New designs and products are in continuous development at the U.T.C. Research Laboratory. While most of these items are specific to customer's unusual requirements, units having general application are added to the New U.T.C. catalogue.
ALL'S HERE, and doubtless you're weighing your rig's DX possibilities. How about a real try for overseas areas that you haven't been able to work in the past?

Your power tubes need consideration first. Possibly their replacement is called for. If so, may we suggest GL-8005's in push-pull—in case you want plenty of dependable watts per dollar, and your rig is in the medium-power class.

CW input for a pair of GL-8005's is 600 w. Phone input is 475 w. Two of these distance-spanning triodes cost no more than one typical 500-w tetrode, and you have greater reliability because triodes don't need "babying along". That's vital when you're out after DX.

A single GL-8005 can, of course, be used for the final stage, with input one-half of the figures above, but we recommend two tubes ... and not just because of the higher input with a pair. For with GL-8005's in push-pull, you (1) reduce second-harmonic radiation which today should be all but eliminated in ham transmitters, and (2) enjoy a better-balanced circuit and layout.

Max ratings apply up to 60 mc frequency, or well beyond the 6-meter band. And drive requirements are low—15 w for a pair in CW operation, 18 w phone—so that replacing your present tubes with GL-8005's usually means little, if any, change in your rig.

Ask your G-E tube distributor for prices and other up-to-the-minute information on Type GL-8005. Or write Electronics Department, General Electric Company, Schenectady 5, N. Y.

See your G-E tube distributor for the latest copy of Ham News, 8 pages—fully illustrated—jam-packed with helpful hints toward better ham transmission and reception ... and FREE!

ELECTRICAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Filament voltage</th>
<th>10 v</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current</td>
<td>3.25 amp</td>
</tr>
</tbody>
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Interelectrode capacitances:

| grid-plate | 5 mmfd |
| grid-filament | 6.4 mmfd |
| plate-filament | 1 mmfd |

RATINGS (ICAS) FOR TYPICAL OPERATION

<table>
<thead>
<tr>
<th>Class C</th>
<th>Class C</th>
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<td>telephony</td>
<td>telegraphy</td>
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| Plate voltage | 1,250 v | 1,500 v |
| Current       | 190 ma  | 200 ma  |
| Driving Power | 9 w     | 7.5 w   |
| Power input   | 235 w   | 300 w   |

ELECTRONIC TUBES OF ALL TYPES FOR THE RADIO AMATEUR

GENERAL ELECTRIC

101-F20-8650
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"The hottest ham performance ever at this price..." That's the verdict of amateurs who have had a chance to try Hallicrafters new Model SX-43.

This new member of the Hallicrafters line offers continuous coverage from 540 kilocycles to 55 megacycles and has an additional band from 88 to 108 megacycles. AM reception is provided on all bands, except band 6, CW on the four lower bands and FM on frequencies above 44 megacycles. In the band of 44 to 55 Mc., wide band FM or narrow band AM just right for narrow band FM reception is provided.

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FEATURES FOUND IN NO OTHER RECEIVER AT THIS PRICE

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- Exceptionally good signal-to-noise ratio
- Separate electrical bandspread calibrated for the amateur 3.5, 7, 14, and 28 Mc bands

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Section Communications Managers of the ARRL Communications Department

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Integrated in a compact unit of pleasing appearance, a transmitter has evolved incorporating substantial power output, separate high and low voltage power supplies, a highly novel, but simple, exciter band switching arrangement and extreme ease of adjustment and operation.

Every consideration was given to the ultimate user of this piece of equipment... the amateur; that is why a choice is given of several different R.F. output tubes... that is why the circuit design is straightforward and reliable... that is why the ST-202-A is properly priced.

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SIMPLIFIED CIRCUIT FOR USE ABOVE 100-MC.

The tube is a "natural" for the 152-162 Mc. band. Its low inter-electrode capacitances, compact structure, short electron transit time, high transconductance, together with being a tetrode allows simplification of circuit. Operation of the 4-65A can be continued up thru the 225-Mc. amateur band in either FM or AM service.

The 4-65A incorporates an instant heating thoriated tungsten filament, processed grids—controlling primary and secondary emission, and a processed metal plate—enabling momentary overloads without affecting tube life. All of the internal elements are self supporting without the inclusion of insulating hardware. Neutralization is normally unnecessary since practical isolation of the input and output circuits is achieved by the screen grid and its supporting cone. No special gear is required for installation, as the five pin base fits available commercial sockets.

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The 4-65A is amazingly versatile, being ideally suited for audio, television, r-f heating, and communication applications, stationary or mobile. It is priced at $14.50 each. Additional data may be had by writing to:

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181 San Mateo Ave., San Bruno, California

To insure performance of the 4-65A... severe mechanical tests are conducted—from withstanding a bump test to holding up under excessive vibration. Tests are carried even further... satisfactory shipment of the tube is insured by package drop tests.
THE AMERICAN RADIO RELAY LEAGUE, INC.,
is a noncommercial association of radio amateurs, founded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternality and a high standard of conduct.

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

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

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

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"It Seems to Us..."

LONG FACES

The other evening on 14-Mc. ’phone one of the boys was grousing about the eventual cut of 50 kc. in our 20-meter band. So far, so good—we’ve done some grousing about it ourselves. But he was remarking what a bunch of lunkheads the people at the conference must be for dipping into the crowded amateur bands. He wondered why they didn’t take away from some other service.

"Why didn’t they take away from some other service?" That’s a good question. And perhaps it deserves more detailed discussion than we have heretofore given. In QST’s pages we have talked mostly about the amateur service frequencies—gains, losses and relocations—because that’s what principally interests you and us. What, then, happened to some of the other services?

Well, there are a number of pretty long faces among the U. S. radio service representatives now leaving Atlantic City. Like the amateur service, they had appeared at the 1944 FCC hearings which furnished the background for formation of the American position at the coming world meeting. Like the amateur service, they had been pleased at some of the results of those hearings, very disappointed in others—but found themselves generally satisfied, as were amateurs, that the U. S. position was as fair to all services as was possible. Like the amateur service, they went to Atlantic City committed to work with each other, and us, in support of the U. S. Government delegation and its formulated policies. And like the amateur service, they found that many times the necessity for compromise in the face of entirely opposite viewpoints existing in the delegations of other countries made it impossible for the U. S. A. to achieve all its wishes.

The fixed service (government, commercial and military point-to-point) is taking by far the most severe cut. Estimates of its actual losses run from 20 to 33 per cent (the difference results principally from divergent opinions on the value to fixed of the frequencies it presently shares with mobile under the Cairo, 1938, regulations). The U. S. proposals for fixed were appreciably less than under Cairo, and Atlantic City cut them back further. On the effective date of the new conference regulations, though perhaps two years away, the fixed service is just going to have to give up a most uncomfortable percentage of its present channels. And this in spite of the fact that the expanding aeronautical service will have many requirements for point-to-point service which must also come out of these bands.

One of the particularly long faces belonged to a Government official. He was concerned over the problems that the expanded maritime-mobile service is going to have to solve to operate successfully in the bands it is getting out of Atlantic City.

"Well," you ask, "who’s getting all the gravy? Fixed, maritime mobile and amateurs seem to be the losers. Where are these frequencies going, anyway?" That’s another good question, to which the answer is mainly two-fold: high-frequency broadcasting, and the aeronautical mobile service.

The latter, of course, needs more frequencies. The rapid expansion of airlines, both domestic and international, caused by the world’s greatly-increased interest in aviation, has resulted in a huge need for more channels. Because the safety of life and property are involved, no one can challenge the need for radio service and the frequencies required to furnish it. (However, aeronautical mobile by no means had a blank check; it had to make intensive studies and surveys of actual operation, and demonstrate its frequency needs in terms of the number of planes in the air at any one time in any one area, the proximity of routes, the distances at which propagation studies indicated duplicable use of channels was feasible, and so on.) While many of the new channels for aeronautical mobile are in the v.h.f.-u.h.f. regions, as are ours, it did indeed have an urgent need for space in the long-distance bands much greater than the admittedly limited facilities provided under Cairo.

International high-frequency broadcasting? (Proofreader: Be on your toes to cut out any improper language we may use!) We’ve said on this page before what we think of the justification for this service in h.f. bands: there ain’t any. The U. S. A.’s official position at the world conference was for modest assignments to h.f.
broadcasting. But there were a great many foreign countries who wanted more and more and more space for it. After weeks of discussion, it being obvious that compromises were necessary, our Government was obliged to agree to broadcasting assignments far greater than U. S. A. wishes — although considerably less than the wishes of many of the other countries.

These are but the highlights of the manner in which some of the other services are being affected. Radio communication, on DX frequencies at least, is an international matter on which there must be agreement among the nations of the world; otherwise, chaos would result. On the lower and higher frequencies where regional deviations are reasonably feasible, the countries of the American region have insisted upon the full width of our present bands — such as 3.5 and 50 Mc., and even 7 Mc., even though those bands were cut in Europe — because our governments know the amateur service in our two countries is extremely crowded in our present assignments.

But to the question, "Why didn't they take away from some of the other services?" the answer can be simply stated: they did! — J. H.

RESERVE DRILLS

From the Naval Reserve article in this issue, we are glad to see the Navy retaining its post-war policy of not congesting the amateur bands with reserve drill networks, even though the participants are amateur licensees.

Under the crowded conditions existing in our bands today there is no room for the successful operation of military-reserve networks by enrolled amateurs, a fact the Navy well recognizes. Such drills really do not belong in the amateur bands; they are specialized training operations and should be so provided for. FCC allocations to amateurs are not made with considerations of possible use by these nets. Military services receive their frequencies by Executive Order, which is perhaps as it should be; and although we are quite aware of the extensive frequency needs of the U. S. services we fully agree with USN that provision should be made therein for reserve drill networks. That is, in fact, a standing policy of the ARRL Board of Directors.

Of course we amateurs support these communications reserves. We've often pointed out the value of the amateur service as a reserve of trained personnel — by no means only for military purposes but basically for all the U. S. radio needs. So when military communications reserve stations are to be used in amateur bands, it should be, as the Navy provides, strictly in amateur status. As such we welcome them. — J. H.

**A.R.R.L. CONVENTIONS**

**New England Division**

*Boston, Mass., October 18th*

When the Eastern Massachusetts Amateur Radio Association and the South Shore Amateur Radio Club pool their efforts in sponsoring an amateur gathering, you can be assured of a bang-up affair! This year the 10th Annual Boston Hamfest is being combined with the New England Division Convention. The date: Saturday, October 18th. The place: Where else but the Mechanics Building? The program: Bigger and better than ever, of course. Registration: $1, plus $3 for those wishing to attend the banquet. Extra prize stub for those buying combination tickets before Oct. 1st. Write Frank Baker, W1ALP, 91 Atlantic St., North Quincy 71, Mass.

**Southwestern Division**

*Phoenix, Arizona, October 18th-19th*

Beginning with a preregistration party Friday evening, the Radio Club of Arizona has a full program planned for the Southwestern Division convention, to be held this year at the Hotel Adams and the Shrine Auditorium, Phoenix, over the October 18th week-end. Technical demonstrations by men such as John Reinartz, contests, ARRL representative, plenty of prizes, movies, dancing, banquet, special events for the gals — these will make your trip worth while. Make reservations early to the Radio Club of Arizona, Box 3751, Phoenix. Registration: $5.00.

**New Hampshire State**

*Manchester, October 4th*

It's Manchester again this year for the New Hampshire State Convention (New England Division), to be held October 4th at the Masonic Temple on North Elm Street. Anyone who has ever attended one of these affairs knows what a good time he can expect. Anyone who has never been to Manchester should come this time and enjoy a grand program, lots of prizes, good speakers, and a family-style banquet. Registration is $4.00. Write J. Henry Izart in care of the Manchester Radio Club.

**OUR COVER**

Uncovering performance data for a 16-element array is a cinch when you're working with the compact dimensions of 420 Mc. This month's cover shows (l. to r.) "Pete" Morrow, W1VG (ex-W9VKF), Jack Paddon, VE3BLZ, and Vern Chambers, W1JEQ, checking Ed Tilton's gain figures on a Hz. lawn test set-up. W1HDO promises a full report on the interesting possibilities of this band, to appear in an early issue.
Exit Heterodyne QRM

Selectable Single-Sideband Reception Up-to-Date

BY J. L. A. McLAUGHLIN*

The need for improved means of receiving signals through heterodyne beat-note interference has in the last few years become increasingly apparent.

During the war the writer designed and built for the Federal Communications Commission and the Office of Strategic Services a receiving system that enabled them to copy 'phone and c.w. transmissions through terrific heterodyne QRM that made reception hopelessly impossible on the best conventional receivers.

