ONTARIO DIVISION

ONTARIO — SCM, David S. Hutchinson, VE3DU — Congrats to HP on making the BPL. The Beaver Net (c.w.) is in operation again, thanks to TM and SF. Look for them on 3535 kc. ATR schedules Buckeye and Beaver Nets. BCS schedules HP, GN, and Beaver Net. CAR is on the air again. EF assisted in clearing emergency channel on 3800 kc. on Christmas night for St. Lawrence River QRR. KM lost 12 feet off pole in sleet storm. Three new AEC members in Hamilton are BGB, BGT, and BNQ. BHS is our latest ORS. OJ is on 3.5 and 28 Mc. VD is looking for traffic on 7 Mc. QK schedules 2DR, 3WX, and QMN. WY is rebuilding with an RK4D32 final with 300 watts. Congrats to the Ontario 'Phone Net for a very nice job. WB expects to be transferred from Pagwa River by DOT. BAJ is having trouble with earth currents. BEV is on a trip to W5- and XE-land. QC is trying out 50 Mc. Brantford, Hamilton, and points east, let him know if you hear him. BLD is working DX on 28 Mc. WX is very busy with AFARS and Beaver Net. Anyone who wishes to send in reports via radio, do so via Beaver Net on 3535 kc. A traffic station is wanted in Ottawa for BN, SF, TM, WX, WY, QU, ATR, BCS, and HP are active on BN. Listen for QBN. Welcome back to WK, another old ORS. BDX finished schedule with OX1Z. The Intercity Radio Club of London and St. Thomas was dissolved in December and two separate clubs were formed. Officers of London Radio Club are: VE3AAO, pres.; VE3ADC, vice-pres.; and VE3BJI, secy.-treas. Meetings are held the 2nd Thurs. of each month. Traffic: VE3WX 315, HP 191, QK 134, ATR 77, CP 72, SF 67, TM 35, AQA 25, BCS 25, AIV 16, VD 16, AHP 10, CAR 9, KM 8, UA 8, AXQ 7, GV 7, QU 5, WY 5, LO 4, QW 4.

QUEBEC DIVISION

QUEBEC — SCM, Gordon F. J. Phelan, VE2SU — Recent appointments include TA and BY as EC, DX as OBS and OPS, and BB as ORS. TH worked G6BY on 3.8-Mc. 'phone. PT knocked off a W6 on 3.5 Mc. TA's rig is absolutely 100 per cent emergency — output is 50 watts 'phone and c.w. on 7 and 3.5 Mc. with no power lines required from Hydro. HL has his Code Proficiency certificate. EM is experimenting up to 300 Mc. BV is chairman of program committee of MARC. PU worked a ZL on 28-Mc. 'phone. KQ has been on 28 Mc. 'phone with an 809. HB is using an 813. TM uses 807 on four bands. AC has a Meissner job on 3.5 Mc. SQ is a new man in Lauzon. DU, PF, KF, and JB were visitors at the Radio Club de Quebec Oyster Party. BG's OPS appointment now includes the signatures of four successive SCMs. CG is building a rotary three-element beam to feed an HY51. Les would like traffic. We are sorry to announce the death of NS. OB is on with 15 watts. EA has 75 watts 'phone and c.w. UO schedules VE1EY. OL worked HP2CA/Marine in Trinidad on 15 watts. The St. Maurice Valley Amateur Radio Assn. is active again. New slate is QA, pres.; DD, vice-pres.; EC, secy.; OD, QL, and VH, directors. RO helped in the quick rescue of fliers downed in the St. Lawrence River. Assisting him were DV, AB, HB, NE, AG, DZ, XP, AW, DD, HL, IC, and LA. Is there an EC in your district? Traffic: VE2DR 95, BB 46, UO 18, SU 14, TM 8, OL 1.

VANALTA DIVISION

ALBERTA — SCM, W. W. Butchart, VE6LQ — NC is the call of NARC'S new club station. Operating schedules are getting under way immediately. HM has been working hard on the Frequency Checking Tests. EL, of Camrose, has half-kw. on the air. AO underwent minor operation, but is back on the air. LQ installed tube-keyer system. PP, of Lac La Biche, is using new HT-9. US is on 3.5-Mc. c.w. from Lethbridge. MJ works out nicely on 14 Mc. with his newly-acquired rig. SZ finds DX on 14 and 28 Mc. quite consistent. LG has an 813 on 3.8-Mc. 'phone. HQ gets out very well with his new rig. He keeps schedules with his son up in Whitehorse. MJ worked J9CRP twice in January on 14-Mc. 'phone. WS installed motor drive on his four-element beam. LW was married in January. IR is celebrating the arrival of a jr. YL operator. BV spent a few days in the hospital. How about some of you chaps getting

(Continued on page 118)

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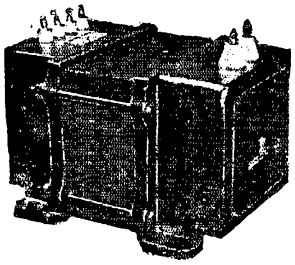

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2051	.90	VR105	.75	9001	1.15
811	1.95	VR150	.75	9002	.89
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(*Continued from page 116*)

interested in the ARRL appointments available at present. I need traffic men, 'phone men, experimenters, etc., and have some Official Observer appointments waiting for the right men. Get in touch with SCM and get into ARRL operating organization now! Traffic: VE6AO 25, MJ 20, LQ 15.

BRITISH COLUMBIA — SCM, W. W. Storey, VE7WS — CE has a new RME-45 and made WAS with 30 watts. 7WL worked J2EUG, J9AAI, VP9F, CO2JV, and KH6AS on 28 Mc. The Vancouver Amateur Radio Club members thank ALQ and ADF for the trip through Electronic Labs. BA is on 14-Mc. c.w. with a VFO, 6L6, 6L6, and a T55. MO keeps schedules on 14 Mc. on Sundays. AGP is club secretary. YD is very active on 28 Mc. using a clipper on his transmitter. HY is on 3.5-Mc. c.w. with a 6L6 and plans with ND to get on 50 Mc. with an RK-34 transmitter and a 9002 in the receiver. TE is getting 110V piped in. MQ. using an 833 on 28 Mc., has WACed several times. AKC is on 28 Mc. with p.p. 807s and a Gonset converter. YA is using his fourth four-element beam on 28 Mc. AFM has a 16-tube receiver when he puts a 7-tube converter in front of a b.c. set. AFO is the proud possessor of an HQ-129X. AQG, RCARA member, (50 watts on 28-Mc. 'phone) has a 12-inch reflector he built himself. AJP worked CO2JJ, CO2OM, HK3IW, ZI2, 3, 4 on 28-Mc. 'phone with 100 watts and three-element beam. ADV has obtained some FB War Asset equipment. MH has worked 48 countries on 14-Mc. c.w. AZ works the W boys with 40 watts into a piece of bent pipe. UU is heard on 14-Mc. c.w. with 150 watts. LF is open for contacts on 7 and 3.5-Mc. c.w. AKG has worked all U. S. districts except W1 and all Canadian districts except VE6 on 28 Mc.

YUKON — Acting SCM, W. R. Williamson, VE8AK — The bi-monthly meeting of the YARC was held Feb. 18th at the Dept. of Transport Radio Barracks at Whitehorse with a good attendance. BJ, and BL are newly-licensed amateurs. AS had new HQ-129X and is working out fine on 14 and 28 Mc. with big rig and 8JK antenna. AG is planning on a pair of 814s. AK and AJ drove a truckful of grub out to AO at Lake Laberge. AO promptly started his own little QSL bureau, putting AK and AJ to work answering 135 QSLs. BB still is building rig. AT, from Fort Selkirk, recently visited several local ham shacks. AN is on 7 Mc. with Millen exciter. AL was in town from Teslin and gathered information for his *VE8 Drift*, a nice little paper devoted to the doings of VE8 amateurs. AM proved helpful in relaying a message to RCCS authorities recently when RCCS radio installation at Mayo burned down.

PRAIRIE DIVISION

MANITOBA — SCM, A. W. Morley, VE4AM — 50 Mc. is being used in Brandon for local rag-chews and experimenting by CT, MY, and AU. DG, in Winnipeg, and HS, in Miami, are running tests on this band. In Dauphin, AW has two new 50-ft. poles and is working on 3.8 Mc. RH runs 6V6-815. PA visited Winnipeg. MM, in Portage, has new receiver. KD, Neepawa, has all parts for p.p. 813 final. CR took a trip west; CC went east. NI and QV are working all the 'phone DX on 14 Mc. SR, YO, NG, LC, and AD are heard consistently on 14-Mc. 'phone. BN rebuilt to p.p. T20s. SS has new antenna. FW is on 7 Mc. KX was heard on 3.5 Mc. New calls heard include FZ and WK on 3.5 Mc. FU worked 19 Gs in 50 minutes on 28 Mc. PK is spending his time between 28, 14, and 3.5 Mc. AC belongs to the "Skunk Net." The Manitoba AFARS Net has 3AFH, 3AYR, 3CH, 3BKY, 4CU, 4DG, 4EH, 4EO, 4FW, 4HS, 4KD (control), 4MM, and 4AM as members. It is meeting nightly and traffic is moving through the province at a fair clip, Fort William to Brandon and north to Flin Flon. CC, the QSL Manager, says he has ONE envelope. Get yours in. Traffic: VE4AM 69, KD 36, AC 16, MM 9. 73. *Art.*

SASKATCHEWAN — SCM, Norman E. Thompson, VE5CO — The MJ Club had a nice time at FK on last meeting. Because of blizzard conditions at the time the turn-out was small. As transportation was disrupted at the time reports were due this month, we have not much on the book. RA got himself an LA and OA. LV got a nice shiny new National receiver and is finding out what all the knobs do. MW is on 28 Mc. GH is keeping 7 Mc. hot and has a built-in audio monitor in the receiver so as to check his sending. OP is taking the bugs out of his modulator. *OM is* going strong on 28 Mc. and coming up for WAC. DF combined received and transmitter into nice rack job. CZ has three-element beam on 28 Mc. but until spring will be rotated right inside the operating room. CO has slug-tuned exciter bandswitching and is using five 807s. 73. *Norm.*

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Predictions

(*Continued from page 25*)

month to month will be apparent. Only representative data are given, although the predictions have been confirmed by a large number of observations.

Tables showing predicted "open" periods could be worked out for any station location from these charts, but the charts themselves are much more informative and more easily used. Tables can only define areas generally, and would be quite lengthy if made complete.

Predicting amateur "conditions" in the foregoing manner is, of course, subject to certain limitations just as is the predicting of weather conditions. The recommended method is based upon maximum usable frequency since it is felt that the average amateur wants to know what he might *usually* work and not what he can be *certain* of working based on optimum usable frequency. Certain errors may occur because of the world-map projection used, and may also result from the method of drawing great-circle paths on this projection. Additionally, ionosphere storms, warnings of which are sent out by WWV at 20 minutes after and 10 minutes before every hour,[4] may disrupt normal communications. In general, attenuation of signals becomes greater as the difference between maximum usable frequency and operating frequency becomes greater. Each of these factors could result in an amateur not making contact in accordance with the predictions. On the other hand, sunspot peaks (at twenty-seven day intervals), sporadic-*E* and other factors might permit contacts to be made at times other than those predicted by the foregoing method. In any event, it is believed that a much better picture of amateur "conditions" can be predicted by this method than has heretofore been possible, and if charts are constructed and used as described above, the DX hound will have another handy tool in the radio shack.