The FCC first employed this communications aid as far back as the summer of 1941. The June, 1941, issue of QST contained an article by this author describing this communications development.1 Mr. George Sterling, then chief of the Radio Intelligence Division of the FCC, was quick to recognize the importance of this invention2 to the highly specialized work in which the Commission was engaged. The Commission immediately purchased the original development model and subsequently ordered units for all primary monitoring stations throughout the country. Because of Mr. Sterling’s foresightfulness, when war came one Government agency, at least, was capable of carrying on radio intelligence work in the face of malicious or accidental interference. When the communications division of the OSS was set up, shortly after the start of the war, it, too, promptly ordered similar equipment for its services.

The first war model supplied the OSS and the FCC was similar to the early models used by the FCC. Later, a second war model was designed for the OSS; it was a decided improvement over earlier models both in performance and design. It was more compact, for one thing, and it was self-contained and could be connected to any of the standard communications receivers in use by the OSS, without modification or circuit changes in the attached receiver. Because this later model lends itself more to present-day amateur requirements, this article will be devoted to an explanation of its performance characteristics in the presence of strong heterodyne interference.

**Heterodynes**

How this new heterodyne-eliminating receiver operates will perhaps be made clearer if we take up first the causes of beat-note interference and the inherent weakness of today’s communications receivers in the presence of such interference.

The single heterodyne audio beat note, the product of one off-frequency carrier beating with the carrier of the desired signal, is well understood, but the audio beats produced by multiple off-frequency carriers are not clear to many.

Fig. 1 will help to form a picture of just what takes place after rectification of two or more carriers. Fig. 1-C indicates that when four carriers are present six principal audio beat notes are produced by rectification.

The removal of one heterodyne beat note can be achieved either before or after rectification by some form of phasing device; that is, some scheme.

---

* Box 529, La Jolla, Calif.


2 U. S. Patent No. 2,364,863.
Fig. 2 — Circuit diagram of an adapter unit for working with a conventional communications receiver. The i.f. output from the receiver is introduced to the two 6SA7 converter tubes at the left. The oscillator of "A" is on 495 kc., and oscillator "B" is on 505 kc. Only one 6SA7 is in operation at any time, as determined by the position of the switch. In either case the resultant beat with the desired signal is 50 kc., which passes on through the 50-kc. bandpass amplifier. However, the interference appears on the high-frequency side or the low-frequency side of the 50-kc. signal, depending on its initial relation and which converter tube is in use. The unsymmetrical 50-kc. channel has high attenuation for frequencies below 50 kc. and rejects the interference and sideband on one side of the signal.
Here is a simplified and improved version of the receiving system first introduced in QST just before the war. A thorough trial in wartime radio intelligence work proved the worth of the system—a system that can go a long way toward eliminating QRM.

capable of putting a variable rejection notch in the response curve of either the i.f. or a.f. amplifiers. Schemes such as these have been mentioned in the pages of QST by this and other authors. The rejection of a single interfering carrier can be demonstrated quite beautifully in the laboratory, but under normal communications operations, when complex heterodynes are present, these systems fail to generate any great enthusiasm in the operator. The reason for this coolness can be found in an inherent weakness in all such devices—that is, in the presence of heterodyne interference the best-note tone seldom will give any clue as to whether or not it is being produced by only two carriers, or by more than two. If there are more than two carriers present this sort of rejector falls down. Instead of being an aid the adjustable rejection becomes a nuisance, and distracts the operator’s attention from the real job at hand—i.e., the message being received—and forces his attention on the beat notes.

It is obvious that to be useful under present-day crowded band conditions any practical system of heterodyne elimination must first of all be rapid in operation, suppressing all the interference that it is capable of suppressing under the particular receiving conditions in a minimum of operating time. It must not introduce any new operating techniques alien to the normal training of the operator—rather it must permit the operator to concentrate on the signal being received, not on the interference.

The system developed by this author (Fig. 2), which is the subject of this article, satisfies these conditions. It is fast and effective, being semiautomatic in eliminating multiple-heterodyne QRM both on 'phone and c.w.

**Operating Principles**

The receiver is fundamentally a triple-detector superheterodyne. The desired signal in the first i.f. system (455 kc.) is converted to a new intermediate frequency of 50 kc. This 50-kc. i.f. system differs from the conventional in that the response curve is unsymmetrical (Fig. 3). All frequencies below the carrier (50 kc.) are greatly attenuated, giving the amplifier the characteristics of a high-pass filter.

On 'phone reception this unsymmetrical selectivity of the 50-kc. i.f. system permits single-sideband reception. Since both sidebands contain identical intelligence, we can sacrifice the one containing the undesired signal without reduction of intelligibility or naturalness.

The manner in which the desired single side-band is selected is as follows: Two crystal-controlled oscillators are used, one ("A") on 405 kc. and the other ("B") on 505 kc. Either will convert the 455-kc. carrier to 50 kc. Although the desired carrier remains the same in both cases, all other frequencies converted will be transposed when switching from oscillator "A" to oscillator "B." "A" converts the 455-kc. signal to 50 kc. and all the side frequencies in the same numerical order, hence the upper single-sideband frequencies are selected in this case. Oscillator "B" converts the 455-kc. signal to 50 kc. and inverts the numerical order of the sideband frequencies, hence the lower sideband frequencies are selected in this case. Assuming that an undesired carrier happens to be 456 kc., "A" will convert this "side" frequency of 456 kc. to 51 kc., and oscillator "B" will convert the same frequency to 49 kc. In other words, we have here a system in which we can switch undesired carriers from a frequency on one side of the desired carrier to a new frequency on the other side. Since the 50-kc. i.f. is of the high-pass single-sideband type, this switch permits placing the undesired carrier either in or out of the passband frequencies. In the case of the
The heterodyne eliminator is a small unit that can easily be set on top of a communications receiver. This model was built for the OSS for wartime radio intelligence work.

456-kc. interference, oscillator "B" would be selected to eliminate the 1000-cycle beat note; "B" converts the signal to 49 kc., which frequency is attenuated 50 db. in the 50-kc. i.f. filter. If "A" had been used instead, the undesired signal would have been converted to 51 kc., resulting in no attenuation at all.

C.W. Reception

The selectable single-sideband system of heterodyne elimination is an obvious improvement in the reception of phone signals. At first glance its value in c.w. operation may not be so apparent. The improvements, though not obvious, are nevertheless present. The unsymmetrical filter (50-kc. i.f.) cuts off very sharply at the edge of the signal carrier's frequency; it is similar to a crystal filter with the rejection notch set about 1000 cycles below resonance. It differs from the crystal curve, however, in that it cuts off a wide band of frequencies rather than putting a notch at one particular frequency in the resonance curve. By means of the sideband selector switch we can flip an undesired carrier to the low-frequency side of the unsymmetrical filter. It should be obvious that throwing a switch that removes a whole band of frequencies is faster and easier to do than adjusting a critical phasing control, as is the practice in crystal-filter operation.

The second point in favor of this system over the crystal filter is that the objectionable "ping" of the high-Q crystal circuit is absent. A final improvement in the reception of c.w. signals is achieved by use of a sharply-tuned 1000-cycle filter in the audio circuit. This filter, together with the unsymmetrical response-curve switching system, makes for very easy c.w. operation even in the presence of tough QRM. In c.w. work the b.f.o. is left fixed at the correct frequency to produce a 1000-cycle beat note with the desired signal. The operator merely tunes for maximum signal strength.

Tuning the Carrier

A prime requisite of single-sideband 'phone operation is placing the desired carrier correctly in the bandpass filter of the second i.f. In the model described earlier a visual system of tuning was employed, using a tuning meter connected to the output of a sharply-tuned 50-kc. amplifier.

In the later system this extra equipment has been eliminated and an accurate aural system substituted. The center position of the sideband selector switch is marked "carrier." In this position oscillators "A" and "B" are both operating, and the correct tuning is indicated aurally when the signal is tuned to zero beat with itself. (The two i.f. signals produced by the beats between the desired carrier and the two oscillators move in opposite directions as the receiver is tuned.) Further help in aural carrier positioning is achieved by narrowing the bandwidth of the high-pass filter in the "carrier" position of the switch. This bandwidth is made only a few hundred cycles wide and peaked sharply at 50 kc. When the sideband control switch is flipped either to the upper or lower band the original bandwidth of the high-pass filter is restored and one oscillator is disconnected. This improved aural tuning system permits normal tuning by ear of a 'phone signal in the presence of extreme interference.

For c.w. reception as well as 'phone the FCC and the OSS found this system far superior to the conventional communications receivers. These units made it possible to copy signals through heterodyne interference that otherwise would have made them unintelligible.
AUGUST IN REVIEW

Last month we expected that the allocations work at Atlantic City would be concluded in late August, so that we could give you a final report in this issue. Progress has been slower than hoped and it is now apparent that the work will run far enough into September to make it impossible to report it — at least in detail — in this number. So there will be at least one more installment of this temporary QST department. The opening of the International High-Frequency Broadcasting Conference — the third and last of the Atlantic City conferences — in August has further reduced the rate of accomplishment of the radio conference. Both in allocations and in the organizational and political matters the problems this month have been the harder ones that did not yield easily. Yet actually a great deal has been accomplished, solutions are now being found for all the major difficulties, and most of the committees are approaching the end of their work. Then will come the editing and assembling of the conference work into a formal document and its ultimate formal approval by plenary meetings — meaning yet some weeks of painstaking work before A.Cy. begins to become but a memory.

At the moment of writing, a partial allocation table has been adopted by the main allocations committee from 10 kc. to 2850 kc. and another one from 25 Mc. to 10,500 Mc. Except for some of the maritime bands and the amateur 14-Mc. band the table for 2.85 to 25 Mc. has not yet been adopted, although a draft exists which has tentative acceptance in most respects. We shall follow our practice of previous months and give you below the current situation on each of our bands as it appears to us at the end of August:

1.75 Mc.: The provisions we outlined in this column last month have now been accepted and approved by the allocations committee. As we said then, they do not, for the present, offer anything to American and Canadian amateurs.

3.5 Mc.: The tentative agreement we reported last month still awaits formal adoption by the committee. In the American Region it repeats the Cairo arrangement — what we have now, the same as all the world conferences have provided since 1927 — and lists 3500-4000 kc. as shared between amateur, fixed and mobile, subject to later regional determination. The amateur proposal for Europe and most of the rest of the world is 3500–3800, shared on a mixed basis with three other services, and with the rest of the band up to

Allocations Committee Completes Amateur Assignments!

On September 8th, after this article was written, the Atlantic City allocations committee completed its adoption of a frequency table, including provisions for amateur bands at 3.5 and 7 Mc., and a new 21-Mc. band, precisely as previewed in this article except for slight modifications in regions outside the Americas which we shall report next month. The effective date has not yet been decided but it is believed it will be some time in 1949. These allocations are not final until they are approved by the plenary sessions and the documents signed but it is now possible to say that, barring unexpected changes in final plenary meetings, the allocations of U.S. and Canadian amateurs for the next interval between world revisions of regulations will be:

<table>
<thead>
<tr>
<th>Band</th>
<th>Allocation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3500–4000 kc.</td>
<td>(available under regional arrangement as at present)</td>
</tr>
<tr>
<td>7000–7300 kc.</td>
<td></td>
</tr>
<tr>
<td>14,000–14,350 kc.</td>
<td></td>
</tr>
<tr>
<td>21,000–21,450 kc.</td>
<td></td>
</tr>
<tr>
<td>26,960–27,230 kc.</td>
<td>(shared with ISM)</td>
</tr>
<tr>
<td>28,000–28,700 kc.</td>
<td></td>
</tr>
</tbody>
</table>

and allocations from 50 to 10,500 Mc. in exact accord with present assignments except that 1215–1225 Mc. is expanded to 1215–1300 Mc. The band 220–235 Mc. will temporarily remain 235–240 Mc. Final details will appear in our next issue.
4000 kc. assigned in small slices to other services, sometimes two or more of them sharing. Australia, however, has put in for 3500-3800 exclusively for amateurs, and China and New Zealand have said they desire the whole 500 kc. for amateurs.

7 Mc.: The tentative agreement we reported last month is still pending before the committee. For Europe this plan yields only a hundred kilocycles exclusively to amateurs, plus another 50 shared with broadcasting under the condition of no interference to the latter, while broadcasting gets the rest exclusively. This arrangement would apply also in India, the Netherlands Indies and the British colonies and protectorates outside the American Region. Australia and South Africa desire to divide the band into two exclusive halves, 7000-7150 amateur, 7150-7300 broadcasting, avoiding any shared use. For the whole American Region and for New Zealand (and for most other parts of the world not yet specially listed) the plan calls for the whole band, 7000 to 7300, remaining exclusively amateur.

13 Mc.: The sole assignments so far adopted by the allocations committee in the range from 2.85 to 25 Mc. are three maritime-mobile bands and the amateur 14-Mc. allocation, which therefore were joined in a deadlock that endured from early July until August 23rd. We hope that you have read, for background, our report on this band on page 34 of last month's QST. Space does not permit its repetition here; we can only pick up the story at that point and carry it to its end. When we last wrote, both the committee and its working group were at an impasse in the matter of this band. The WG could get no agreement; in the committee the forces were about evenly divided between the countries that wanted to continue the whole 400-kc. band for amateurs and those that wanted to reduce it to 300, assigning the remaining 100 kc. to fixed. After seven weeks of study and debate, including two lengthy sessions of the main committee, the band was decided as 14,000 to 14,350 kc., on an exclusive worldwide basis except that U.S.S.R. is to be permitted to make a shared use with the fixed service in the last 100 kc., 14,250 to 14,350 kc., for domestic use only, pledging itself to employ all necessary technical measures to reduce harmful QRM to amateurs to a minimum. The remaining 50 kc. (14,350-14,400) are now to be assigned to the fixed service. This decision, of course, was a compromise between the two opposing viewpoints. It means that we have lost 50 kc. from our best DX band but that, except for the special case of U.S.S.R. territory, we have kept the band on a worldwide basis rather than one on which part of the world might have had 400 kc. but the other part would have had only 300. It is bad enough to have this kind of mutilated assignment at 7 Mc.; it would be much less desirable at 14. The major nations, including the United States and Canada, felt that regional sharing was impracticable at such frequencies and that it was imperative to set the bandwidth at the maximum figure to which worldwide agreement could be got. Both our countries did their absolute utmost to maintain the old bandwidth for us. They kept the matter open these many weeks, they made many speeches in defense of the 400 kc., they engaged in extensive private negotiations on the matter. No item before this conference has been discussed so long and so exhaustively. For whatever consolation it may be to us, we can believe that every last thing possible was done. The trouble, of course, is that it has been necessary to increase the allocations to h.f. broadcasting by several hundred kilocycles, and inevitably this increase has had to be taken from the assignments of other services. Most of the services have had to yield something, most of them consider themselves rather badly hurt; and the point was repeatedly made that all services had to share the "cost" of broadcasting and that the amateurs could not be an exception. When the subject came up in committee the second time, only nine countries, led by U.S. & Canada, were willing to take an outright stand for a 400-kc. band. Led by France & U.K., the others quickly aligned themselves for the 350 compromise, they consisting in about half of the cases of countries that had previously desired only 300 and in the other cases countries that preferred 400 but admitted willingness to take 350 if it were necessary to get unanimous agreement. (The first group, by the way, included Mexico, who said that she preferred 300 and was consenting to 350 reluctantly, and that if all the countries did not agree to 350 the most that she would accept would be 300.) The spokesman for U.S., New Zealand, Canada, China and Venezuela repeatedly pleaded for the retention of the full band, some of the talks being superb expositions of the value of the amateur service. They did not yield until the last moment but finally, after nearly three hours of this further debate in the large committee, they had to acknowledge defeat. Without a roll call it was then agreed, without further dissenting voice, that our band would be 350 kc., the other 50 kc. fixed. Amateurs everywhere will join with us in feeling it is a great pity that the amateur service, with its extremely small holdings in the DX part of the spectrum, should have been obliged to make this contribution to world readjustments. Our friends here have pointed out that with our new 21-Mc. band (which at this writing seems assured) we'll still show a substantial gain in this region, and the spokesman for one of the major powers congratulated us after the meeting for having pulled a worldwide exclusive band of 350 kc. up from a much lower figure; but, so far as we are concerned, no matter how you cut it...
that it wasn't for lack of discussion — our matter was "worked on" for seven weeks as no other amateur matter (and almost no other allocations matter) ever was, with every possibility of effecting world agreement on a wider band thoroughly explored and exploited.

21 Mc.: The tentative agreement we reported last month is still pending before the committee. It provides for a new band, 21,000 to 21,450 kc., on a world-exclusive basis.

27 Mc.: Throughout all of the American Region and in Australia, New Zealand and South Africa we have a new international band as a result of the acceptance by these countries of the U.S. proposal to get recognition for our 11-meter band sharing frequencies with industrial, scientific and medical apparatus. To recognize the ISM problem and implement its control it was found desirable to set up a worldwide ISM frequency (one of several), and this has now been done, by decision of the allocations committee — at a figure slightly different than that heretofore used here, namely 27.12 Mc. This will result later in a slight shift in our 11-meter assignment to the new band 26.90 to 27.23 Mc., subject to ISM QRM as before. It is probable that other countries will join their amateurs into this arrangement later.

28 Mc.: The U.S. proposal for the 10-meter band has been approved and adopted, as a result of which it has been decided that this band will be 28 to 29.7 Mc. on a worldwide exclusively-amateur basis, no longer shared with experimental stations.

50 Mc.: It should be recalled to mind that the Cairo amateur band in this part of the spectrum is at 56 to 60 Mc. and in some regions is only 58½ to 60 Mc. Our present assignment of 50-54, differing from Cairo, is a recent matter and has been pretty well confined to the U.S. & Canada. The proposal of our two countries to assign 50-64 Mc. as an exclusive amateur band has now been adopted for the whole American Region, Australia, New Zealand, South Africa, and for all of Asia except U.S.S.R. We regrt to report that there is to be no regularly-assigned 5- or 6-meter band in the European region except for the tiny segment 72 to 72.8 Mc. which has been reserved for that purpose by France and U.S.S.R. (including Asiatic U.S.S.R.). The United Kingdom has set up its television system in the range 41 to 61 Mc. and, although it now has amateurs at 58½-60 per Cairo, it refused to consider a definite allocation for them in or near this range, and its influence controlled the allocation column for the European-North African region. However, we understand that it is the intention of U.K. and several other European countries to permit amateur operation somewhere in the 50-60 Mc. area in the television channels, as a domestic matter on the condition of no interference to other services. The 800 kc. at 72-72.8 in two European countries is not regarded as a general amateur assignment.

144 Mc.: Even the v.h.f. portion of the spectrum is congested with problems. Regional allocations have grown up with differing practices in different parts of the world and for a while it looked as though we were going to have three different "2-meter" bands around the earth: 144-148 in the Americas, 154-160 in Europe, 166-170 in Australasia. An adroit bit of negotiating by U.S. eventually resulted in their consolidation.
at our part of the spectrum and in the earmarking of half of the band on a world-exclusive basis. It has now been decided that 144-146 shall be worldwide amateur. That is the size of the band in Europe and Africa. However, the remaining two megacycles, 146-148, are additionally assigned to amateurs in the American Region, Australia, New Zealand and Asia-except-U.S.S.R.

We also understand that if ZS amateurs later find that they need this additional half of the band and request it of their PMG, it can probably be arranged.

220 Mc.: You must remember that our real assignment in this range is 220-225 and that it is only on a temporary basis that we occupy our present frequencies of 235-240. The U.S. proposal of 220-225 for amateurs has been adopted for the American Region, China and South Africa. In the American Region the navigational aid known as DME operates on these frequencies until Jan. 1, 1952, under a special treaty which temporarily puts us on 235-240. Europe and the other British dominions, because of their concern with DME, did not find it possible to go along on an amateur assignment in the 200-Mc. range.

420 Mc.: This is the band which we temporarily share with altimeters, under a power restriction that recognizes that such an "AeNA" must not be interfered with by another service. The U.S. proposal has been generally accepted and as a result we have 420-450 as a worldwide band except in U.S.S.R., not exclusive but shared with zero navigation aids, which maintain priority as at present. A footnote adds that in this region the AeNA will be confined to altimeters only and is only a temporary assignment. The band is to be eventually exclusively ours in this region. In Europe (except U.S.S.R.) and in Africa, the band runs up to 460 Mc. instead of 450.

Above 1000 Mc.: The pattern for microwave allocations here has closely followed the pioneering assignments of the U.S. and we are happy to report that in every case the present U.S. amateur allocations have been adopted as exclusive amateur bands in at least the American Region. As the proposals were studied and more countries found they could accept them, it gradually became possible to make some of our allocations uniform around the world. In one case we have a small gain. Thus 1215-1300 Mc. has been agreed to as worldwide except in U.S.S.R., an extension (proposed by U.S.) of 5 Mc. over our present assignment. Similarly 2300-2450 has been made worldwide. As at present in this country, 2450 Mc. has been agreed to as an ISM frequency in some regions, and the band is subject to ISM QRM within 50 Mc. of this figure in the American Region, Australia, New Zealand, South Africa and U.K. In the American Region we retain 3300-3900; and something of the sort is arranged for Australia, New Zealand and Asia-except-U.S.S.R., where amateurs are to be admitted in the band 3300-3900 marked shared between amateurs, fixed, mobile and nav aids — but probably to be divided into exclusive segments. For long we here have had a band at 5650-5850 and recently it has been expanded to 5650-5925 because of the establishment of an ISM assignment at 5850. At Atlantic City the world went along with the first part but not the expansion. As a result, 5650-5850 is now a worldwide amateur assignment, subject to ISM QRM within 75 Mc. of 5850 in this region, Australia, N.Z., South Africa and U.K. Then 5850-5925 is an additional amateur allocation in the American Region only, again subject to ISM QRM. Finally, our present 10,000-10,500 was accepted as worldwide. Allocations stop at that figure in the A.Cy.
Table but it may be assumed that our present assignment of 21,000–22,000 Mc. endures as a domestic matter.

**General Regulations**

So much for allocations up to the moment. We can now give you the text of the general regulations adopted for the control of amateur stations. This is a rewrite of the Cairo text of Article 8, to precisely the same effect except for one substantive change in giving countries permission to waive the code test for amateur operators in the case of stations using frequencies exclusively above 1000 Mc. The text:

**Amateur Stations**

§1. Radio communications between amateur stations of different countries shall be forbidden if the Administration of one of the countries concerned has notified that it objects to such radiocommunications.

§2. (1) When transmissions between amateur stations of different countries are permitted they must be made in plain language and must be limited to messages of a technical nature relating to tests and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified. It is absolutely forbidden for amateur stations to be used for transmitting international communications on behalf of third parties.

(2) The preceding provisions may be modified by special arrangements between the countries concerned.

§3. (1) Any person operating the apparatus in an amateur station must have proved that he is able to transmit, and to receive by ear, texts in Morse code signals. Administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 1000 (one thousand) Mc./s.

(2) Administrations shall take such measures as they judge necessary to verify the qualifications, from a technical point of view, of any person operating the apparatus of an amateur station.

§4. The maximum power of amateur stations shall be fixed by the administrations concerned, having regard to the technical qualifications of the operators and to the conditions under which these stations must work.

§5. (1) All the general rules of the Convention and of the present Regulations shall apply to amateur stations. In particular, the transmitting frequency must be as constant and as free from harmonics as the state of technical development for stations of this nature permits.

(2) During the course of their transmissions amateur stations must transmit their call sign at short intervals.

**Call Signs**

The list of three-letter call blocks, CAA to ZZZ, from which the nations choose calls for their commercial stations and prefixes for their amateur stations, has been expanded to run from AAA to ZZZ and has been considerably altered. There will be some changes to learn when the new list takes effect. Germany is to be allowed only half of the old D series, the rest being whacked up among countries that are short of calls. There are quite a few rearrangements, and some new countries to take care of, including the Republic of the Philippines, Outer Mongolia, the Indian dominion and Pakistan. There are some rather extensive alterations in the rules controlling the formation of calls for various services. The world in fact finds itself fresh out of call signs. One significant action is the extension of the AAA–ZZZ series into a numeral series, 2AA to 9ZZ. In this extension the Philippines find themselves assigned 4DA to 4IZ, the United Nations 4UA to 4UZ, as their only call series — and other nations have similar assignments to supplement their previous holdings. In these calls the digit is to be regarded the same as if it were a letter. That is to say, additional letters may be added to make ship or aircraft calls, and any first two characters may be used as a prefix in amateur calls. To illustrate by a purely hypothetical example, KA1HR might now become 4DHHR, the 4D being the Philippine prefix. It will be a little hard to adjust ourselves to the thought that there isn’t a prefix missing from a call that begins with a digit. The Philippine Republic isn’t very happy over this arrangement and has promoted the adoption of a resolution recommending that future conferences dealing with the call problem study the desirability of doing away with the present arbitrary division of the alphabet and establish two-letter prefixes for everybody, the letters being chosen from the name of the country, as, for example, US, GB, FR, etc. Well, that’s not to worry about at this conference, anyway.

The Atlantic City documents are going to be formidable — long, complicated, detailed, and offering many changes from previous world practice that will interest the well-rounded amateur. There is a vast expansion in the scope of the new International Telecommunications Union and the activities planned for it, constituting formidable changes to readjust mechanisms to deal with the rapid expansion of communication problems. It will take a long time for us amateurs to digest all the implications of the new set-up but QST will report the pertinent parts as rapidly as possible, probably with a general outline in our next issue. And then too (we hope,) we’ll have the conclusion of the story of amateur allocations at A.C.Y.