2-Meter Transmitter

(*Continued from page 29*)

Performance

A super signal was not the object of this design. What we wanted, and all anyone can expect, is a signal that won't be objectionable on the air. No oscillator can be both efficient and stable, but this one is a reasonable compromise between the two aims. Actual *measured* output was about 3.5 watts, with 18 watts input. This sounds low, but is quite respectable at this frequency, in comparison to some oscillators. The familiar lamp load is not to be trusted; this rig gave a fairly bright indication with a 15-watt lamp when the wattmeter registered less than four watts!

More important than the output is the sound of the signal on the air. The carrier has a d.c. note; it can be tuned in with a b.f.o., and though

(*Continued on page 122*)

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(*Continued from page 120*)

it fuzzes when modulation is applied (indicating f.m.) it does not change its center frequency materially. The modulation appears near the center of the carrier, instead of several hundred kilocycles off to one side, and it is readable on all but the most selective of receivers.

Don't get us wrong — this little rig is no substitute for crystal control — but if you must use a modulated oscillator, this job will at least give you a readable signal on most receivers. It will occupy a considerably narrower portion of the band than many oscillator rigs now in use, and if you decide to go to MOPA later, the oscillator should make a good driver unit for a Class C amplifier using an 829 or 832. It's no worker of miracles, but it certainly is a step in the right direction toward a cleaner and more enjoyable 2-meter band.

Atlantic City

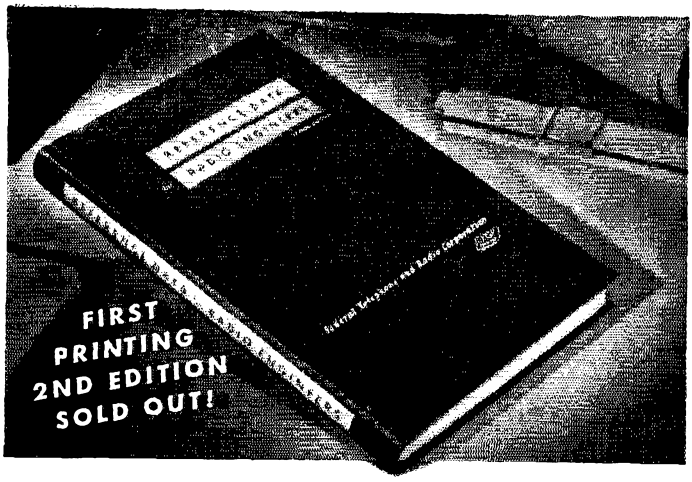
(*Continued from page 41*)

itself. When the short waves first opened up, every service in the country — Government, commercial and amateur — could operate anywhere it wanted to in the short-wave territory, *and did*, with increasingly chaotic results. The 1924 conference represented an attempt to solve an otherwise impossible situation by means of mutual agreements to be voluntarily respected by all services until the law could come along and catch up. Everybody was perfectly aware that the "regulations" resulting from these agreements were not binding, but everyone knew also that some sort of order was essential in order to continue operating at all.

In many respects, this 1924 Hoover Conference was a modern international radio gathering on a small scale. Every domestic service was present pushing for all the short-wave territory it could get. The "shorts" were so brand-new that nobody had a clear idea of which waves were good for what; for that reason, everyone was out to get all that could be got, from one end of the scale to the other. Without going into detail (details in past *QST*s for those interested) we may say that the outcome of the 1924 meeting was amateur bands as follows: 1500–2000 kc., 3500–4000 kc., 7000–8000 kc., 14,000–16,000 kc., 56,000–64,000 kc.

It was recommended that the Supervisor of Radio decide whether one license would permit the use of all these bands or whether multiple licenses would be necessary (it was later agreed that one would do the trick). Incidentally, it will be noticed that we here embarked on the idea of maintaining a harmonic relationship, so far as possible. The omission of any ten-meter assignment in the table, however, is not accidental; there was no assignment. The reason for this is that the Hoover series did not extend as far as the ten-meter territory. The 5-meter assignment

(*Continued on page 124*)



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(Continued from page 122)

was incorporated by special request solely because of the fact that a small group of experimenters wished to work there; the same reason applies to a subsequent 400–401-Mc. assignment for beam experiments, made shortly after the conference by the Department of Commerce at the special request of ARRL.

Other bands were assigned to the various other services which wanted space in the spectrum and which, remember, were just as much entitled to it as we were.

Since the 1925 conference did nothing to alter this general set-up we will skip over it and say that during 1924, '25 and '26 we here in the U. S. operated in the 1924 bands. By mutual agreement, of course.

In the meantime, Congress was being bombarded with requests and entreaties for a new law but was still doing nothing about it. How long this might have gone on no one knows had it not been that in 1926 the so-called "breakdown of the law" came about when a broadcast station which didn't like its assignment on the mutual-agreement basis made a test case resulting in a court opinion denying the Secretary of Commerce the authority to compel stations to observe any specified wavelength assignments (outside the very broad limits previously mentioned in the basic law). Overnight, all the existing regulations which specified definite wavelength assignments were rendered inoperative. Any other service that wanted to could have started to operate in "our" bands, for instance. It was a tense moment! Would all the radio stations in the country jump their assignments? Well, they could have, but most of them didn't; almost unanimously, the radio world in this country sat tight on its Hoover agreements, one of the most remarkable spectacles radio regulation will probably ever see.

However, this upset of the 1912 law had the effect of spurring Congress to the realization of the absolute necessity for a new law and so in 1927, the same year when the Washington International Conference was held (but before that affair), Congress passed the Radio Act of 1927 which not only defined amateurs for the first time in any law, foreign or domestic, but set up a Federal Radio Commission to administer radio matters and gave it the necessary authority to make regulations that would stick. As soon as the commission was created, we got it to assign to us the same wave-bands that had been agreed upon at the 1924 Hoover Conference, except that we had a 10-meter band included.

We are now almost through with the story. Discerning readers may at this point ask how we could get the Hoover bands assigned to us under the 1927 U. S. radio law when our Government was a party to (and ratified) the 1927 international treaty which gave us somewhat different territory — specifically, narrower bands at 7 and

(Continued on page 126)

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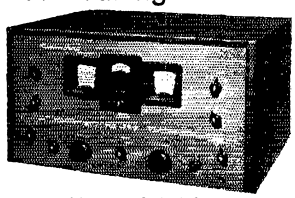
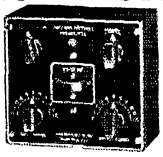


HAMMARLUND HQ-129X — Many exclusive Hammarlund features: "full range" crystal filter, high gain R.F. stage with antenna compensator, calibrated bandspread, noise limiter, voltage regulated power supply, drift compensation. 540 KC to 31 MC. Complete with speaker in matching cabinet. **173.25**



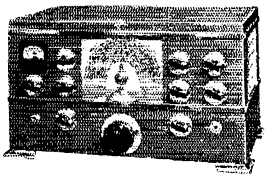
PEP UP YOUR SET!

MILLEN 92101—Pre-Amplifier automatically boosts any impedance antenna up to 30 db. 6AK5 broad band R.F. amplifier for additional 30 db. gain.

Complete with 10 meter coil, less tube..... **24.75**

6 meter or 20 meter coils, each..... **3.15**

6AK5 tube..... **.90**



NATIONAL NC-240D — Superb National quality offers all desirable features: 12 tubes, 490 KC to 30 MC, amateur bandspread, R.F. stage, crystal filter, A.N.L., B.F.O., A.V.C., tone control, full vision dial. Operates on 115/230 V. 60 cy. A.C.

Complete with matching speaker..... **241.44**

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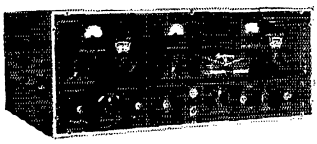

Model AF-100 — Truly the best value for the ham who wants a trouble-free, efficient all-band transmitter! Versatile? — see Supreme's ad elsewhere in this issue for complete specifications! Furnished complete, including your call letters embossed on transparent plastic!

Your cost, only..... **450.00**

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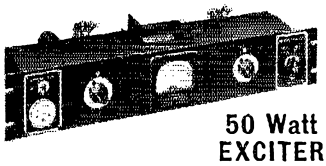


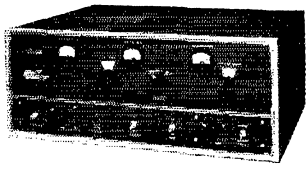
50 Watt EXCITER

Model 90800

90800 — 50 watt Transmitter/Exciter, uses 807 final straight or as doubler. Complete with 10-11 meter coils..... **42.50**

90700 — ECO Frequency Shifter, complete with tubes..... **42.50**

TEMCO



75-GA — Famous 75 watt phone/100 watt CW transmitter offers beauty and compactness, in addition to efficient operation in the 3.5, 7, 14, 21 and 28 megacycle bands. Built-in V. F. O., front panel bandswitching. Complete, your cost..... **495.00**

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G.E. 8" P.M. Speaker, 8 watts	4.95
G.E. 12" P.M. Speaker, 12 watts	8.75
Westinghouse 3½" round, 0-2000 V.D.C.	6.95
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G.E. 3½" round, 0-200 Ma. D.C.	3.39
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829-B ceramic socket & alum. shield	.75
.01 Mfd. mica pigtail cond. 5 for	1.00
Dunco 30 sec. Time Delay Relay, 110 V.A.C.	4.65
4000 Mfd.—30 V. W.D.C. Electrolytic Cond.	1.75
Belden rubber mike cable, 100 feet	4.50

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TRANSMITTING and SPECIAL TYPES!

New! JAN Approved!

6AK5	.90	813	6.75
802	1.58	814	4.50
803	9.00	832A	4.05
805	3.75	866A	.75
807	1.05	872A	2.95
810	2.65	24G	1.95
811	1.95	VR150	.75
3E29/829B			3.00

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4 Mfd.—1000 V.D.C.W.	.95
2 Mfd.—2000 V.D.C.W.	1.75
4 Mfd.—3000 V.D.C.W.	5.95
3 Mfd.—4000 V.D.C.W.	6.95
4 Mfd.—4000 V.D.C.W.	9.95
1 Mfd.—5000 V.D.C.W.	2.50
.1 Mfd.—7500 V.D.C.W.	1.95

KENYON UNIVERSAL MODULATION TRANSFORMERS

T-489, 15 watts audio	4.29
T-493, 40 watts audio	6.23
T-494, 75 watts audio	9.38
T-495, 125 watts audio	20.73
T-496, 300 watts audio	31.46

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(*Continued from page 124*)

14 Mc.[7] The answer is that the 1927 U. S. law went into effect before the Washington conference was held and, further, that the terms of the Washington conference did not go into effect until January 1, 1929. Until January of 1929, therefore, our Government let the wider-band specifications stand as U. S. law. On January 1, 1929, however, it immediately amended our amateur regulations to conform strictly to the international agreements.