**Strays**

The American section, International Scientific Radio Union, and the Washington section, IRE, will hold a second meeting this year in Washington on Monday, Tuesday and Wednesday, October 20th, 21st and 22nd, in the auditorium of the new Interior Department Building, C Street between 18th and 19th Streets, N.W. The program will, as usual, be devoted to the more fundamental and scientific aspects of radio and electronics. The program of titles and abstracts will be available in booklet form before the meeting. Correspondence should be addressed to the Institute office, or to Dr. Newbern Smith, Secretary, American Section, URSI, National Bureau of Standards, Washington 25, D. C.
The "Twin-Lamp"

The Poor Man's Standing-Wave Indicator

BY CHARLES WRIGHT, W4HVV

When it was found that none of the standing-wave meters so far described in amateur publications would operate satisfactorily on my 300-ohm lines at 50 and 144 Mc., it was decided to search elsewhere for ideas for something that would do the job. Only two informative articles were found in the literature on directional couplers, and both dealt primarily with instruments for use in wave guides. The problem was then one of simplification and adaptation for use with two-wire lines.

The first article described directional couplers made entirely of distributed constants which, in effect, sampled the line current at quarter-wave intervals. After several weeks of experimenting with various lengths of 72-ohm line (the XYL called them "snakes"), light bulbs and various other gadgets, this idea was given up. The indicators were good only for one frequency, and were so massive that when they were attached to the line they caused more standing waves than were present to begin with.

The second, though it seemed completely irrelevant at first, held the real answer to my problem. The indicator to be described was evolved by considering the electrostatic and electromagnetic components of the traveling wave in a wave guide analogous to the voltage and current relations in a two-wire line.

The Theory

Referring to Fig. 1-A, a current, I_l, in the line would induce a current, I_l, in a loop near the line, as shown. If the reactance of the loop is small compared to the resistance of the bulbs A and B, the current I_l will lag I_l by 90°. This current will, of course, be the same through lamps A and B, and will cause them to burn with equal brightness if they are identical.

Now from Fig. 1-B, we see that bulbs A and B are across the line and in series with a small capacity C. This capacity is, of course, the distributed capacity between the loop and the line. If the reactance of this capacity is large compared to that of A and B the current I_2 will flow and will lead the voltage across the line by 90°. If A and B are identical the current will divide equally between them.

Since I_l lags I_l by 90° and I_2 leads E_l by 90°, it is apparent that if I_l and E_l are in phase with each other, I_1 and I_2 will be exactly out of phase.

Fig. 1-C is a combination of the circuits explained above. Condenser C is the capacity between the wires of the loop and the line. Currents I_1 and I_2 are shown as they appear in Figs. 1-A and 1-B. It is now evident that bulb A will light from the sum of I_1 and I_2 and bulb B will light from the difference between these two currents. This is the case for a wave traveling toward the right.

In the case of a wave traveling toward the left, the currents will add in bulb B and tend to cancel in bulb A. Thus the device is a form of "directional coupler." When the line is terminated on the right-hand side (marked "load" in Fig. 1-C)
by a resistance equal to the characteristic impedance of the line, there is no reflected wave and only bulb $A$ will light. If the load is something different, there will be some reflected energy, and lamp $B$ will burn along with $A$, the relative brilliance depending upon the relative magnitudes of the transmitted and reflected energy. These facts are what make the device so useful as a standing-wave indicator.

In the foregoing discussion, three conditions were set up: bulbs $A$ and $B$ should be identical; the reactance of the loop should be small compared to the impedance of $A$ and $B$; and the reactance of the coupling capacity should be high compared to the bulb impedance. To satisfy the first, bulbs of the same characteristics were used, and in the interests of sensitivity, these were 2-volt 60-ma. flashlight bulbs. For the second and third considerations, the length of the coupling loop must be kept short compared to a wavelength. It was found that, for 50-Mc. operation and a transferred power of about 20 watts, a loop length of about 4 inches was a good compromise between sensitivity and the satisfaction of the above conditions. For 28 Mc. it can run a few inches longer, and at 144 Mc. an inch or so shorter. In any event, the length is not critical.

![Diagram](image)

**Fig. 1** — A simple representation of the operation of the "Twin-Lamp" standing-wave indicator. The sketch at $A$ shows the current inductively-coupled in the loop, for a wave traveling from left to right, and $B$ shows the current that is capacitively-coupled into the loop. $C$ shows how the currents combine to light lamp $A$ and not lamp $B$.

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**Building a "Twin-Lamp"**

The construction of a "Twin-Lamp" indicator is about the easiest thing you'll run into in amateur radio. Two possible circuits are shown in Fig. 2. The circuit of Fig. 2-A is more sensitive than that of 2-B, but it requires opening the line to connect it into the circuit. The circuit of Fig. 2-B is convenient to use in initial work, but the final touching-up at my shack is always done with the more sensitive indicator of Fig. 2-A.

The photograph shows how simple the gadget of Fig. 2-A is to build — the construction of the Fig. 2-B type will then be obvious. A short length of Amphenol 300-ohm Twin-Lead that is to be used as a test section has its insulation removed from one wire for a distance of about $\frac{3}{4}$ inch, just enough to permit soldering a lead to the wire. Another piece of Twin-Lead, from 4 to 10 inches long (depending on the frequency and the power level), is short-circuited at each end. One wire is cut, in the exact center of this loop, and the wire peeled back on either side just far enough to provide leads to the flashlight bulbs. The short lead from one side of the test section is then soldered to the tips of the flashlight bulbs, and the leads from the loop are soldered to the threaded sides of the flashlight bulbs. A few pieces of tape can then be wrapped around the test section and the coupling loop, to hold them together.

If one has several hundred watts of power available, the coupling loop can be made small, on the order of 4 or 5 inches for 28 Mc. This is preferable to using a larger loop with larger flashlight bulbs. In any event, it is highly advisable to be careful when first applying power, since the lamps can burn out fast. Adjustable coupling at the transmitter, or other means for controlling the r.f. power in the line, will avoid any burn-out difficulties.

*(Continued on page 110)*
A "Halo" for Six Meters

Horizontal Polarization for 50-Mc. Mobile

BY FRANCIS H. STITES,* W1MUX/3

Before the war little thought was given to mobile antennas for use on the old 5-meter band. A simple quarter-wave whip was convenient and unobtrusive; it worked fairly well, and so was almost always used. But now, with horizontal polarization nearly universal at home stations, the vertical whip antenna has lost much of its efficiency. The loss in signal strength resulting from crossed polarization, and the additional noise picked up because of the vertically-polarized character of ignition noise, combine to reduce the performance of the mobile station.

The antenna described herein was designed to cure the ills associated with the whip antenna. It does this and more, introducing only one new problem of importance: how to convince the XYL that it should be put on the family car. The antenna is unusual looking, but its exceptional performance more than makes up for all the questions people ask about it.1

Design

In line with current 50-Mc. practice, a first-class antenna must be horizontally-polarized. For mobile use it should also have a circular radiation pattern. In addition it should tune broadly, be easy to feed, and work well close to the ground or automobile body. It must be reasonably compact and rugged enough to withstand mobile service with little or no maintenance.

The only horizontal antenna that is small enough to warrant consideration for mobile use is the doughnut type of horizontal loop. Fortunately this antenna meets all the requirements and has several additional advantages.

The loop, if sufficiently small in diameter, has a radiation pattern identical to that of a vertical dipole. This means that the pattern will be circular and the antenna will perform well in the region between one-quarter and one-half wave above ground. In a practical antenna the minimum diameter is limited, since a very small loop has an unreasonable radiation resistance, very high Q, and excessive resistance loss during transmission. This antenna is large enough to give a feed resistance of 50 ohms, is broad enough to cover the whole band, and radiates almost equally in all directions.

Perhaps the simplest way of understanding the operation of the antenna is to visualize it as a folded dipole bent around and end-loaded. The folded section is needed to compensate for the reduction in impedance caused by the end loading.

With horizontal polarization practically standard on 50 Mc. these days, the mobile enthusiast has been left more or less out in the cold. His vertical whip, the customary antenna for mobile use, has been relatively ineffective, and any sort of horizontal antenna system has been thought to be cumbersome and poorly adapted to mobile operation. Borrowing an idea from commercial practice, W1MUX here presents a compact and effective antenna system which not only solves the polarization problem, but eliminates that other bugbear — directivity.

The 50-Mc. halo used by W1MUX is mounted atop a pipe mast, the base of which is bolted to a metal angle plate welded to the rear bumper.

QST for
Performance

To determine as accurately as possible the performance of the loop and the improvement it gives over a vertical whip, a number of its characteristics were measured. Radiation patterns as shown in Fig. 1 were taken of the loop and a conventional quarter-wave vertical antenna mounted on the same car. These curves were made with considerable care. A calibrated receiver with a horizontal antenna sixteen miles from the mobile transmitter was used to measure signal strength. The transmission path was close to line of sight, with the car on an airfield reasonably free from near-by reflecting objects. Input power was kept constant during tests. A point of maximum field strength was found for each antenna, and the car rotated about this point.

The curves show the considerable improvement the loop gives over a conventional whip. The radiation field of the loop, with its center 8 feet above the earth, is practically independent of the automobile. The ratio of maximum to minimum strength in the horizontal plane is only 2.7 db., or less than half an S-unit. Opening the car doors, or even lifting the trunk lid directly beneath the loop, affects neither the loading on the transmitter nor the received signal.

The vertical antenna, however, is another story. With the current maximum of the whip a few feet above the ground, the car body is in the center of the radiated field. The steel body and other antennas seriously distort the field. This particular whip had a maximum-to-minimum ratio of 14 db. Changing the mounting point of the whip or moving other car antennas will affect the shape and maximum-to-minimum ratio of the whip but will not materially change the average value of field strength.

The difference between the average field strengths of the two antennas was found to be 7.5 db. This means that the loop gives an immediate power gain of 5½ times, equivalent to boosting the transmitter power from 25 watts to 137 watts. With the whip at its poorest angle it would take 450 watts to equal the average signal delivered by the loop-equipped 25-watter.

The measured impedance of the antenna at resonance is 58 ohms. A second similar antenna had an impedance of 57 ohms. Fifty-ohm coaxial cable provides a good match when used for the feedline. Since the bandwidth at the 3-db. points is about 7 Mc., the loop can be resonated at 50.5 Mc. and still be reasonably efficient at 54 Mc.

Theory indicated that the loop might be more subject to fading than the usual vertical antenna, but it did not work out that way in practice. Working both strong and weak stations, while in motion indicated less fading with the loop, both on transmission and reception. In order to measure and compare the fading characteristics of the two antennas, an Esterline-Angus graphic recorder was modified to pull the recording paper at a relatively high speed. The recorder was connected to a receiver and calibrated in terms of signal strength. Runs were made at different speeds, distances and directions, for each antenna. The recordings showed signal strength plotted against distance.

A study of these recordings revealed several interesting things, the most evident being the increase in average signal when using the loop. The amplitude of the smaller variations (fading) averages about the same for the two antennas. The severe fading so often observed on mobile signals appears to be caused by reflections from buildings, water tanks, and similar objects rather than ground reflections. Cars passing by have no noticeable effect, but reflections from aircraft appear quite serious. The signal fluctuations resulting from a single object reflection begin with rapid small amplitude variations, building up to large amplitudes at a lower frequency and finally returning to the earlier small, rapid fluctuations. Both antennas showed this same characteristic.

No accurate measurements have been made using the loop for receiving. Listening tests indicate excellent receiving performance, however. Skip stations come in very strongly even in poor locations, and ground-wave stations have been heard and worked from a surprising distance. The
This particular antenna has been in use for several months and has required no adjustment or maintenance. It does not vibrate excessively, and what movement there is seems to have no effect on performance. Because the loop antenna seemed so independent of objects beneath it, a test was made to determine the effect of a close reflecting surface. While measuring the antenna impedance, a large aluminum sheet was brought up under the loop. No change in impedance could be observed with six-inch or greater spacing from the antenna. Reassured by this measurement, Mel Wilson, W1DEI/3, mounted his six-meter halo above the metal roof of his sedan. Supported by suction cups and twelve-inch insulating spacers, the antenna appears to function normally and Mrs. Wilson will still ride in the car with him.

**Construction**

A general idea of the construction of the antenna can be gained from the photograph. Details of the condenser plates, antenna mounting, and mast mounting are shown in the drawings in Fig. 2.

Care should be taken, in the construction of anything as prominent as this antenna, to do a neat, workmanlike job. Bending the large ½-inch aluminum tubing is the most difficult part. It should be tightly filled with fine sand and carefully bent around a rigid object about 18 inches in diameter. The final hoop diameter should be about 20 inches. Small dents can often be removed by coaxing through the tubing a cylindrical steel plug on the end of a rubber hose. Dents and creases can sometimes be filled in with aluminum solder and filed smooth. The small ¼-inch diameter tubing can be formed with the fingers to the same curve as the larger tubing and mounted 2½ inches below it. A ¾-inch standard plumber’s tee is convenient for supporting the antenna. The ¾-inch o.d. tubing fits such a tee and should be securely soldered to it with aluminum solder. Be sure to use an iron when tinning the aluminum. A torch can be used on the bronze fitting. The mast is ⅞-inch water pipe, threaded at the top to screw into the bronze fitting.

The condenser plates can be any convenient shape, with an average diameter of about 5 inches. A detail drawing of the condenser assembly is shown in Fig. 2-A. The plates are screwed to plugs in the ends of each element. The large-diameter plugs have two tapped holes in one end for attaching the condenser plates, and three holes in the sides for securing the plugs to the ends of the ⅛-inch tubing. The small plugs each have a small hole in one end for attaching the condenser plates, and are a drive fit into the ends of the ⅛-inch tubing. Two access holes are needed in one of the condenser plates to loosen the screws in the other one. The plate spacing is critical and must be rigidly fixed. A tapped spacer...
of good insulating properties is used with several thin washers to fix the spacing. Washers can be added or removed to tune the antenna.

Final tuning of the completed antenna can be done by adjusting the condenser-plate spacing carefully to give maximum loading on the transmitter.

An insulator of some type is needed to support the ends of the small tubing near the mast. Any easy-to-work insulating material is suitable. For this antenna a block of bakelite was cut to clamp around the supporting pipe, and holes were drilled to accept the ends of the small-diameter tubing. Two screws tapped into plugs in the tubing ends hold the element securely and also provide convenient connections to the feedline. Insulated bushings mounted in the supporting pipe protect the short insulated wires connecting the antenna to the coaxial feedline. If desired, a "bazooka" line balancer can be incorporated by merely grounding the outer conductor of the coax to the inside of the pipe at a point a quarter wave below the antenna.

The ¾-inch pipe mast must be very securely fastened at its base. This mounting is extremely rugged and consists of a section of 4-inch angle iron welded in three places to the bumper assembly. The pipe is fastened to the angle iron by two ¾-inch "U" bolts. The cable is brought out through a hole two inches above the base of the pipe to protect it in case the base of the pipe rubs against anything.

Other sizes of tubing may be used for the antenna, the only requirement being that the ratio of tubing diameters and the element spacing be chosen to provide the necessary step-up to match the radiator impedance and the transmission-line impedance. The main radiating element has an impedance determined primarily by its over-all diameter. In this particular antenna, the 20-inch diameter loop has a measured impedance of about 9.3 ohms. Many combinations of tubing sizes and spacings can be chosen to give the desired impedance step-up of 5½ times. If 70-ohm coax is available instead of 50-ohm, other combinations can be chosen to provide the needed step-up of approximately 7½ times. A nomogram has been constructed to show the relation between element size, spacing, and impedance step-up. The nomogram, shown in Fig. 3, is precise for large ratios of $D/R_2$, but may be used with reduced accuracy at closer spacings. If, for example, the desired step-up is known, the necessary spacing can be found for any combination of element sizes.

The exact procedure is as follows:

1) Divide the radius (or diameter) of the larger pipe by that of the smaller to get $R_2/R_1$.

2) Lay a straightedge between this value of $R_2/R_1$ and the desired step-up ratio $M$, found on the solid diagonal line.

3) Read the value of $D/R_2$.

4) Multiply this ratio by the radius of the smaller conductor ($R_1$) to find the center-to-center spacing required.

Using the nomogram to find what spacing would be required to match the 20-inch loop and a 70-ohm line, the ratio $R_2/R_1 = 2.3$ is first determined and located on the left-hand scale. The desired step-up ratio of 7.5 is located on the diagonal scale, and a line drawn through these two points, intersecting the right-hand scale at 7 to give the necessary ratio of spacing to the smaller radius. The center-to-center spacing will then be $7 \times 3/16$ or approximately 1.3 inches. (See dashed line on nomogram.)

This nomogram may be used with any folded antenna.

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Fig. 3 — The impedance step-up resulting from the use of various conductor sizes and spacings in a folded dipole may be obtained from this nomogram. At the left is the ratio of conductor sizes, $R_2/R_1$. The line at the right is the ratio of the spacing (center-to-center) and the driven-element radius, $D/R_2$. The solid slanting line is the impedance step-up. Laying a straightedge between any two known quantities will give the value of the third. The dashed line shows how the W1MU X halo with its conductor ratio of 2.3 to 1 (¾- and ¾-inch tubing) could be modified to match a 72-ohm coaxial feedline. The greater impedance step-up of between 7 and 8 times is obtained by reducing the center-to-center spacing to 1.3 inches. This nomogram may be used in designing folded-dipole radiators of all types.

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A Sturdy 55-Ft. Skyhook

BY CORLISS B. GARDNER,* W1ALJ

The mast shown below was described by the author several years ago in QST. Judging from the letters received, it has been duplicated widely. Since then, improvements have been made to permit easier erection.1

The sketches show complete details. The bottom section, minus the 3-ft. stiffening block, should be set in place first, as shown at A. The top section then is slid between the two uprights, with the raising lever on the upper side. The bottom end of the top section then is pulled up and the two sections lined up so that the bolt can be put in place, as shown at B.

By pulling downward it is not difficult to swing the top section up into vertical position. Bolt "A" is then slipped into place and the stiffening block inserted.

For masts up to 45 feet, only two guys at the top will suffice. For greater heights, two at the top and three at the midjoint in the top section are recommended, as indicated in C.

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* 19 Sweet Fern Lane, Peace Dale, R. I.
1 Method devised by W1BXZ, Wakefield, R. I.
A Pretuned Bandpass Frequency Multiplier

80 to 6 Meters with a Single Control

BY McMURDO SILVER *

* McMurdo Silver Co., Inc., 1249 Main St., Hartford, Conn.

The greater the number of bands to be covered by a transmitter, the greater are the complexities involved in providing a convenient and rapid means of changing the transmitter from one band to another. Especially is this true ordinarily if tuning controls are to be held to a minimum. The principle of reducing these complexities through the use of broad-band fixed-tuned circuits is a relatively new idea in amateur transmitters. In this article it is applied to a frequency-multiplier unit which requires only the addition of a VFO or crystal oscillator to drive it to an output of 40 watts on all bands from 80 to 6 meters. Once adjusted properly, only the output-stage tuning needs touching up occasionally for operation at any frequency in any band.

Single-dial control for receivers has been an accomplished fact for such a long time now that it is becoming difficult for even old-timers to realize that there was a time when a half-dozen controls had to be set critically before a signal could be heard on a superheterodyne receiver.

The development of transmitters with the same objective in mind has lagged, probably for the simple reason that it has not always been considered important to shift transmitter frequency at will. But within the past few years, amateur operating technique has been gradually changing in a direction that is beginning to date the plug-in-coil type transmitter.

Several years ago a beginning was made in the form of ganged tuning for multistage transmitters and few of those who have built and operated transmitters of this type would ever consider anything less. However, while ganged tuning reaches the objective of rapid change of frequency within a band, it does not lend itself well to switching circuits for changing from band to band.

More recently, attention has been turned toward the possibilities offered by broad-band transmitter stages to eliminate the necessity for ganging several condensers and switching padders and tracking condenser connections in addition to the tube connections. There is more than one way of obtaining the required amount of broad-banding in transmitter stages, depending upon such factors as how simple the circuit must be, the efficiency required and to what degree undesired multiplication must be suppressed in the doubler or tripler stages. The use of bandpass filters as coupling devices between stages seems to offer the best possibilities of a compromise of these factors.

Although bandpass filters do not lend themselves to the efficient generation of power in significant quantities, they can be made to perform quite satisfactorily in circuits where power output is of secondary importance. Used as coupling agents between almost zero-power driven 6AG7 tubes they give that highly-desirable operating convenience of a series of frequency multipliers.

Top view of the bandpass frequency multiplier, showing the mounting of the tubes and the various paddler and trimmer condensers. The plate coils for the output stage are at the far end.

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Fig. 1 — Circuit diagram of the bandpass frequency multiplier.

- **C1-C10**: 3-30-μfd, air trimmer (Silver 619).
- **C11-C20**: 100-μfd, variable, double-spaced.
- **C21-C30**: 0.0022-μfd, mica.
- **C31-C36**: 0.1-μfd, 400-volt paper.
- **C37-C39**: 0.0022-μfd, mica.
- **R1, R2, R3, R4, R5**: 2700 ohms, ½ watt.
- **R6, R7, R8, R9**: 10,000 ohms, 2 watts.
- **R10**: 13,500 ohms, 4 watts (two 27,000 ohms, 2 watts, in parallel).
- **R11**: 52 ohms, 2 watts.
- **L1**: 3.5, 7 Mc. (Silver 125-G1).
- **L2**: 48-54 Mc. (Silver 125-G2).
- **S1**: 6-gang 6-position ceramic rotary switch, progressively shorting (Centralab).
- **T1**: 3-4-Mc. filter (Silver 110).
- **T2**: 6-7.5-Mc. filter (Silver 111).
- **T3**: 12-15-Mc. filter (Silver 112).
- **T4**: 21-21.5-Mc. filter (Silver 113).
- **T5**: 24-30-Mc. filter (Silver 114).
- **T6**: 48-54-Mc. filter (Silver 115).
broad enough to cover many amateur bands without retuning during operation.

It was determined that the maximum required passband — 3 to 4 Mc. — could be covered by two tuned and appropriately-coupled circuits. It is perhaps convenient to think of the filters in terms of dual-tuned receiver i.f. transformers. That is what they look like diagrammatically and is what they are electrically, except that the two coils of each transformer are at somewhat above critical coupling in order to obtain the double-bumped selectivity curve typical to two over-coupled tuned circuits. Each coil is tuned by a very small shunt air capacitor.

Turning to Fig. 1, T1 is the first such filter. Two tuned circuits are overcoupled to just the degree necessary to get a “sway-backed” selectivity curve 1 megacycle broad. The range 3 through 4 Mc. is covered with output power flat within 20 per cent. Since each successive frequency-multiplying stage is essentially only a duplication of the first stage, examination of this individual stage will make clear the character of all succeeding stages.

Following T1 is the first 6AG7 multiplier tube — or the 807 output amplifier. Considering first the condition when the bandswitch is in position A, we find that S1B connects the 807 grid to the secondary of T1. In this condition the only active tube is the 807, all four 6AG7 cathode circuits being opened by S1B. S1E and S1F select the plate and output link coils appropriate for 3.5- through 4-Mc. output in the 807 plate circuit. The output of the multiplier is now at the frequency of the driving exciter.

If we turn S1 to position B we find that several circuit changes have occurred. S1B has closed the cathode circuit of the first 6AG7 so that it is powered and operating to yield twice the input frequency across the secondary of T2. The grid of the 807 has been shifted to the T2 secondary, and its plate circuit changed to the 7-Mc. band. Something else quite important has happened — S1A has added capacitor C3 (in series with C1A) across the secondary of T1, and has also connected R1 in parallel with R3. The grid input capacitance of each 6AG7 is significantly lower than that of the 807 output amplifier. Therefore this compensation is required to keep the transformer secondaries properly tuned whether feeding the following 6AG7 or the 807. S1A does this by progressively adding C3 across T1, C5 across T2, C9 across T3 and C14 across T6. In the cases of 21-Mc. transformer, T4, and 50-Mc. transformer, T6, which always feed the 807, switching compensation is not necessary.

Returning to the discussion of the first stage, R2 is the grid leak while R3 provides protective cathode bias, assuming probable keying of the oscillator. A portion of the operating bias is provided by R3 (and similar cathode resistors in following stages), the balance being derived from the grid leak.

Because even overcoupled broad-band filter circuits cannot be made as broad as desired without sacrificing considerable in uniformity of output over a band, it becomes necessary to broaden them by adding resistors across the secondaries of T1, T3, T4 and T5. By careful choice of L/C ratio, transformer coupling and circuit loading, it becomes possible to obtain a passband as wide as desired in each successive filter — a passband having steep skirts immediately beyond its high- and low-frequency limits, yet exhibiting a power-output variation within each passband of not more than a ratio of 8 to 10.

At first glance it may appear that the only difficult filter to design is T1, covering, as it does, the range of 3 to 4 Mc. — that each succeeding filter need cover only a lesser percentage frequency bandwidth because of the successive narrowing of the spread required at the higher frequencies. And this is true if the use of the multiplier is to be limited to a highest frequency of 30 Mc. But when the 50-Mc. band is added and it is desired to get output useful for and beyond 144 Mc., some of the stages must be designed to pass frequencies outside the band normal to the stage.

The plate circuit of the 807 uses a special wide-space tuning capacitor of small physical dimensions — so that it won’t turn into an inductance at high frequencies. Its coil arrangement is dictated by convenience, with due regard to efficiency and output. It has been found that almost any two successive amateur bands may be covered quite satisfactorily indeed by a single inductor having a tap for the higher-frequency band. And avoiding stray resonances in a multiplicity of idle coils. Thus, all of L1 is included in the 807 plate circuit.