From that time to the opening of the second World War, through both national and international regulations, we retained the bands first set up for amateur use in the Washington International Treaty of 1927.

This concludes a very rapid and rather brief résumé of our amateur progress in terms of legislation. It is, needless to say, impossible in such an article as this to go into detail or to describe adequately the tremendous part played in all amateur matters by the ARRL ever since the League's formation.

In the next issue will appear a brief outline of the steps leading up to an international conference, a description of how such a gathering does business, and a résumé of the preparatory work which has been going on in this country looking to our participation in the Atlantic City Conference which opens in May.

[7] Although the U. S. government's proposals for amateurs at the 1927 international conference were for the same bands we were using domestically as a result of the Hoover agreements, practically every other nation was bitterly opposed to amateurs having any appreciable bands — or even any privileges at all in the high-frequency spectrum. The bands we got represented the only compromise our Government could secure in the face of an almost unanimous effort on the part of the other governments to bar amateurs from the h.f. spectrum entirely, or permit it only under the most restricted conditions, such as use of dummy antennas, etc.

50 Mc.

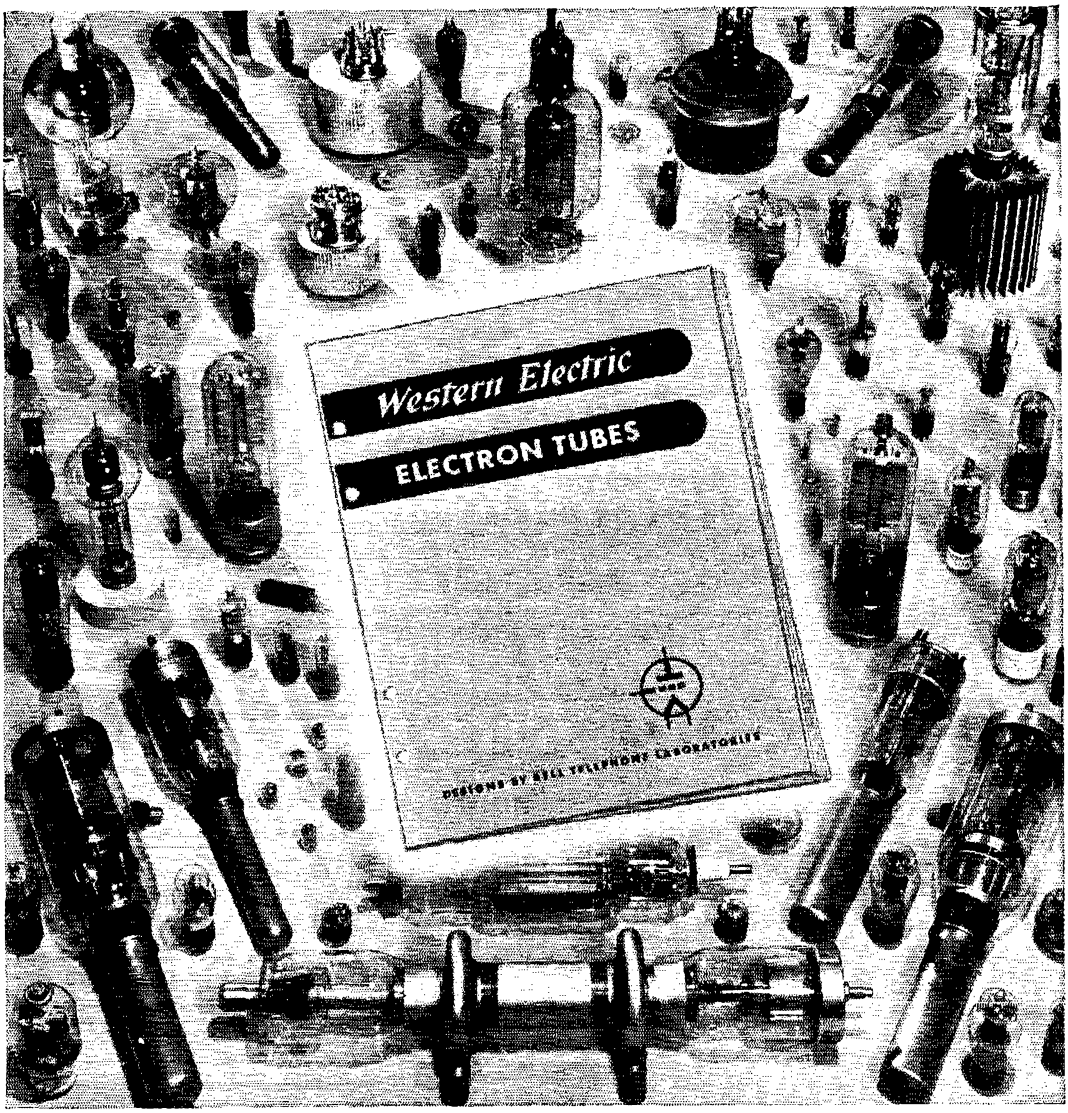
(*Continued from page 53*)

the use of c.w. should make it possible to copy many signals which are inaudible on voice. They stress the fact that some mighty nice DX work should be possible, if a few of the more advanced workers would use straight c.w. when the band is open. If strong voice signals can be heard at 400 miles, how much farther could we go on c.w.?

There is a considerable swing to horizontal polarization, but the old polarization arguments still rage. W8UKS, Lakewood, Ohio, who has done very well with horizontal arrays, now has a vertical beam up. With it he has been able to work W8NBV, Erie, Pa., and W2RJH, Westfield, N. Y., 100 and 150 miles respectively, when conditions are favorable. Regular contacts are made with W3QKI at Erie on horizontal polarization, however. Sam is aiming at Youngstown and Pittsburgh regularly, but has nothing to show for it to date.

There has been a trend to crystal control in Western New York, according to W2RPO, ex-W8NOR, who lists the following crystal-controlled stations: W2S, QZJ, SIC, PZI, UHI,

(*Continued on page 128*)



Send for this helpful Data Book on tubes by

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In concise, tabular form, this new book gives the essential data on 166 codes of electron tubes designed by Bell Laboratories and made by Western Electric. Planned to help the circuit designer quickly find the tube best suited to his needs, it contains technical characteristics, ratings, dimensions and 89 basing diagrams—all arranged for quick, easy reference. Send for your copy today!

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Please send me the General Bulletin on Western Electric electron tubes.

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(*Continued from page 126*)

V.H.F. MARATHON

Call	Contacts Through Feb. 15th (Incomplete) 50 Mc.	144 Mc.	235 Mc.	Score	States Worked 50 Mc.	144 Mc.	50-Mc. WAS
W1AEP							21
W1BCT		32	1	140		2	
W1CGY	8			42	2		15
W1EH*		24		92	2		
W1HDQ*	27	14		196	6	2	25
W1KLR		39		134		2	
W1LLL	17			95	5		27
W1PFJ	35			124	5		25
W1PLQ		53		172		1	
W2AMJ	—			—	—		24
W2BQK	—			—	—		18
W2BYM	27			123	7		25
W2COT	14	38		138	3	3	7
W2QVH	37	41		245	7	2	7
W2RSO		37		286		3	
W2ZD		134		620		3	
W3CGV	22	4		111	4	2	8
W3GKP	4	15		87	1	2	2
W3HWN		28		229		3	
W3IUN	19			93	4		4
W3MHW		14		70		2	
W3MNA		25		102		2	
W3RUE	7	21		118	3	1	16
W1KMZ/3	22			103	5		5
W4FJ	6	1		47	2	1	2
W4HVV	—			—	—		15
W4JAZ		17		78		2	
W6BWG	49			106	1		2
W6HZ	54	36		191	1	1	5
W6OVK		36		218		1	6
W6WNN	7	5		52	1	1	3
W7KAD	—			—	—		19
W7QAP	—			—	—		11
W8QQS	7			44	2		2
W8UKS		23		144		3	
W9AB	2			9	2		6
W9ALU	5	4		71	1	1	6
W9CZD	5			59	1		1
W9MBL	5			28	2		2
W9PK	14			108	9		19
W9ZHB	—			—			25
W9ZHL	6			62	2		2
WØYUQ	—			—			22
WØZJB	—			—			27
VE4DG	10			10	0		

* Not eligible for award.

BAG, KHO, and IRU. W2SOK and W2RPO have VFO control, and W2QZB is MOPA. Tests are being run with Toronto stations and the first two-way work was done on Jan. 13th, when W2QAG and W2HNN worked VE3ADO.

A group of 144-Mc. enthusiasts in Erie, Pa., recently conducted an expedition to Dunkirk, N. Y., to attend a meeting of the Dunkirk Amateur Radio Club. They took along two complete crystal-controlled transmitters, several beam antennas, and converted 522 and 1068 receivers. These were set up in the Dunkirk Armory, and contact was established promptly with W2RPO and other stations in the vicinity of Buffalo. The Dunkirk gang were properly impressed, and it is hoped that activity there will pick up in order that the gap between Erie, Westfield, and Buffalo can be more reliably bridged. Any club in that

(*Continued on page 130*)

(*Continued from page 128*)

area which is interested in a similar demonstration is invited to write W3LTN, W8NBV, W3QKI, or W3WBM for further information.

The spot-frequency net (147.96 Mc.) in the Boston area is growing. W1CTW reports that upward of 20 stations now have crystals for this frequency. The net operates every Monday, except the first Monday of the month, at 9 P.M. W1CTW worked 22 different crystal-controlled stations during January.

A 144 Club operates on 144.13 in the New York area and includes W2s QUF, FKI, BVD, MYL, MRG, SMX, SYW, CPD, PIX, DPB, ATK, MPN, CDS, and W1LUC/2. Meetings are held on the air each Wednesday evening at 9:30.

Crystal Control on 235 Mc.?

With modern tubes, crystal control and superhet receivers are not much more difficult for 235 Mc. than was similar technique on 112 Mc. in prewar years. W1CTW has a crystal-controlled rig on 235 Mc., employing a similar approach to that he described in *QST* last July, except that 832s are used in the tripler and final stages. W6OVK writes that he, W6NNS, W9OAW/6, and W6WQN now all have crystal rigs and superhet receivers on 235 Mc., and that signals are comparable to those heard on 144 Mc. He has rebroadcast these signals on 144 Mc. to the boys in Sacramento, in the hope of getting some 235-Mc. activity started up there.

Activity on 420 Mc.?

In an attempt to promote interest in 420-Mc. work, W2MWH is operating on 425 Mc. each Tuesday evening from 8 to 9 P.M. He uses a corner reflector on a rotating pole-oscillator which is modulated with continuous tone. The system rotates 90 degrees every 15 minutes. He stands by for possible QSOs after the test period. The signal is S9 at 8 miles, but the outer limit of the range has not been established.