(Continued on page 110)

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Bottom view of the band-pass frequency multiplier, showing the bandswitch and coils. The single tuning condenser for the output stage is in the lower left-hand corner.
NEW F.C.C. AMATEUR DIVISION

In reorganizing its engineering department under its new chief engineer, George E. Sterling, W3DF, FCC has set up a division on amateur affairs on the same level as its other engineering divisions. The new unit is entitled the "Radio Operator and Amateur Division," and is headed by George K. Rollins, W3GA. Another "George" was named to fill the vacancy caused by the promotion of Mr. Sterling — George S. Turner, a former W9, as assistant chief engineer.

The new division will handle regulatory matters and licensing procedures for amateurs, commercial operators, and the Citizens Radio Service. FCC has thus again shown its genuine interest in the amateur service, not only by creation of its new division but also by continuing to have amateur regulatory affairs administered by persons who are themselves members of the fraternity.

George Rollins built his first ham station, a Ford spark coil and a crystal receiver, from the Boy Scout Manual in 1919, operating from Springfield, Mass., as 1CHO. Then came SHW and a %-kw. spark, and a c.w. rig later; W8JO and W8BWR at Michigan State College; W9GR; a W4 call he can't remember; and upon release from the Navy in 1945 as a Lieut. Commander, W3GA with a bandswitching rig on 40–20–10 meters. Right now he is interested in n.b.f.m., so that he will have experience of his own when this type of emission on the lower-frequency amateur bands comes up for reconsideration next year. George has been with FCC since 1939.

C.A.R.L. SHOW

Sometime in May, 1948, the Chinese Amateur Radio League will hold another amateur radio exhibition in Nanking, the first since 1942. To provide a true international flavor, they would like to receive from amateurs all over the world photographs of stations, QSL cards, club emblems or banners, and the like. Such items can be sent, not later than March 15th of next year, to CARL, 40 May Yuan Villa, Kuo Fu Road East, Nanking (2), China.

Although with very limited means, CARL contributed tremendously during the late war. The society is very active at present, with 36 local chapters and with student chapters in 13 universities. It would welcome the help of American amateurs as supporting members. Such members will receive the League's emblem, membership card, and circular. Membership dues are $5.00 for the first year, and $1.00 for succeeding years. Applications should include name, age, nationality, address, profession, and amateur call.

SPECIAL TEMPORARY AUTHORITY

FCC has recently been receiving requests for special temporary authority from amateur licensees without observance of the required 10 days notice. While FCC is willing to consider telegraphed applications in emergencies, they state that requests for special temporary authority should be filed with the Commission at least 10 days previous to the date of the proposed operation.

PROPOSED CHANGES, 42-88 MC.

We reported in August QST an informal engineering conference held by FCC in June in an attempt to solve some of the problems of interference being caused television broadcasting by the fixed and mobile services, and amateurs. FCC has now issued a proposal to make certain changes in this portion of the spectrum which would eliminate present sharing of television assignments by other services, and withdraw the 44–50 television assignment (Channel 1) and make it available to former users of the sharing arrangement.

The 50–54 Mc. band remains amateur, in the FCC proposal. The Commission has this to say about interference from causes other than sharing (Continued on page 116)
A Compact and Inexpensive Superhet for 144 Mc.

A Step Up from the "Rush-Box" for Mobile or Fixed-Station Use

BY BASIL C. BARBEE, * WSFPJ

We are prone to think of superhet receivers in terms of gang-tuned circuits and their associated tracking problems, so we build superregeens instead, putting up with their well-known inefficiencies rather than face the electrical and mechanical problems normally connected with superhet receiver design. On 144 Mc. ordinary tuned circuits are sufficiently broad to permit fixed-tuning at the middle of the band without appreciable loss in performance. Here is a simple receiver incorporating this technique, with a degree of complication only slightly exceeding that of the simplest rush-box jobs. Its selectivity and audio quality are more than worth the difference.

Of the amateur bands presently available for mobile communication, probably the 144-Mc. band is the best suited, particularly if we exclude the DX possibilities of the 28- and 50-Mc. bands. The antenna need not be of unwieldy size, the equipment may be built compactly and efficiently without resorting to expensive special components and tubes, and the band is wide enough to provide plenty of room for hundreds of stations to operate simultaneously, if only the stability of the equipment were improved. At the present state of the art, however, most mobile 144-Mc. amateur stations use equipment all of a pattern: a modulated oscillator for transmitting and a superregenerative detector for receiving. Many even use "transceivers," which combine the functions, with detriment to both.

The few who have crystal-controlled mobile rigs still, for the most part, use superregenerative receivers, although they would probably prefer to use converters ahead of the broadcast receivers in their cars, as is common on 28 and 50 Mc., if a higher proportion of the other stations on the band were crystal-controlled. Unfortunately the selectivity of any broadcast receiver is too great to pass some of the signals at present heard on 2 meters. The only satisfactory way to achieve improved reception appears to be the construction of a good superheterodyne receiver especially designed for the 144-Mc. band.

The receiver to be described, although intended primarily for mobile use, serves equally well as a fixed-station receiver when provided with a suitable a.c. power supply. It is a superheterodyne of nine tubes, including the voltage regulator, all of which are miniature types. The entire unit is constructed on a chassis 4½ x 7½ x 2 inches, while the over-all dimensions of the cabinet are only 4¾ x 6¼ x 8¾ inches. Most of the components not regularly found about the ham shack may be obtained at low cost from war-surplus equipment outlets.

Although the sensitivity has not been measured, it compares favorably with that of the average superregenerative receiver, and the background noise in the absence of signal is considerably less than in a superregen. Installed in a car, in conjunction with a quarter-wave vertical antenna, this receiver pulled in signals from a radius of 200 miles around New York City. The bandwidth was intentionally made fairly broad (120 kc.) in order to accept not only crystal-controlled signals, but also the better class of MOPAs and the more stable modulated oscillators. Nevertheless, the selectivity is adequate to "dig out" many more stations from a crowded band than can the ordinary superregen.

Circuit Details

The circuit line-up consists of a 6AK5 t.r.f. stage, 6J6 push-push mixer, 6J6 push-pull oscillator, two stages of 6-Mc. i.f. using 6AK5s with a.v.c., a 6AL5 as detector, a.v.c. rectifier and series-valve noise limiter, 6C4 first a.f., 6AK6 second a.f., and 0A2 voltage regulator on the

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C1 - 4-µfd. variable (surplus).  
C2 - 12-µfd.-per-section split-stator (made from APC-25; see text).  
C3 - 11.5-µfd.-per-section split-stator (surplus).  
C4, C5, C6, C7, C8, C9 - 560-µfd. mica.  
C11, C12, C13, C14, C15, C16 - 220-µfd. mica.  
C17, C18, C19 - 5-µfd. Erie Ceramicon.  
C20, C21 - 0.10-µfd. 600-volt paper.  
R1, R2, R3 - 220 ohms.  
R4 - 47,000 ohms.  
R5, R6, R7, R8, R9, R10, R11, R12 - 5600 ohms.  
R13 - 3300 ohms, 2 watts.  
R14, R15 - 0.1 megohm.  
R16 - 33,000 ohms, 1 watt.  
R17 - 47,000 ohms.  
R18 - 2.2 megohms.  
R19 - 0.33 megohm.

Fig. 1 — Wiring diagram of the 144-Mc. mobile receiver.

oscillator plate supply. The "B" supply, 200 volts at 60 ma., is obtained from a dynamotor which also supplies the low-power stages of the transmitter, while the heaters are supplied from a 12-volt battery consisting of the car's regular battery plus an additional 6-volt battery in series. By connecting all heaters in parallel instead of series-parallel, a single 6-volt battery may of course be used. Two audio outputs are provided, one at voice-coil impedance (4 ohms) so that the voice coil of the broadcast-receiver speaker may be switched over to the 144-Mc. receiver if desired; and the other at 2500 ohms for the operation of a handset, the microphone of the latter being used in conjunction with the 144-Mc. transmitter.

The r.f. stage is an ordinary t.r.f. pentode amplifier. Originally a 6J4 grounded-grid stage was tried, but because of difficulties with oscillation it was abandoned in favor of the present arrangement. No doubt the 6J4 could have been made to work with the proper shielding, but because of the necessity for rapid completion the 6AK5 pentode was hastily substituted.  

Push-push mixers are not uncommon, but although mentioned in the Handbook theory section, they are seldom seen in amateur apparatus. The split-stator tuning condenser for this stage was made from an APC-25 by sawing loose, with a jeweler's saw, half the stator plates from one stator terminal and the other half of the plates from the other stator terminal. The two halves of the mixer grid coil are spaced $\frac{3}{4}$ inch to admit the primary winding, which is of the same diameter. The oscillator-injection coupling link is a single turn over the center of the primary winding, supported by a pillar insulator. A short length of RG-58/U concentric line connects this link to the link at the oscillator coil; this latter link is formed by looping the center conductor back upon itself to form a single-turn coil and soldering it to the outer conductor. At this point the link and the line are supported by another pillar insulator.

The push-pull tuned-plate oscillator circuit is not unusual. The untuned grid coil is supported around the plate coil by the grid leak and the leads to the tube socket. The remainder of the
R19 — 1 megohm.
R20 — 0.82 megohm.
R21 — 1 megohm potentiometer, audio taper.
R28 — 0.27 megohm.
R29 — 0.47 megohm.
R38 — 560 ohms.
R39 — 220 ohms.

Note — Resistors ½ watt unless otherwise specified.
I1 — 3 turns No. 18, ½-inch i.d., ½-inch long, tapped at ¼ t.
I2 — 1 turn No. 18, ¼-inch diameter, around L1.
I3 — 7 turns No. 18, ½-inch i.d., close-wound.

The receiver circuit follows usual receiver practice and needs no explanation here. No switch was provided for disabling the series-valve noise limiter because the limiter is almost always useful in mobile operation and its slight impairment of audio quality is of no importance for communication purposes.

No attempt was made at ganging the tuning controls. Instead, the main tuning dial controls only the oscillator, while the mixer grid circuit is fixed-tuned at the center of the band, and the antenna trimmer on the front panel resonates the grid circuit of the t.f.f. stage, requiring very infrequent adjustment. Thus single-dial control is achieved without the loss of stability and gain that usually results from ganging. Since the width of the 144-Mc. band is somewhat less than 3 per cent of the center frequency, and since the Q of the mixer grid circuit is not likely to be greater than 35 with ordinary circuit components, the variation in gain over the entire band with this arrangement would be expected to be only about 3 db. (½ 8-unit), an assumption that was verified in practice.

I4 — 4 turns No. 18, ½-inch i.d., c.t., ½-inch space in center.
I5 — 1 turn formed from end of center conductor, RG-58/U cable.
I6 — 4 turns No. 18, ½-inch i.d., c.t.
I7 — 2 turns No. 18, ½-inch i.d., c.t., around L3.
I8 — No. 47 Mazda lamp.
J1 — No. 47 Mazda lamp.
J2 — SO-239 co-ax connector (surplus).
J3 — Jones P-306-AB connector.
RFC — 45 turns No. 36 in 3 pies on IRC BT-½ resistor.
S1, S2 — S.p.s.t. toggle switch.
T1, T2, T3 — Midget 6-Mc. i.f. transformers, No. 278-0011-00 (surplus).
T4 — Midget universal push-pull output transformer.

As reception of 'phone and m.c.w. signals only was contemplated, a. v. c. was applied to the two i.f. stages, and only one gain control, in the a.f. circuit, was provided. One toggle switch is used to turn on the heaters, while another turns on the plate dynamos, but only when the heaters have been turned on. A dial light, situated above the main tuning dial under a reflector made from a chrome-plated drawer pull, illuminates the panel and serves as an indicator that the heaters are on. The whine of the dynamotor, which is mounted "aft," indicates that the plate switch has been turned on.

The chassis was made of scrap ½-inch aluminum from the panel of a TU-5B tuning unit, from which came also the compact but excellent vernier tuning dial. The chassis is supported by the panel, which was made of a scrap of ¾-inch dural for stiffness. The cabinet was made of scraps of ½-inch aluminum, and provided with six 8-32 elastic clinch-nuts to which the panel is secured with 8-32 oval-head rack screws and cup washers. Two holes were cut in the rear of the cabinet to pass the antenna and power connec-
The 144-Mc. mobile receiver is built on a chassis only 4½ X 7½ X 2 inches in size. The oscillator tube is mounted below the chassis, with its coil and tuning condenser above. Only the oscillator is tuned by the vernier dial, eliminating tracking problems.
Element Spacing in 3-Element Beams

Tests on Parasitic Arrays, with Particular Reference to Optimum Element Lengths for Various Spacings

BY PHILIP C. ERHORN, * W2LAH

The remarkable efficiency of the simple two-element parasitic beam antenna has been proven by thousands of hams. Ask the man who owns one! But when you do, you'll probably find that he is experimenting with a three- or four-element array, and is having a lot of trouble answering the questions that seem to multiply with each additional element. First and foremost, what are the optimum spacings for a three-element beam? What formula should be used in setting up the element lengths? What can be gained by tuning?

All these questions and more remained to be answered, and so, spurred on by many QSOs on the subject, the literature was thoroughly culled for concrete information in an effort to find a starting point for setting up the dimensions of a three-element ten-meter array. The various formulas were set down and the element lengths figured out so that they could be compared and perhaps averaged. But it was immediately found that there was little similarity from one set of formulas to another.