Modernizing the Receiver

(*Continued from page 55*)

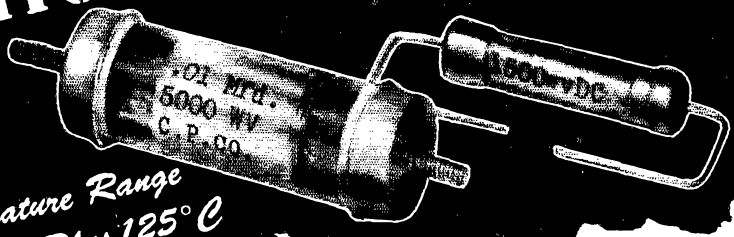
the mixer or the first-i.f. amplifier tubes. The two 0.1-μfd. cathode by-pass condensers shown are actually there. One goes from the cathode to the ground terminal in the middle of the socket and the other goes from the cathode to the ground terminal of the a.v.c. circuit by-pass at the ground end of the r.f. tank coil.

In the practical operation of the receiver, there is absolutely no comparison. The r.f. trimmers on the high-frequency bands really "trim," being very critical in their adjustment. The gain of the receiver is such that full audio gain cannot be used on the weakest signal even with the i.f. amplifier adjusted in sharpest crystal position. The author feels that he has a *new receiver* which has cost him less than five dollars.

PLASTICON* ASG Silicone-Filled GLASSMIKES

1-3/8 x 3-1/2

FOR HIGHER VOLTAGES



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25 Years Ago This Month

(Continued from page 66)

Messrs. Warner and Stewart followed Mr. Godley, with the argument that commercial broadcasting be shifted from 360 to 1000 meters to avoid interference from and with us on our rightfully owned waves. As a result of the hearings, we hopefully anticipate that the following recommendations of the Commission will be made law by Congress: (1) amateur status should be established; (2) limits of amateur bands should be specifically stated, with allocation of 150 to 275 meters for amateur use; and, (3) for the purpose of self-policing there should be amateur deputy radio inspectors, elected by licensed amateurs.

The Nation's Capitol also quaked recently to the doings of Third and Fourth District amateurs, in convention at the Hotel Raleigh. Chas. A. Service, jr., colorfully records the event for this *QST*. Chief Radio Inspector Terrell, amateur radio's booster of long standing, delivered the opening address. The story of the Second District Convention & Show, held at the Hotel Pennsylvania, New York City, is told this month too. All records for attendance were broken by this 5-day affair, with 40,000 persons, including the general public, attending. Speakers included Paul Godley, J. O. Smith, David Sarnoff, Dr. A. N. Goldsmith, and Chief Radio Inspector Batcheller of the Second District.

M. B. West returns to *QST*'s pages once again, this time with a theoretical discussion on "Improving Antenna Efficiency." Let the "power-factor" sharks feed on this effort and digest and argue its new radiation theories! "Improvements in Multi-Stage Audio Amplifiers," by H. E. Bussey, 4AI, and "The Loop Receiver at 3ZY," by L. M. Dunnam, complete our technical fill.

Of operating interest is the tally of messages delivered to President Harding from state governors during our March relay — 40 at last count! We read more reports on the Transatlantics, and also of 3ZO's scheduled tests with Venezuela in an attempt at a North-South America contact. The "Chicago Plan" and the bang-up First National Convention of last fall have won for the Chicago Executive Radio Council the Smith Cup award.

F. A. Hill, 4GL, and A. L. Groves, author of many fine *QST* articles on inductances, are introduced in "Who's Who in Amateur Wireless." Station descriptions that meet our eye are those of Laurence Mott's 6XAD, Avalon, Calif., 7ZU, Polytechnic, Montana, 9BD, Vancouver, B. C., and 1BLE, Boston. A new powerful broadcast station, WGY, Schenectady, N. Y., is described for the benefit of radiophone listeners.

The lighter side of this issue is once more ably enhanced by S.P.W.; this month it's a parable of a much-married ham and a radio widow. Strays report that station 3XM, Princeton, N. J., has suffered a bad fire. . . . The Army has perfected a stray (static) eliminator that really works. . . . Could it be that the kick in a chemical rectifier comes from the Twenty Mule Team borax solution used?

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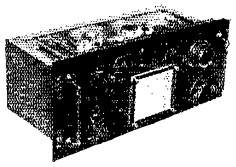

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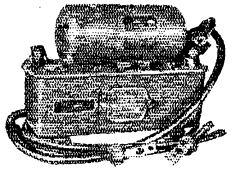
Black aluminum cabinet with 2 variable transmitting condensers, 2 vernier dials, 1 ceramic 4-position switch, mica condensers, 2,500 W.V. D.C. and porcelain ribbed coils. TU5B (1500–3000 kc), TU7B (4500–6200), and TU10B (10000–12500 kc) specify model..... **$3.89**



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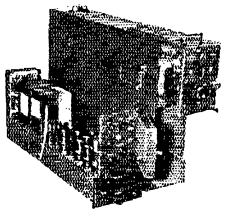

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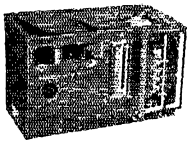
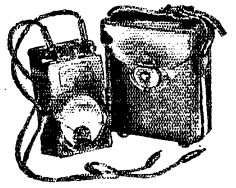


BC-684 F.M. 35 WATT TRANSMITTER

Brand new, complete with 8 tubes, crystal control, 10 channel pushbutton, non-linear modulation coil... less coverplate, crystal and power supply. **$21.95**



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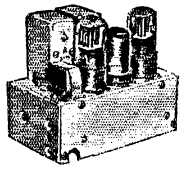
For accurate work, scales 0–10 ohm and 0–1000 ohm, scaled to read 1/20 of an ohm with ease. Housed in a bakelite case. Complete with heavy duty felt lined leather case and lock..... **$14.95**



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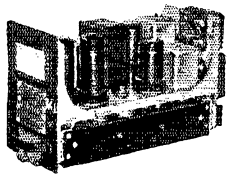
A plug-in sub-assembly of the AN type T-47/ART-13 Radio Transmitter. Consists of a Crystal (200 kc) Controlled Oscillator, and 50 KC Multivibrator Circuit, and Audio (1000 C.P.S.). Supply Overall dim. 6" x 3½" x 5".. **$7.95**



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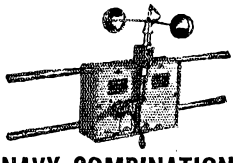
Brand new servo amplifier containing 2 beam power output tubes (1632) similar to 25L6, 2 twin triodes (1633 and 1634) similar to 6SC7, 2 mica condensers, dozens of color coded half watt resistors, 2 dual and 4 section bathtub condensers, 3 transformers, 2 wafer switches, 1 volume control, 4 octal sockets. Easily convertable..... **$3.95**



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Foreign Notes

(*Continued from page 57*)

tervals throughout the spectrum, so that bands of frequencies of varying characteristics will be available for amateur experimentation."

There is a proposal by the Headquarters that the delegation of the Union to the 1947 world telecommunications conference be composed of all representatives named and sent by individual member-societies. It proposes further that George W. Bailey, as president of the Union, be named chairman of the delegation, with Kenneth B. Warner, secretary, as his alternate. It is understood that the *Radio Society of Great Britain* is to send three amateur representatives.

On nonconference matters, the Union welcomes into membership the *Vereeniging voor Experimenteel Radio Onderzoek in Nederland*, the new, combined amateur society in the Netherlands. Membership is proposed for the *Union Belge des Amateurs-Emetteurs*, the merger of two amateur societies in Belgium.

Strays

The Quad-City Amateur Radio Club, Moline, Ill., will hold a hamfest April 27th at the Farmall Club, south of Moline. The program of games, prizes and equipment demonstrations begins at 10 A.M. Tickets are $1.50 and include an evening lunch. They may be obtained from H. E. Hermann, Moline.

The RSGB telephone number is Holborn 7373!

WEST VIRGINIA 3RD QSO PARTY.

The Mountaineer Amateur Radio Association will sponsor the 3rd All West Virginia QSO Party beginning at noon April 1st and ending at noon April 10th.

Rules:

Open to all West Va. hams. No power limitations. Any and all bands may be used.

Both c.w. and 'phone may be used during the contest.

C.w. to 'phone and cross-band QSO permitted. No extra credit.

No credit for more than one QSO with a station unless the station is in a different county from that of the first QSO.

Two points for each completed QSO. One point for one-way exchange.

The following information must be exchanged during a QSO: Date, time, call, city, and county.

Multiply total QSO points by number of different counties worked.

All logs must contain the exchange information to be eligible for the prize.

Logs will be cross-checked, and incomplete and incorrect logs will not be counted.

To be eligible for the prizes the logs must reach Raymond Wardle, activity mgr. MARA, 501 Pythian Street, Morgantown, West Va., not later than April 20, 1947.

Highest scorer will receive a two-year subscription to *QST*. Second prize will be an ARRL *Handbook*.

How's DX?

(Continued from page 59)

San Francisco. Other QTHs are: PK6EE, Box 76, Macassar, Celebes, N.E.I.; HI8MAF, Max Fiallo, P.A.A., Trujillo City, Dominican Republic; CP1AP, Box 346, La Paz, Bolivia; VP8AM, W. H. Hannaford, No. 1 Arch Green, Stanley, Falkland Islands . _ . _ . _ All QSLs for YI2AM should go via ARRL . _ . _ . _ Add to QTH list: CT2WX, 53rd Recon. Sqdrn., APO 406, c/o PM, N.Y.C.; PZ1RM, O. W. Morroy, Box 118, Paramaribo, Surinam, D.G.; VP9Q, B. S. Atkinson, Kenrose, 3rd Ave., Cavendish Heights, Bermuda; TI2BF, Paco Bermudez Term., E. San Martin Ave., San Jose, Costa Rica; PA1OY, Box 679, Paramaribo, Surinam, D.G.; ZB1AD, Signals Officer, RAF Station, Luqa, Malta; W7IMW/C7, Det. 44, c/o 1st Marine Division Hdqtrs., FPO, San Francisco, California.

Tidbits:

Suggest that everyone read the "Operating News" item in this issue entitled "Ending Signals." Several DX stations have complained to us that upon using QLM, QHM, etc., the East Coast ignores the procedure and the QSOs are, in most cases, with W6s and W7s, who seem to know the meaning of these signs. Come on, East Coast, let's show 'em! . _ . _ . _ A certain W2 complains about the key clicks from a certain W4. To the W2: How about getting rid of that resonant filter ur using and sharpening up ur own signal? Know who? . _ . _ . _ About ten of the gang in the N.Y.-N.J. area bought a BC-342 receiver for PAØVD. Upon conversion it was shipped to him, after endless red tape . _ . _ . _ W5IWY has received a QSL from FF8WN which he did not earn, he says. The QSO supposedly took place on Jan. 1, 1947, 0455-0500 GCT. Anyone interested drop him a line . _ . _ . _ From a reliable source we find that EP3D is a bootlegger, so don't look for any cards from Persia for this one . _ . _ . _ 73.

Staggering

(Continued from page 61)

possible condition at the present time. 'Phone men, who *like* to listen to other 'phones, could have the benefit of the wide-band transmissions of our neighbors, while the c.w. men would be relieved of this annoyance and would have a better opportunity to observe the eccentricities of some of the weaker DX signals.

The success of the plan hinges, of course, on the ease with which we can get all of the countries of the world to agree to it. From observation of past quick mutual agreements between these countries, the U. N. or any other international group should knock it off like anything! Write your director and congressman immediately, telling of your support of the "staggering band theorem" and all it implies. A convenient blank will be found on page 173 of this issue. Sign it and send it air mail — at once.

Hints and Kinks

(Continued from page 68)

units makes it entirely practical for one to be used at the base of the tube requiring the bias. The 813 amplifier in use at this station has a grid circuit as shown in Fig. 3. A small selenium rec-

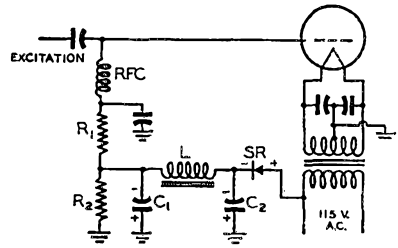


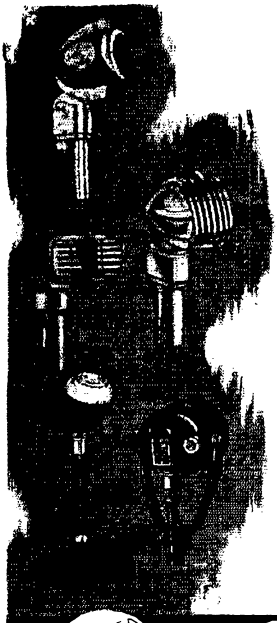
Fig. 3 — **Bias system for an 813 amplifier using one of the new midget selenium rectifiers.**
C_1 — Dual 8-μfd. electrolytic.
C_2 — Section of C_1.
R_1 — 2500 ohms, 2 watts.
R_2 — 5000 ohms, 10 watts.
L — 30-hy. 30-ma. filter choke.
SR — Federal Tel. & Radio Type 403D2625.

tifier is used in a half-wave circuit, filtered by C_1, C_2 and L. Values are dependent, of course, on the particular application, but for the 813 the values shown below the diagram have worked out very nicely. About 80 volts of fixed bias is always present at the grid of the tube, and the additional few volts required for operating bias are obtained by the series grid leak, R_1. In my case, bias increases to about 130 volts when excitation is present, varying, of course, with the amount of grid current flowing at the time.

Since only one side of the a.c. line is tapped, a good earth ground to the transmitter chassis is a requirement, and the power plug should be polarized to assure that the bias lead will always be the hot lead. — *R. D. Althaus, W8KGD*

Strays

The North Shore Radio Club of Long Island is holding a hamfest on Thursday, April 10th, at Lost Battalion Hall, 93-29 Queens Boulevard, Elmhurst, L. I., N. Y. Speakers, demonstrations and prize awards are scheduled. Program starts at 8 P.M. — tickets $1.50.



FAITHFUL PERFORMANCE

"Back in 1938 I bought a Turner Ham Mike, crystal. Up until the beginning of the war, I used the little feller nearly every nite. Then the war came and I put the rig and the mike in moth balls and stored it in the attic. The average temperature in the attic in summer was around 125° and in winter 20° below was not uncommon. Sunday, July 14th, I got the old hay burner back on the air . . . needed a mike. So I dug out this old mike and plugged it in. I called a CQ and got an answer right away. I asked the fellow how the quality was and he said excellent. Every contact I've had since then gives the same report, "you sure have nice quality, old man."

Signed

Johnny Harrison
WØUEL

THE TURNER COMPANY

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Microphones licensed under U. S. patents of the American Telephone and Telegraph Company, and Western Electric Company, Incorporated. Crystals licensed under patents of the Brush Development Company.

MOTOR GENERATORS

Built by a leading manufacturer to rigid specifications of the U. S. Navy for fire control use. *Input:* 115 volts D.C. at 14 amps., 3600 rpm. *Output:* 120 volts A.C. 60 cycles single phase at 10.2 amps. or 1000 watts continuous duty. Splashproof. Fully covered. Centrifugal starter. Brand new in original boxes including spare parts kit. Shipping weight 290 lbs. Net weight 260 lbs. Price f.o.b. New York $87.50.

Electronicraft, Inc., 5 Waverly Place, Tuckahoe 7, N. Y.

COMMERCIAL RADIO INSTITUTE

A RADIO TRAINING CENTER FOR 26 YEARS

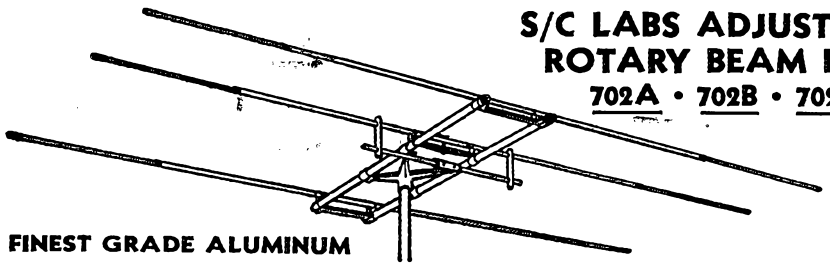
Resident Courses Only • Broadcast, Service, Aeronautical, Television, U.H.F., Preparatory Course. Frequency Modulation and Marine telegraphy classes now forming for July 1. Entrance Exam. June 16.

Literature upon request. Veteran training

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

S/C LABS ADJUSTABLE ROTARY BEAM KITS

702A • 702B • 702C



FINEST GRADE ALUMINUM

Type 702A • 27 mc to 29.7 mc (10 and 11 meter band) $44.95
Type 702B • 50 mc to 54 mc (6 meter band) 29.95
Type 702C • 144 mc to 148 mc (2 meter band) 24.50

COMPLETE WITH ADJUSTABLE "T" MATCH @ $6.75 *extra*

S/C LABS THREE-ELEMENT BEAM, DESIGNED FOR 2, 6 and 10 METER BAND. WEIGHT LESS THAN 15 LBS.

Also in stock a complete line of FM and television antennae. See your local dealer or write for circular

PRECISION AND ADJUSTABLE ANTENNA

Type 701A • (28–44 mc)
10 meter amateur $6.50
Type 701B • (44–88 mc)
Television 5 meter amateur 5.85
Type 701C • (88–148 mc)
FM 2 meter amateur 5.75

S/C LABORATORIES, INC., DEPT. Q, 20 VAN WAGENEN ST., NEWARK 4, N. J.

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.
(3) The Ham-Ad rate is 30¢ per word, except as noted in paragraph (6) below.
(4) **Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.**
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 7¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquring for special equipment, if by a member of the American Radio Relay League takes the 7¢ rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 30¢ rate. Provisions of paragraphs (1), (2), (4) and (5), apply to all advertising in this column regardless of which rate may apply.
(7) Because error is more easily avoided, it is requested signature and address be printed plainly.
(8) No advertiser may use more than 75 words in any one issue.

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

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

QSLs-SWLs postpaid. Quality plus! Stamp for samples. W1HJI, P. O. Box 1023, Manchester, N. H.

CRYSTALS: Precision low drift units. Type 100A in 80, 40, and 20 meter bands. Two units plug in one octal socket. One dollar each. Rex Bassett, Inc., Ft. Lauderdale, Fla.

QSLs in colors. Stamp for samples. Glenn Griffeth, W3FSW, 1042 Pine Heights Ave., Baltimore 29, Md.

COMMERCIAL radio operators examination, questions-and-answers. One dollar per element. G. C. Waller, W5ATV, 6540 E. Washington Blvd., Tulsa 15, Okla.

QSLs, highest quality, samples free. VYS Print, 1704 Hale Avenue, Ft. Wayne 6, Ind.

DEKA-XTAL. New compact 10-crystal unit for standard 5-prong socket. Looks and operates like a dial-knob. Just plug it in and turn to any of 10 frequencies, your selection. Ask your dealer or write us. Also other low TC ham crystals in FT cases to fit octal sockets. 80 and 40 ± 1 kc. $2.65; 20 ± 4 Kc., $3.50. Scientific Radio Products Co., 738½ W. Broadway, Council Bluffs, Iowa.

CALL-Letters, very attractive white letters on blue desk stand. All "Lucite," $2.50 postpaid. Bernard Hartz, W. Pine, Frackville, Pa.

WANTED: "Wireless" apparatus prior 1925; early books, catalogs magazines, etc., Franklin Wingard, Rock Island, Ill.

AMATEURS, experimenters, industrials and export accounts write for catalog and monthly bulletins. Buy the "TB" guaranteed way and save. TAB. Dept. Z, 6 Church St., New York 6, N. Y.

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

QSLs. Samples for stamp. Scarvaci, W9GIL, Lincoln Printing Co. 303 W. Wells St., Milwaukee 3, Wis.

SELL: NC100XA rcvr and spkr. Excellent condition. New noise limiter. Best offer. I. Werlin, W1JPT, 77 Bartlett St., Somerville, Mass.

IN Stock: new and used Hallicrafters, Hammarlund, National, Pierson, RME, Collins, Temco, other rcvrs and xmtrs. All other amateur parts. Trade-in accepted. Terms financed by me. Write: Henry Radio, Butler, Mo. and Los Angeles 25, Calif.

FOR sale: 3" Jackson oscilloscope, Model 523, $45, also 5" RCA oscilloscope, Mod. 158, $65, and Stancor 350 watt Class B modulator xfrmr for 100THS, $15. Used. D. Mitchell, Route 1, Winnebago, Ill.

SELL: 50 watt C.W. xmtr. Coils, cabinet, $40. W9MZW, Kingston, Ill.

SELL: BC-342 with QST revisions, $60; RME-45, $155. W8VVD, 467 Park, Birmingham, Mich.

WANTED: Thordarson plate xfmr T-19P70 or T-19P71. Write to W9MMU, 112 Mississippi Ave., Joliet, Ill.

SELL practically new Waterman Pocketscope, perfect condition, $50. W6QNA, 736 No. St. Andrews, Hollywood 38, Calif.

PANORAMOSCOPE: Three inch CRT, 115 volt for sale or swap for radio, photographic equipment. Gordon Bachand, W2TLL, 32 Fremont St., Bloomfield, N. J., Bloomfield 2-3862.

WANTED: Radio transmitter assembly expert, ham preferred. Must have complete knowledge wiring, assembly, tubes, circuits, and all component parts. At least five years actual experience required. This position cannot be bluffed. Write, giving full details and references to: Greene Plastics, Inc., Radio Transmitter Div., Wakefield, R. I.

SPECIALIZING in Hallicrafters receivers and transmitters. Also used gear. Pioneer Radio. T. Tappan, W2AVD, Waverly, N. Y.

SURPLUS bargain catalog. Send for the bargain ham catalog everyone is talking about. Surplus Radio, Inc., 30 Munson St., Port Washington, N. Y.

FOR Sale: 200-watt phone and CW transmitter, complete. Pair 804s in final, six-foot relay rack job, $100. Write W1DBS, John Savonis, 11 Dwight Court, New Britain, Conn.