And what about the new trend toward wide spacing? What about front-to-back ratios? Since the questions were still piling up, it seemed that the only way to find out some of the answers was to set up an experimental three-element array, make careful tests for all of the commonly-used spacings, and then be governed by the results. The procedure employed in these tests and the results are here presented in detail.

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The all-metal array used in the tests. The spacings shown are those determined by the author to be the optimum compromise: reflector 0.2 wavelength and director 0.15 wavelength from the driven element. The shorting clamps on the "T"-match were finally positioned eight inches either side of center to give the lowest standing-wave ratio (1.75 to 1) with 70-ohm transmitting Twin-Lead.

Equipment Used in Tests

All of the arrays were of "plumber's-delight" construction, as shown in the photograph, utilizing 1½-inch 24ST dural tubing for the elements, supporting boom and "T"-match. The dural tubing was obtained cheaply from a junk dealer in 12-foot lengths, with 4-foot inserts for each end that fitted like a glove yet could be moved smoothly for adjustment of element length. With the help of a friend, and using the shop facilities of a local high school, several dural castings were made to be used in securing the elements to the tubular boom. These castings were formed so that the elements could be removed easily, or the casting and inserted element slid along the boom and locked for spacing adjustments. Mechanically, everything turned out to be simple, rigid and strong.

A portable transmitter, whose input was variable from a few watts up to 40 watts, was used with a feeder-matching unit to facilitate loading changes. This feeder or antenna tuning unit was simply an impedance-matching device between the final tank and a so-called flat line. It proved to be very worth while in transferring power efficiently from the final tank to the line. The circuit is given in Fig. 1.

A sketch of the field-strength antenna is shown in Fig. 2. The method used in setting up the field-strength antenna served a double purpose. The length of a resonant half-wave antenna was first determined by erecting the three-element array on its mast, roughly tuning it by formula, and using it to excite a single half-wave element (also 1½-inch dural), and then tuning the half-wave for maximum current. Since the element could not be broken in the middle, the thermomilliammeter was inserted at the center of a simple "T"-match made of wire, and tapped out equally near the ends of the element. Tuning this half-wave to resonance was rather critical, in that the resonant point was extremely sharp.

With this half-wave antenna mounted on a...
short wooden $2 \times 4$, a close-spaced director was added to it and tuned to give maximum current through the thermomilliammeter. The forward sensitivity was increased thereby, and this makeshift array was used as a field-strength indicator at a distance of about a full wave from the beam array.\textsuperscript{1} It was impractical to increase this distance because the writer had to work alone and several thousand readings were to be taken. The addition of the director to the field-strength antenna also helped to make it relatively insensitive to reflections from near-by trees or buildings. All measurements were made with the beam and field-strength antenna 20 feet above sandy ground and 7 feet above a wooden roof. Finally, the new Micromatch\textsuperscript{2} circuit was constructed and tested, and proved to be an excellent indicator of standing-wave ratios.

**Tuning Procedure**

Because the length of the boom was 12 feet over all, the first set-up used took full advantage of this length, with the reflector spaced 0.2 wavelength and the director 0.15 wavelength from the driven element, or symbolically R-0.2-A-0.15-D.

The driven element of the array was set at the just-determined resonant length and left at that length for all subsequent measurements. The parasitic-element spacings were based upon this length for two operating frequencies, 28.6 and 29.2 Mc.\textsuperscript{3}

\textsuperscript{1} The validity of measurements made this close to the antenna may be questioned, in view of the fact that the induction field is not negligible at this distance, the behavior of the ground-reflected wave is uncertain, and there is a distinct possibility that the pick-up antenna tends to become part of the antenna array being tested. To offset one of these factors, it may be observed that the use of a director with the pick-up antenna will tend to discriminate against the ground-reflected ray, and also that the inherent directivity of the beam under test will tend to reduce the amplitude of the reflected ray at such a short distance. Also, coupling between the pick-up antenna and the beam under test presumably would be detectable by a change in the input impedance of the beam when the pick-up antenna is removed, and the author states that the presence or absence of the pick-up antenna caused no observable change in the standing-wave ratio. The adjustments achieved by the procedure outlined have led to good results in actual communication. — Editor


\textsuperscript{3} The usual method is to calculate the spacings on the basis of free-space wavelength, since all theoretical studies and calculations, as well as published data, are on this basis. The author's spacings are about 4 per cent less than the free-space values. — Editor

The reflector was first detuned by removing the sliding inserts in each end of the 12-foot center section, and the director was set at the same length as the driven element and pointed at the field-strength antenna. With power applied a field-strength reading was noted. The director length was then shortened inch by inch until the maximum reading was obtained (about double the reference value) and then fell off as the length was reduced past the optimum point. The length for maximum gain was not too critical.

With the director left at the adjustment for maximum forward gain, the reflector was set at the same length as the driven element. As the field-strength meter immediately went off-scale, power was reduced until the meter read about half-scale. The reflector length then was increased inch by inch but showed no increase in field strength, gradually falling off as the length was increased. The optimum length was coincidental with the driven-element length, and was definitely not critical. It was then found that the director could be lengthened slightly to produce a small increase in gain.

Next, with the beam reversed so that the reflector faced the field-strength indicator, the reflector was again lengthened, until a minimum reading was reached. Lengthening past this point caused the reading to increase again. Incidentally, it was necessary to practically quadruple the power input to the transmitter to get any reading at all off the back of the array for adjustment of the front-to-back ($F/B$) ratio. The $F/B$ ratio was excellent even with the reflector set for maximum forward gain, and adjusting the reflector for best $F/B$ ratio reduced the forward gain reading by only a small amount.

It was now found that lengthening the director gave a small increase in forward gain, but the $F/B$ ratio was completely ruined. It was also found that the forward gain could be slightly increased by shortening the driven element and retuning the director. However, the $F/B$ ratio was again ruined. These increases in forward gain were so small as not to be worthy while, in view of the much-poorer $F/B$ ratio which ensued.

An alternative method of tuning was tried which has been widely advocated. The reflector was turned to face the field-strength antenna and detuned by removing the sliding end inserts. The driven element was set to the determined resonant length and the director tuned for minimum field strength. The director length was considerably shorter with this method. Rotating the array 180 degrees disclosed an exceptionally poor $F/B$ ratio, particularly when the director was spaced at 0.2 wavelength. But by tuning the reflector to the previously-determined length for best $F/B$ ratio, the forward gain was greatly increased and the $F/B$ ratio was also greatly improved. Then increasing the short director to the previously-found optimum length again greatly increased the

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*Fig. 1 — Feeder-matching unit used in the tests. Loading is determined by adjustment of link coupling and feeder taps, as described in the Handbook.*
forward gain and had an extremely small effect upon the F/B ratio. Now the lengths of all the elements were at the settings found in the first procedure, and the alternative procedure was obviously not ideal.

Both the R-0.2-A-0.15-D and the R-0.15-A-0.2-D spacings were checked at 28.6 Mc. and at 29.2 Mc. and the values found at one frequency with a given spacing followed closely in pattern for the other frequency. Here note that the spacing figures for the lower frequency were also used at the higher frequency. This saved a lot of time, particularly as the difference was very slight and was compensated for in the element tuning. However, once the array was tuned up at either frequency, it was found that sliding the parasitic elements toward or away from the driven element produced an immediate and radical drop in field strength, this showing that the tuning was optimum for a given spacing only. No unusual effects were noted except in two cases to be pointed out later.

The standing-wave ratio (s.w.r.) was measured by means of the Micromatch and was found to be almost 100/1 with 300-ohm Amphenol Twin-Lead for the line. No amount of adjusting of the “T”-match could alter it, with the “T”-tubing the same diameter as the driven element, spaced 2 inches between adjacent surfaces. However, changing over to 70-ohm transmitting Twin-Lead almost 100/1 with 300-ohm Amphenol Twin-Lead was terminated in a resistance equal to its own impedance. Since this impedance varies with different tuning conditions the necessary readjustments for maximum output after each change become rather tedious. — Editor.

Now with the spacings reversed — that is, R-0.1-A-0.15-D — the same procedure was used, with all elements set at the same length for the start. The director length was found to be fairly critical and the reflector length very critical. A change of only two inches produced a large change in both forward gain and F/B ratio. The length of the reflector was slightly greater for maximum F/B ratio than for maximum gain, but again the loss in forward gain at the setting for maximum F/B ratio was small. The director length remained unchanged after the reflector was tuned, and the length was fairly critical.

It was decided to see what unusual figures might evolve with a spacing of 0.1 wavelength for both director and reflector. Again, all lengths were initially set at the length of the driven element. The director could be shortened a few inches for a worthwhile increase in gain, and the length was fairly critical. Increasing the reflector length by several inches also gave a good increase in gain, and the setting was not very critical. It was then found that the optimum director length, although unchanged, was now quite critical. The F/B ratio at this point was excellent. However, increasing the reflector length gave a slight improvement in the F/B ratio and had an unmeasurable effect upon the forward gain.

At the higher frequency, where the spacings were slightly greater, in terms of wavelength, the director could be shortened to a point where the field strength appeared maximum, and then

![Diagram](image.png)

It was felt that this method was also not ideal.

**Close Spacing**

The next spacing to be tried was the popular close spacing, R-0.15-A-0.1-D. It was decided that the original method of tuning the director with the reflector detuned completely was not necessary and wasted some time, so all elements were set to the same length as the driven element to start.

The director length was very critical. A change of only two inches made a big difference in the field-strength reading, and the optimum director length was considerably greater as compared to the wider spacings. The optimum reflector length also was somewhat greater than any of the previous lengths, and the length for maximum forward gain was also the correct length for best F/B ratio. Shortening or lengthening the reflector immediately ruined the excellent F/B ratio. Any attempt to retune the director showed a definite decrease in forward gain.

Now with the spacings reversed — that is, R-0.1-A-0.15-D — the same procedure was used, with all elements set at the same length for the start. The director length was found to be fairly critical and the reflector length very critical. A change of only two inches produced a large change in both forward gain and F/B ratio. The length of the reflector was slightly greater for maximum F/B ratio than for maximum gain, but again the loss in forward gain at the setting for maximum F/B ratio was small. The director length remained unchanged after the reflector was tuned, and the length was fairly critical.

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4 Adjusting the beam while using it as a receiving antenna is based on the assumption that the tuning conditions for optimum gain and front-to-back ratio are the same for receiving as for transmitting. This is true only when the antenna is delivering maximum power to a load — i.e., is terminated in a resistance equal to its own impedance. Since this impedance varies with different tuning conditions the necessary readjustments for maximum output after each change become rather tedious. — Editor.

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further large decreases did not seem to have any effect upon the forward gain. But after the reflector was tuned, the director assumed a more natural length. This seemed to indicate that the spacing figures for such close relative spacings should be figured carefully for optimum results.

**Broad-Banding**

According to the *Handbook*, an array can be broad-banded by tuning the director to a frequency differing from that of the other elements. So with the R-0.2-A-0.15-D spacing, the array was tuned to resonance at 28.6 Mc. and the director was then detuned to the length determined for 29.2 Mc.—600 kc. higher in the band. The field strength dropped off only about 1/6 of the reference value and the F/B ratio was apparently unchanged.

However, with the R-0.15-A-0.1-D spacing, it was found that this type of broad-banding seriously affected the forward gain, dropping the field strength to almost half the reference reading. With the reverse spacing, R-0.1- A-0.15-D, the drop in gain was also serious, but somewhat less.

**Combined Spacing**

The recent trend toward wider spacing of parasitic elements has also produced arrays using combined close and wide spacing. The next logical step was to try some such beam, and the following statements pertain to a spacing of R-0.25-A-0.1-D. This particular set-up brought out some very interesting facts, since these spacings happen to be the optimum for self-resonant parasitic elements used singly.

With all the elements set at self-resonance, it was found that the director could be increased in length about one-half inch for a very small increase in forward gain. This made it just longer than the driven element. The gain dropped rather rapidly as the length was varied either way from this setting. The reflector length was increased only two inches for a slight increase in forward gain. The F/B ratio was rather poor, although increasing the reflector length another six inches improved the F/B ratio somewhat. But it was still not as good as all other spacings so far checked. The forward gain was not affected by the adjustment for best F/B ratio. With the reflector tuned for maximum F/B ratio, the director then peaked at "self-resonance.

The reverse spacings, R-0.1-A-0.25-D, were the next to be checked, and it was immediately noticed that with the elements all set to the same length as the driven element, the wider-spaced element was automatically the reflector, until detuned. However, progressive shortening of the director gradually increased the forward gain, with the adjustment very critical over an unusually wide range. On the other hand, the reflector length needed to be increased only two inches for maximum forward gain and the peak was quite critical, the field strength dropping off rapidly on either side. The director could now be lengthened by several inches for a fair increase in forward gain. However, the F/B ratio was poor. Retuning the reflector for best F/B ratio unfortunately resulted in a very serious drop in forward gain. Splitting the difference between the two reflector lengths was only a fair compromise.