ERECO beam rotator. High torque output 1-3 Rpm. Selsyn indicators. Attractive control panel. Reversing switch. Watertight. 110 VAC operated. Models from $37.50 to $50. Build your own kits from $17.50 to $25. Write for photos, literature, Dealers' inquiries invited. Manufacturer Ereco, 1006 Hewitt, Everett, Wash.

CRYSTAL processing kit, including 4 finished, highly active, "BT" crystals. State preference in 5.4 to 8.4 megacycle range; 2 holders, abrasive, instructions, treatise, $1. plus postage. Breon Laboratories, Williamsport, Pa.

QSLs? SWLs? No cheap trash! Modernistic? Cartoon? DeLuxe? Photographic? Samples 20¢. RME-45? RME-84? "Rus" Sakkers, W8DED, Holland, Mich. (Veteran).

FOR Sale: One 16B Western Electric A.M. radio transmitter used, in good condition complete with tubes. 50-watts output 30 to 60 megacycles. Sale price, $500. F.o.b. Cleveland, Ohio. Inq: Graybar Electric, Inc. 1010 Rockwell Ave., Cleveland 14, Ohio.

SELSYNS, size 5G, 115 volts, 60 cycles, $9.85 per pair. F.o.b. J. A Weber, 150D Maple, Hershey, Pa.

ANYONE interested in buying RCA crystal frequency monitor, write WCRW, White, Chicago 14, Ill.

SELLING B.C. 348 Q receiver A.C. $65, new. B.C. 375E transmitter, partly converted. Filament transformer and carbon mike, all new, $50. 25 Watt phone/c.w. Transmitter 10-80 meters in Parmetal cabinet. $60. Miscellaneous gear. Worley, W2WI, 723 Hamilton Ave. Trenton 9, N. J.

TEN-meter pre-selector, newly designed circuit, excellent signal to noise. Brand new, uses 6AK5 tubes, $32.50. Send for details. Also "QS" v.f.o. unit, 6 watts output, Crystal locked, no chirp, no drift. Pure xtal note. 40, 20 meter output. Dave Eby, W6MHF, 739 Haight St., Apt. 19, San Francisco, Calif.

TRC-10 unit complete, $55, containing receiver, 2 tube 40 watt. Cw. transmitter in case. Range 2-12 Mc. With spare set tubes, 5 crystals, key, fones, 60 cycle supply. Had million Bux fun with this rig. Now QRO. W2CO, 304 North Maple, East Orange, N. J.

SINGLE operator wanted in summer camp, Jackson Hole, Wyoming. Teach high school boys radio. Contact pack trips. References exchanged. W. S. Wilson, Cranbrook School, Bloomfield Hills, Michigan.

BARGAIN! Solid copper antenna wire, No. 14 enamel 120-ft. coil on form, $1. postpaid. W2CRB, 1523-41st St., Brooklyn, 18, N. Y.

SX-28 Hallicrafters receiver, Jensen bass reflect cabinet speaker, headphones $175.00. George Riehl, W8JNF c/o Matzek, 4800 Broadway Ave., Cleveland, Ohio.

SELL: Collins, AN/ART 13, Autotune transmitter, complete with tubes, mike, dynamotor, cables, two 12 volt, 15 amp Exide batteries, and 6 amp, 24 volt battery charger. Also BC 342 receiver. All for $245 or sell receiver separately. F.o.b. Atlanta, Ga. W4FEK, 287 Springdale Drive, NE.

RECONDITIONED receivers: S-40, $69; HQ-129-X, $129; NC-100A, $89; NC-80X, $59; S2OR; SX-28; SX-28A; SX17; S-39; NC-81X; HRO-5Tal; NC-240; RME-45; RME-69; RME-99; RME-84, etc. Also transmitters, converters, pre-selectors, ECOs, test equipment, etc. Shipped on approval. Send $5. Rest C.o.d. Terms available. Write for list. Henry Radio, Butler, Mo.

W2MWB operating 425 megacycles every Tuesday 8-9 Pm. Continuous tone, rotating beam 90° every 15 minutes. Skeds. 9121 82 Street. Woodhaven, L. I., N. Y.

FOR Sale: brand new BC-342N AC rcvr, Army HRO, BC-654 cw/phone transmitter-receiver, ship-shore radiophones, Handietalkies. W20EA, 712 Bergen, Linden, N. J.

3" DuMont scope, type 164 E, $89. RCA signal generator, type 167-B, 100 Kc 30 Mc. AM-FM, $48. Both new. R. C. Barbour, Pine Orchard, Conn.

TUBES (loose-packed), 6V6GT, 75, 39¢ ea. 1H6G, 49¢; 25V5, 79¢ ea. All tubes guaranteed. S & S Radio Co., 140 Derby St., Salem, Mass.

MEISSNER 150-B xmtr complete, tubes, ECO, coils and mike. $335. Super-pro rcvr rack mount. $160. Both on the air now work fb. Fred Foss, W9TRU, Menomonie, Wis.

BRAND New: 150-watt xmtr, General Electric BC-191F Cw. or fone. 80 and 40 meter bands, slight change for 20 and 10. Complete with new tubes, 7 tuning units, antenna tuning unit. Power supply 1000-volt, 350 mil dynamotor. 327 No. in original packing case. All for $59. Phillips Radio, 701 56th, Kenosha, Wis.

SELL: Meissner 150-B xmtr, brand new, 813 modulated pair 811s. (Sept. '46 *QST*, p. 123) complete: $250. Brand new tubes gauranteed, 829B/3E29, $2.95; 250TH, $7.85; 810, 304TL, 805, $3.45; 813, 8001, $6.25. Want good ham receiver. W9YEJ, Knochel, Lincoln, Ill.

GEAR box unit, 110 volts Ac. 3-phase. Can be used on single phase by shunting capacitor double shaft, ideal for rotating beams, $15. Also selsyns pair, $8.50, type 1SF. W2TG, 146-13 58th Road, Flushing, L. I., N. Y.

WOUND slung-tuned coils specified for the one tube (6AK5) preamplifier, described in G-E Ham News, Nov.-Dec. issue. By removing few turns coils ready to use on 6 or 10 meters. Can be rewound for any band, 4 for $1.00 plus 15¢ shipping charge. Also limited quantity 115 volt, 16 amp. output brand new auto-transformers. See Jan. Feb. *QST*, $4.95. Ed Doherr, W3CIR/1 96 Highland St., Hyde Park, Boston, Mass.

HAROLD Gordon Cusack: QTH? Roger Curran, 803 Forest Fulton, New York.

SELL: 2 generators, Electric Specialty Co 1-2000 volt @ 250 Ma; 1-1000 volt @ 300 Ma; 1-12 volt @ 10.5 amps. Good condition. Best offer. W2KOA, Greenport, L. I., N. Y.

SELENIUM rectifiers: full wave bridge circuit. Rating 220 volts at 40 milliamps. Excellent for bias supply, relay operation, ohm meters, audio oscillators, condenser checkers, etc. Dimensions ½" x ¾" x 2¼". Two for $1, postpaid. Robson-Brugess Co., 5501 So. 36th St., Omaha 7, Nebraska.

SAMPLES: Listeners' — dime. Operators', quarter, coin, Kernz, (Quality QSLs), Fulton, N. Y.

FOR Sale: old issues of *QST*, some year 1919 to 1942. Many complete year runs, some bound. F. Schoenwolf, 1917 Warner Ave., Chicago 13, Ill.

"GET on the air". Need receiver? Buy my SX-16, tunes all bands, including 6 meters. $65 less speaker, prepaid. W8NNE, 713 Garfield, Bay City, Mich.

SELL Breting 12 communications receiver, in good condition. $55 f.o.b. West Chester, Penna. W3GGM, Ted Supplee, RD No. 3.

WANT National coil cabinet for SW3 coils. L. Becker, W2OS Collins Center, N. Y.

FOR Sale: *QSTs* 1920–1937. Robert Kruse, Madison, Conn.

FOR Sale: BC-610 transmitter. Coils for 80, 40, 20, 10. New Eimac tubes, $525. Picked up at Port Huron only. H. S. Oringer, W8ZJF, 820 Chestnut St., Port Huron, Mich.

ABBOTT Ultra abortwave transceiver, DK3 equipped for battery or Vibrapak supply; Mallory 6A 325 Vibrapak for same; Radiomarine 1P58A longwave receiver; miscellaneous parts. W3BS, 1012 Wilde Ave., Drexel Hill, Penna.

SALE: National FB7-A receiver, power supply, 20, 40 coils. Abbott TR4, Radiart Vipower supply, 110-v. AC-6V. DC all for $90. A. Viveiros, 1365 Davol St., Fall River, Mass. W1IJC.

THORDARSON Kilowatt matched power supply, delivering 2000/2500 volts 500 Ma. after filter. New components 19P68, 19C38, 64F33, 866s, four Westinghouse 3 μfd, 2000 volt filter condensers. Completely wired on standard chassis $100. George Vesely, W9SKR, 1522 West 18th, Chicago 8, Ill. Tel. Canal 5129.

FOR Sale: Hallicrafters SX-28 without speaker, in excellent condition. Also a pair of Navy 7x50 binoculars assembled from surplus parts. Has coated lense and leather case. J. E. Duff, RD No. 2, Canton, Ohio.

TRANSMITTER: Want up to 60 watt complete, serviceable, commercial phone transmitter for 10 or 20 meters. W2POO. John H. Caldwell, 101 Hartsdale Road, Hartsdale, N. Y.

SELL Pre-war surplus: one RCA 203A, original carton, $5. Jewell 1000 volts AC and DC voltmeters with external multipliers, one of each, either at $7. All items f.o.b. WØDKK, R.F.D. No. 4, Topeka, Kans.

QSLS, samples, Albertson, W4HUD, 705 So. Hamilton, High Point, N. C.

WANTED: Old Marconi tuners, Types 107A, 168, 106, 117, 101. Write T. Tappan, W2AVD, 547 Clark, Waverly, N. Y.

CARTOON QSLS. Cuts. 10¢. Merchant, Box 1592, Rapid City, So. Dakota.

WANT *LF-90 90–600 Kc inverter in OK condition. L. C. Chapman*, Rt. 1, Columbus, Miss.

FOR Sale: PP 6L6 modulator, factory-built, with 913 cathode ray modulation indicator, Thordarson T-11M74 output varimatch trans. complete with tubes. Ideal for Millen xctr. Also BR2S brush xtal mike. Sinkankas, W2ETQ, 536 East 27th St., Paterson 4, N. J.

HT-9, new, company guarantee valid; six months old S-20 R, perfect condition; will sell them together or individually for best offer nearest purchase price of $250 for transmitter and $68 for receiver. Rosenthal, W9IYG, 1008 So. Fifth St., Champaign, Ill.

VERY Sensitive hi-speed relays, DC 8000 ohms S.P.D.T., $1.50; variable air capacitors, 4–14 $\mu\mu$fd type, ASP, 6 for $1; Selenium rectifier including 110 volt transformer. Output 24 volts. 15 amps, $3.00. Mack, Box 123, New Hyde Park, N. Y.

ANTIQUES for sale: Paragon RA10 tuner *with* DA 2 *detector* amplifier and one stage R.F. type 10r, DeForest honeycomb coil receiver. Magnavox horn loud speaker. Good condition. Make Offer. E. T. Butt, Kerrville, Texas.

SALE: The first three issues of *QST*: Dec. 1915, Jan. 1916, Feb. 1916; *also the following issues:* Oct. 1916, May, June, July, August 1917 and beginning with April, 1920, consecutive into 1933. Paul Watson, 27 Price St., West Chester, Penna.

SELL FB7–20, 40, 80 coils. Patterson All-wave pre-selector, $25. W2KZ, 531 Cambridge Ave., Buffalo, N. Y.

HEY! I need good 80-meter coils for FB7. State price. W2ADV Meeker, 624 Reynolds St., Elmira, N. Y.

NC-100 ASD converted to cover 500 Kc to 33 Mc, $95 postpaid. Chester Steffen, Macon, Missouri.

SALE: Echophone, EC-2. Good condition. Write W2ATV, Somers Point, N. J.

RME-45, eleven months old but like new: $150. WØGTC, 5500 Kansas Ave., Omaha, Nebr.

SURPLUS small coils, permeably tuned 28 to 200 meters, set of four, 98¢ new 955 tubes with socket, 89¢; Constant Electric Labs, 112 Cornelia St., Brooklyn 21, N. Y.

DB-20 pre-selector for sale. Factory overhauled 1947. Price, $37.50, Express prepaid US or Canada. All inquiries ansd. W7EYS, Box 221, Bellingham, Wash.

FOR Sale: Large assorted ham equipment including 811s, 866s, 852s, hi-voltage insul. fila. trans. power xfrmrs, 250-watt Thord. multimatch modulation trans., coils, forms, various condens and other parts. All pre-war, $100 or best offer. Write or phone Fitzroy 6229: 173 So. Ardmore Ave., Los Angeles 4, Calif. W6FQK is now W9KWL.

TRADE parts for 1 Kw final for communication receiver. Parts are two T200 tubes, two Johnson 211 sockets, two Cardwell DBN neutralizing condensers; one Bud BC-1634 condenser, one Johnson 50ED30 condenser, hi-voltage mica's, stand-offs and etc. Write and give details. Billy G. Michael, Frankfort, Ind. RR No. 7.

SELL: Hallicrafters Panadaptor, never used, $85. 3-element UHF Resonator beam, used one week. Set of tubes for Temco 75GA, used less than 100 hours. W2NCY, Merritt Ave., Dumont, N. J., Spillner.

SELL: National 1–10A receiver, late serial, condition same as new, $45. W8PQH, Everett Brant, 1161 Delaware, Detroit, Mich.

NATIONAL 1–10A UHF receiver, brand new, complete with coils, tubes, MCS speaker and 5886 power supply. Cost $101.93 two months ago. Will ship in original cartons, C.o.d. $75 and charges. No UHF activity and need money. W2RTM, RD No.1, Ballston Lake, N. Y.

SCARCE tubes: 43, 50Y6, 70L7, 1LA6, 7A8, 25Z5, 1P5, OZ4, 84 57, 58, 14R7, 47, 2A3, 2A5, 2A6, 12J7, 6A8, 5Z4, 35Z3, 6K8, 7B7, 32L7, 50A5, 35A5, 71A, 117L7, XXL, and and other scarce types, all brand-new. Guaranteed. Good discounts. Condensers: brand new, fully guaranteed for one year: 20/20 @ 150, 45¢, 20 @ 150, 32¢; 8 @ 450, 32¢; 16 @ 450, 45¢. Write for free bargain catalog. Commercial Radio Service, 36 Brattle St., Boston 8, Mass.

FOR Trade: 1 Kw fone; 6–10 and 20 meters; HK-354s final; 805s cl. B mod; fully metered and in a 77" deluxe grey Bud cabinet; also SX-28 recvr. Want 16 ft. Century or Chris-Craft inboard runabout boat. Must be sound and no conversion. Photos & data exchanged. W9FNP, 687 W. Lexington Ave., Elkhart, Ind.

FOR SALE: Harvey 80T transmitter with 80, 40, and 20 meter coils, also make key and crystals for 40 meters. Also 6X-39. Please make best offer for all or any part. This is estate of W5FQ. Write Mrs. Burt Stuart, 1401 24th Ave., Meridian, Miss.

SELLING Fifty-watt 40–80 fone/cw xmtr, power supply, rcvr, mike, fones, tubes, complete $100. W2APL, 125 Vroom, Jersey City, N. J. LATEST model National HRO-5TA1 receiver. Complete with speaker, power supply and the 4 standard coils. Used two months. Will sell for $245. Will ship express collect. Satisfaction guaranteed or your money returned. M. C. Alford, Rt. No.1, Box 538-A, Dallas 8, Texas.

FOR Sale: Meissner 150-B xmtr complete with tubes, Meissner signal shifter, extra spare parts and coils for 1.5 to 12.5 megacycles. Used only about two hours. Might need new modulation xfrmr. Will sell to first person with $250 and truck to move it. Lawrence Harvey (W3EMO) 1901–17th St., SE, Washington, 20, DC. Telephone Lincoln 3588.

VHF 140–144 MC mobile xmtr/rcvr ARC/4 4-channel xtal controlled, 12-volt dynamotor, $299. 60-watt Navy PA system, 12 outputs, 3 mike. 1 radio, 1 phono input. $500. Wendell S. Fletcher, 1945 Hilldale, Montrose, Calif.

ANTENNA tuner BC939A (Hallicrafters AT-3) complete with condensers. $20 delivered. W9TNZ, 1818 S1 Hamlin Ave., Chicago, Ill.

SELL: Deluxe 70-watt xmtr, complete. Also NC-46 receiver. Details. Write. WØGEH, Box 231, Willow City, No. Dakota.

SELL: Super-pro, standard model, SP110 series, complete, speaker, power supply, 2.5 Mc.-2500 Kc, $215. F.o.b.; 5" oscilloscope, BC-412, $45. F.o.b. Bank references exchanged. Cash only. W8ZET, 59 Samaritan Ave., Ashland, Ohio.

FOR Sale: Cut hook-up wire, stranded, colors, over 4 ft. length. $1.19 per 500 feet; $2.25 per 1000 ft. Ed Harry (W8LYQ), Plymouth, Ohio.

FOR Sale: Echophone EC-1, Instructograph, bug, miscellaneous parts. All good condition and reasonable. Dalls Smith, W9ORN, 918 Woodbury, Miles City, Montana.

WANTED: Transmitter HT-9. 150 B or similar. Cash. VE6HQ.

PK4DG temporarily in New York, all equipment "gone with the Japs". Wants to buy good second-hand amateur rcvr. Offers: J. V. Eysbergen c/o U. S. Rubber Co., 1230 6th Ave., New York 20, N. Y.

SELL complete station Hallicrafters HT-1, 40, 80, 160-band-switching, 814 final, and HRO-W, 500 Kc to 30 Mc coils. Power supply and speaker. $350 f.o.b. Bruce H. Hart, Pine River, Minn.

ROTARY beam mount and rotator with reversible motor. Weatherproof. $30. William Bates, W8FGG, Reynoldsburg, Ohio.

WANTED: Receiver or transmitter or both, to cover all ham bands 80 to 10 meters inclusive. Under $100. Electronics Society, Drexel Institute, 32nd and Chestnut Sts., Phila. 4, Penna.

FOR Sale or trade, Meissner signal calibrator, Model 9–1076, new condition, cost $78, sell for $47. Vomax Model 900, new condition, cost $60 sell for $45. Browning frequency monitor, perfect condition, $20. Jensen BR bass reflex with 8" high fidelity speaker, $12. W2MT, 7703 Furmanville Ave., Middle Village, N. Y.

SELL: New RME-45 rcvr, spkr, best offer; W2OON, 30 Maplewood, Dobbs Ferry, New York.

TRADE. Two receivers: 100–180 Mcs. 13 tubes, 955, 954, etc. Diecast chassis, micro tuning, tuning graphs, 110–220 volt. Brand new. Never connected up. Value $200 each. Photographs 35¢. Want: 5" oscilloscope, test gear, metal lathe, etc. Alva Radio Lab, 712 Santa Fe, Alva, Okla.

COMMUNICATION receiver precision crystal alignment and repair service. Reasonable rates. Three day service. Northern Electric, Ironwood, Mich.

ATTENTION Penn and Marylander hams, selling BC-610C 10 to 80 meters. Perfect condition. Two spare 250TH one spare 100TH, also spare 866, 807, etc. $600 takes it all if you come after it. Write W3IMH, c/o P. O. Box 134, Waynesboro, Penna.

QSLS. Prewar prices. New ham gear, too. Dossett, W9BHV. 857 Burlington, Frankfort, Ind.

CUSTOM-building of ham equipment, your specifications. Medium power xmtrs, VFOs, etc. Inquire Chatel, W2RSC, ex-W1DIF, 235 Duffield St., Brooklyn 1, N. Y.

WANTED: BC-160 xmtr. Have Kw final for sale, complete, $95. W7BWD. Box 683, Philomath, Oregon.

LOOKING for FB QSLs? Stamp brings samples pronto. Moon, W7APH, Box 59 Opportunity, Washington.

SALE: 2 meter rcvr with built-in speaker. 110 v. Cost $27.74 to build. Only $20. HQ-75 with tube, $9. Bruce, 1171 Union, Manchester, N. H.

ROTATORS! Plenty husky for any beam a Ham can dream up! Navy SO-1 radar type. Beautifully built. Automatic lock-in. Instantaneous reversing. No overswing. Demountable reflector, waveguide nozzle. $59.50 f.o.b. NY, new in original heavy crates. Shppg. weight, 490¢ (stripped for ham use, 150lb). 110 v. 60 cycle oper. Using your parts, or our kit, tapped xfrmr (permitting 1–2 rpm), selenium, condrs, instructions, $19.50. Details, photo, 25¢. *Electronicraft, Inc.*, 5 Waverly Pl., Tuckahoe 7, N. Y.

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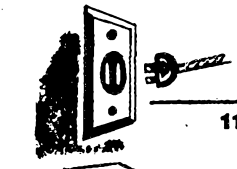
the RME 84 excels in all three



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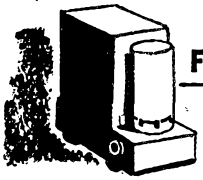
115 VOLT AC



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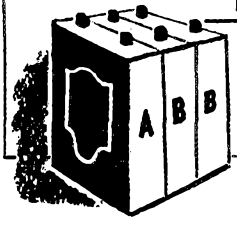

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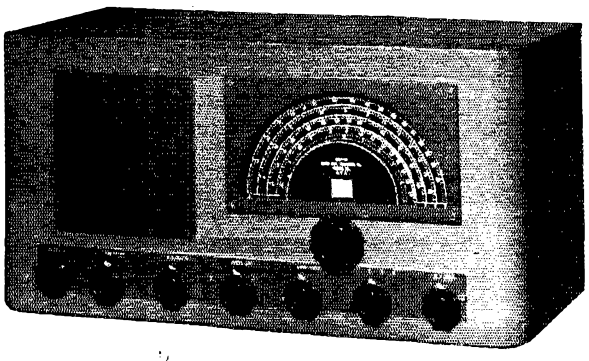

BEING a ham, you've often wished for a portable receiver. The RME 84 was engineered with this in mind and is equipped with a special socket connection on the rear of the chassis apron making possible connections to either a B battery and an A battery supply or a similar source of power such as an external vibrapack.

Because of its modern loctal tubes, the RME 84 will operate at full power on 135 volts of B and 6 volts of A battery. Drain on the B battery is only 22 milliamperes at 135 volts and the 6 volt A battery provides 1.5 amps, including the two dial lights. Disconnecting the dial lights reduces the A battery drain to but 1.2 amps.

For those many field days, for mobile use or for home use, this modestly priced, 8-tube communications receiver is an outstanding value because of its high quality, precision construction.

• • •

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- *Four tuning ranges .54 to 44 MC*
- *One Preselector Stage*
- *Smooth Vernier Tuning Control*
- *Bandspread, positively geared to main tuning control for accurate logging—no backlash!*
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- *Beat Frequency Oscillator—continuously variable by panel control*
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- *Antenna Input Terminals, provision for doublet or single wire*
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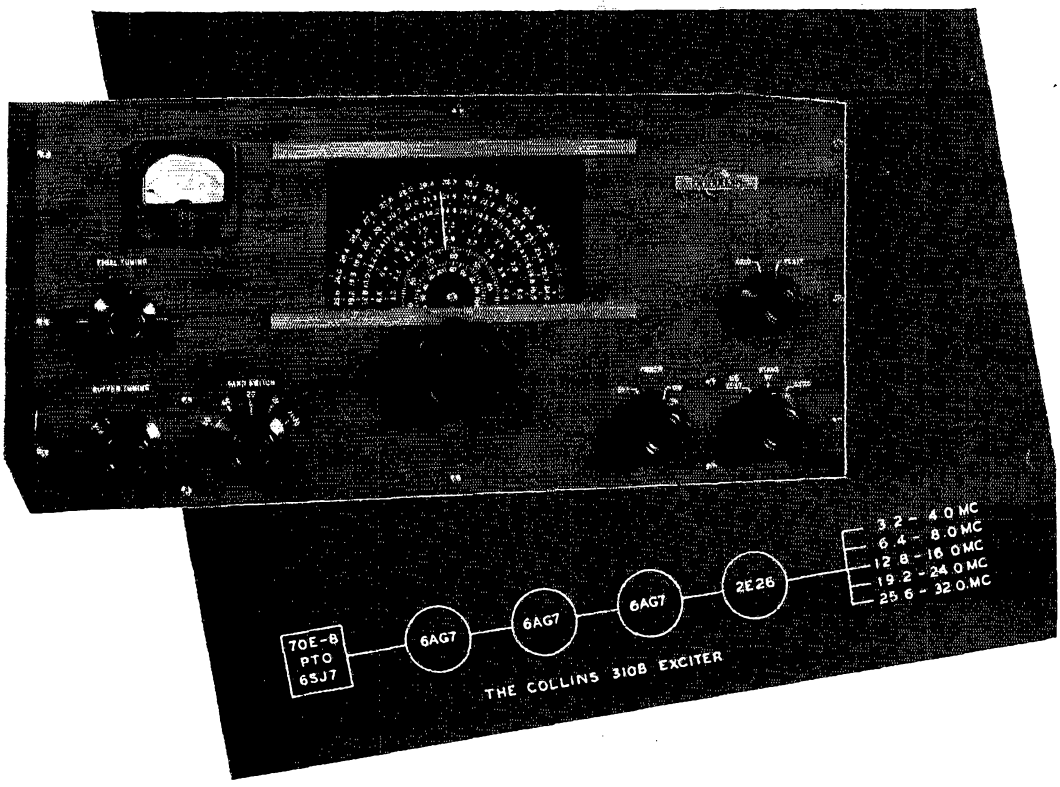

The Collins 310B Exciter puts

Versatility and Precision into your rig

The 310B is the answer to many requests for a multi-band exciter utilizing the Collins 70E-8 P.T.O. (Permeability Tuned Oscillator). Conservatively rated at 15 watts output on all amateur bands up to 30 mc, it will drive a kilowatt pentode final on phone or cw. It provides accuracy and stability of ½ kc on 80 meters, and precision control on all bands.

The bandswitching buffer stages are ganged, condenser tuned, and permeability trimmed. All trimmers are adjusted from the top of the chassis. In the M. O. Test position the plate voltage is removed from the output tube; thus the exciter can be tuned while you listen to a received signal. The power switch can be interconnected with other equipment so that one switch controls the entire transmitter.

The 2E26 output tube has protective bias for keying purposes. Clean keying is accomplished in the cathode of the first 6AG7. Metering is provided for the 2E26 grid and plate currents. Output coupling is by means of a link on the plate tank coil.

Enjoy the many advantages of this new exciter. Use it also in your 6 meter and 2 meter rigs. The 310B makes multi-band operation a pleasure. Write now for full details and the name of your nearest dealer.

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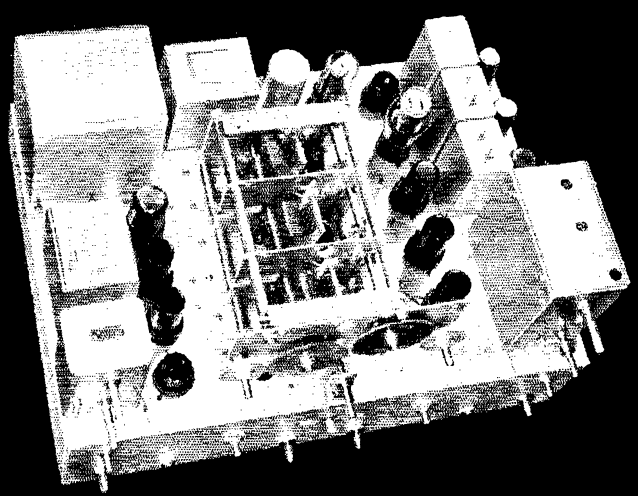
READY NOW

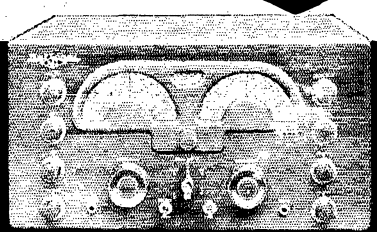
IN ANSWER TO HAMS' DEMANDS

EST. 1914

Hams around the world have been National's collaborators in creating the NC-173—ready now after five years of intensive research. Here are some of the advantages this 13-tube superheterodyne receiver offers:

- The NC-173's newly designed adjustable threshold double diode noise limiter—working on *both phone and CW*—has an extremely high limiting efficiency because of the short recovery time.
- Voltage regulated circuits give the NC-173 high stability and less drift for changes in powerline voltage. The pitch of code characters barely changes—even over extended listening periods.
- The S-meter circuit allows signal strength recordings to be taken on either *phone or code.*
- Works equally well on coaxial feedline, single-wire, directional or balanced antenna.
- AC powered. Will also operate on battery for portable or emergency use—110/120 or 220/240 volts, 50/60 cycle. Frequency range .54 to 31 and 48 to 56 MC. (Includes calibrated band spread on 5, 10, 11, 20, 40 and 80 meters).
- Ask your dealer to let you see and hear the new moderate-priced NC-173.





THE NATIONAL NC-173

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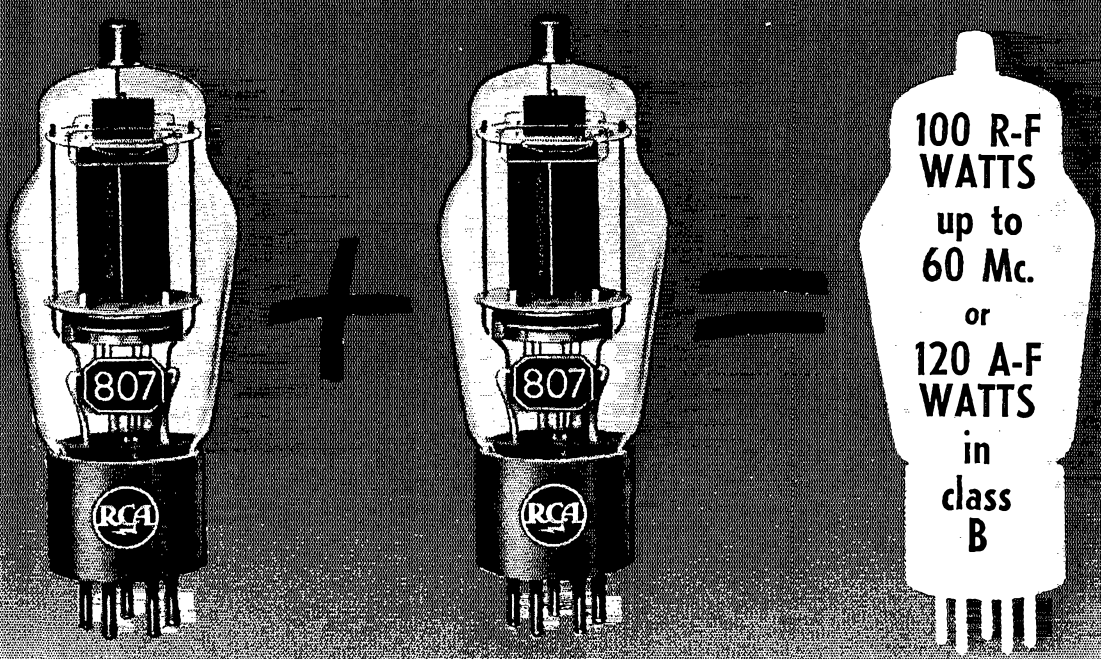
MOST DISTINCTIVE NAME IN RADIO COMMUNICATIONS

WHAT'S BETTER THAN AN RCA-807?



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RCA–807's are still tops in watts-per-dollar value. They will operate without neutralization and they provide high efficiency at low plate voltage.

1. **Two RCA–807's** push-pull in ICAS Class C telegraph service can deliver 100 watts RF output with 750 volts on their plates.

2. **Two RCA–807's** push-pull in ICAS Class C telephony service can deliver 85 watts RF output with 600 volts on their plates.

3. **Two RCA–807's** push-pull in ICAS Class B modulator service can deliver 120 watts audio output with 750 volts on their plates.

4. **Two RCA–807's** push-pull in RF service can be driven by an inexpensive receiving type tube, such as the 6V6, used as a doubler.

5. **Two RCA–807's** push-pull will take full input and operate at high plate-circuit efficiency at frequencies up to 60 Mc.

For the complete story, see the next issue of Ham Tips. It's available at your local RCA Tube Distributor or from RCA, Commercial Engineering Department, Sec. M-54D, Harrison, New Jersey.

THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA

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