**Wide Spacing**

All the spacings in more or less common use, and that could be accommodated in the 12-foot boom length, had now been tested, but one outstanding set of spacings was yet to be investigated: the all-wide-spaced array R-0.25-A-0.25-D. This might give results quite different from any yet observed. So, with no little difficulty, the boom was extended to allow an over-all spacing from reflector to director of 16 foot 6 inches. Wooden props had to be used to keep the elements from sagging out of line in the experimental set-up. The elements were all set at the same length as the driven element in the first step of the now-standardized tuning process. The director then had to be shortened considerably to give the maximum increase in field strength over the reference value. The optimum point was reasonably critical. Now it was found that although the reflector length was not critical, it coincided with the driven-element length as an optimum.

At this point the F/B ratio was excellent, but a definite decrease in back radiation could be secured by increasing the reflector length a few inches. The forward gain dropped somewhat with the reflector adjusted for maximum F/B ratio, and continued to drop gradually as the reflector length was increased considerably past this setting. The F/B ratio was so good, however, that this large increase in reflector length failed to affect it measurably.

In order to check the s.w.r., the "T"-match was tentatively set at the position found to give the lowest s.w.r. for the other wide-spaced arrays, R-0.2-A-0.15-D and reverse. The Micromatch was inserted in the line, and lo, the s.w.r. was only 1.1/1 without any further adjustment! The s.w.r. was checked again during a heavy rainstorm, and although the 70-ohm Twin-Lead was soaked for half its 50-foot length, the s.w.r. was unchanged at 1.1/1. With this all-wide-spaced array, the only critical adjustment was the length of the director, and the only undesirable feature was the un急需 length of the supporting boom.

Borrowing an idea from a well-known demon-
Fig. 3 — The forward field pattern shown is typical of all the three-element arrays tested. The solid line is the pattern for the R-0.2-A-0.15-D antenna. On the relative scale, with the forward field represented by 100, the rear lobe with this antenna had a value of 2. Except for the two dotted-line patterns, the rear radiation with all the antennas was below 5. All arrays were adjusted for best front-to-back ratio in making the patterns.

Field Patterns

Although the forward gains of the various arrays can be rather roughly compared by field-strength measurements in the plane of the antenna, the gain of the beam at operating angles above the horizon can only be determined by methods beyond the scope of most amateurs. The height above ground can be as important to the vertical directivity as the yet-to-be-found optimum spacing. In comparing the forward gains by field-strength measurements, many errors can be introduced by low radiation resistance and high s.w.r.s. Simply having the same transmitter input for each comparison is far from enough. It was therefore decided to make final comparisons of the various arrays by taking field patterns of the direct radiation, adjusting the transmitter loading so that each array gave the same reference reading on the field-strength indicator. In this way no one array could have an unseen advantage over another.

A circle was drawn on a piece of cardboard, with radials for every 15 degrees of arc. This was slit and fitted around the pipe mast and secured to the edge of the convenient rooftop. After the beam had first been aimed for maximum forward gain, an indicator was attached to the mast and the compass card orientated. When the mast was turned, the 15-degree divisions could be read off with good accuracy. Field-strength readings were taken around the compass for each array and the points then plotted on polar graph paper so that a pattern could be read. See Fig. 3.

Because the peak readings were the same for each array, the major lobes were much the same in shape. There was enough variation to be indicative of which was the sharpest and which was broadest. Also the backward lobes, if any, were directly comparable in extent. See Table I.

These field patterns crystallized the findings of most of the previous tests. Several important facts were quite obvious:

1) No one pattern was greatly superior to the others, when the main lobes were compared for general sharpness.
2) Only the combination wide- and close-spaced arrays had a noticeable backward lobe, with R-0.25-A-0.1-D showing a double lobe to the rear.
3) The R-0.1-A-0.1-D spacings had the broadest front lobe.
4) The most widely-used close spacings, R-0.15-A-0.1-D, had the best F/B ratio.
5) The wide-spaced arrays, R-0.25-A-0.25-D and R-0.2-A-0.15-D, had patterns that compared with the best of the others.
6) The director should be spaced closer than the reflector for best F/B ratio and highest forward gain, no matter what the relative spacings.

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7) And according to (6) above and using (4) as a pattern, increases over the basic R-0.15-A-0.1-D close spacing might well be made in steps of 0.05 wavelength each, such as R-0.2-A-0.15-D and R-0.25-A-0.2-D.

TABLE I

<table>
<thead>
<tr>
<th>Parasitic-Element Spacing</th>
<th>Freq.</th>
<th>Director Length</th>
<th>Driv. Elem. Length</th>
<th>Reflector Length</th>
<th>Comparative Ratings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F/B Ratio</td>
</tr>
<tr>
<td>R-0.1-A-0.1-D</td>
<td>28.6 Mc.</td>
<td>16' 10&quot;</td>
<td>16' 0&quot;</td>
<td>17' 2&quot; Max. gain or 17' 6&quot; Max. F/B</td>
<td>5th</td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>15' 10&quot;</td>
<td>16' 0&quot;</td>
<td>16' 8&quot; Max. gain or 16' 10&quot; Max. F/B</td>
<td>1st</td>
</tr>
<tr>
<td>R-0.15-A-0.1-D</td>
<td>28.6 Mc.</td>
<td>16' 2&quot;</td>
<td>16' 0&quot;</td>
<td>17' 2&quot; Max. gain and F/B</td>
<td>3rd</td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>15' 10&quot;</td>
<td>16' 0&quot;</td>
<td>16' 10&quot; Max. gain or 16' 11&quot; Max. F/B</td>
<td>2nd</td>
</tr>
<tr>
<td>R-0.1-A-0.15-D</td>
<td>28.6 Mc.</td>
<td>15' 8&quot;</td>
<td>16' 0&quot;</td>
<td>16' 10&quot; Max. gain or 16' 10&quot; Max. F/B</td>
<td>6th</td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>15' 4&quot;</td>
<td>16' 0&quot;</td>
<td>16' 0&quot; Max. gain or 16' 0&quot; Max. F/B</td>
<td>8th</td>
</tr>
<tr>
<td>R-0.15-A-0.2-D</td>
<td>28.6 Mc.</td>
<td>15' 3&quot;</td>
<td>16' 0&quot;</td>
<td>16' 0&quot; Max. gain or 16' 0&quot; Max. F/B</td>
<td>7th</td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>14' 9&quot;</td>
<td>16' 0&quot;</td>
<td>16' 0&quot; Max. gain or 16' 0&quot; Max. F/B</td>
<td>4th</td>
</tr>
<tr>
<td>R-0.25-A-0.1-D</td>
<td>28.6 Mc.</td>
<td>16' 6&quot;</td>
<td>16' 0&quot;</td>
<td>16' 8&quot; Max. gain or 16' 8&quot; Max. F/B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>16' 10&quot;</td>
<td>16' 0&quot;</td>
<td>16' 2&quot; Max. gain or 16' 8&quot; Max. F/B</td>
<td></td>
</tr>
<tr>
<td>R-0.1-A-0.25-D</td>
<td>28.6 Mc.</td>
<td>15' 8&quot;</td>
<td>16' 0&quot;</td>
<td>16' 8&quot; Max. gain or 16' 2&quot; Max. F/B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>14' 6&quot;</td>
<td>16' 0&quot;</td>
<td>16' 2&quot; Max. gain or 16' 4&quot; Max. F/B</td>
<td></td>
</tr>
<tr>
<td>R-0.25-A-0.25-D</td>
<td>28.6 Mc.</td>
<td>14' 10&quot;</td>
<td>16' 0&quot;</td>
<td>16' 0&quot; Max. gain or 16' 10&quot; Max. F/B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>29.2 Mc.</td>
<td>14' 8&quot;</td>
<td>16' 0&quot;</td>
<td>16' 0&quot; Max. gain or 16' 4&quot; Max. F/B</td>
<td></td>
</tr>
</tbody>
</table>

* With beam adjusted for best F/B ratio.

**Conclusions**

Because only the direct radiation could be measured, it is not possible to specify which set of spacings is best for low-angle radiation. But the data brought out (and verified by the field patterns) did help to settle the question of spacing from other viewpoints. In general, it was felt that while the close-spaced beams exhibited excellent gain and F/B ratios, the low center impedance, narrow frequency characteristics and feeding difficulties made a compromise spacing more desirable, particularly the R-0.2-A-0.15-D spacing. This wider spacing retained an excellent F/B ratio with no measurable sacrifice in forward gain.

No one formula was universally applicable in determining element lengths. Variable factors such as tubing size and mode of construction made it necessary to establish, by separate excitation, the resonant length of a half-wave as a working reference. This was verified in attempting to tune a neighbor's close-spaced beam of entirely different construction and element sizes. There was no critical adjustment and no real gain apparent when the driven-element length was set by formula. The beam just wouldn't seem to tune. Then the parasitic elements were removed in order that the driven element could be tuned to the operating frequency by separate excitation.

(Continued on page 116)
A Simple Volume Compressor

BY JULES DEITZ,* W3FPD

Nowadays it is becoming standard practice to include a compressor circuit in the speech amplifier of a rig. If you haven't already done so, a few hours of work and an investment of less than five dollars will give you the indisputable advantages of volume compression. Many circuits can be devised that will do the trick, but the one to be described seems to be quite simple, and there is no doubt about its effectiveness. It uses only three tubes and a few other parts.

The Circuit

The circuit, shown in Fig. 1, uses a triode-connected 6AB7 as the compressor tube. This 6AB7 should be located somewhere along the line in your speech amplifier, preferably ahead of the driver or the amplifier’s output stage. It is shown as it would be connected in a resistance-coupled circuit, but it should be possible to substitute transformer coupling instead of R2, as it is shown. The 6AB7 is connected as a triode. At W3FPD, the lead marked “from output of speech amplifier” is connected to the hot side of the 500-ohm line connecting the speech amplifier to the modulator. If your arrangement is different, you can bridge a low-impedance tap of your modulation or output transformer with a plate-to-line transformer (its quality is unimportant, but the insulation must be adequate).

Technical Information Division, Federal Communications Commission, Washington 25, D. C.

• Volume compressors for ‘phone transmitters are standard equipment these days for in-the-know hams who want to hold their modulation percentage high without danger of overmodulation. Here is a simple circuit that requires only three tubes and will fit into almost any existing speech amplifier.

A potential of roughly 3 to 5 volts is needed at Rs for control.

When there is no audio voltage at the output of the amplifier, the triode-connected 6AC7 bias generator has a small amount of self-bias developed across Rs. When audio voltage appears across Rs (from the output of the speech amplifier), it is rectified by the 6H6 and applied to the grid of the 6AC7 across Rs. It appears as a negative voltage that increases with the speech-amplifier output. Hence the 6AC7 cathode current will decrease, depending upon the developed bias and the 6AC7 characteristic. Thus far we have a positive voltage with respect to ground appearing at point A, and this voltage will decrease as the output of the speech amplifier increases. But there is a (practically) constant negative voltage to ground at B developed by the steady bleed current through Rs. This voltage should always be higher than the voltage developed across Rs by the 6AC7 current. A strong audio voltage appearing across Rs will reduce the 6AC7 cathode current and hence the net voltage at A becomes more negative. This negative voltage, applied to the 6AB7 grid through resistor R1, decreases the gain through the speech amplifier. The decrease in amplifier gain is proportional to the speech-amplifier output, and the desired volume-compressor action is readily accomplished.

The triode-connected 6AB7 retains the remote cut-off characteristic to a degree that is satisfactory for this application. The time delay of the circuit is determined by the combination C4 and R2. Capacitor C8 should be located close to the grid of the 6AB7, to minimize coupling by the loop to extraneous noise and fields. It was also found advisable to locate the input circuit of the 6AC7 close to its source of audio drive. By observing these simple precautions, no difficulty should be experienced in adapting this device to a ‘phone transmitter.

(Continued on page 180)
Come Aboard, OMI!

Radio Amateurs and the New Naval Reserve

BY D. S. WICKS,* W3JDK/WI1ZO

The Navy’s plan for the Electronic Warfare component of the new Naval Reserve has been realized to date by an active and fast-growing organization throughout the U.S.A.

Backed up this training plan, the Navy is providing each of its more than 300 Reserve Armories with a radio station, complete with radioteleprint facilities, radars, direction finders and a well-equipped electronics laboratory. In addition to the large stocks of gear set aside from war surplus the Navy has purchased test equipment, television kits, tools and other items necessary for complete electronics training. For localities where no armory is to be established, similar equipment installations are being provided for some 400 Electronic Warfare Drill Quarters, which are facilities smaller than the armories and exclusively for electronic-warfare training. Approximately 175 seagoing Navy ships, including destroyers, submarines and smaller craft, have been stationed on both coasts, in the Great Lakes and along the Mississippi River to augment the Reserve training facilities ashore. A maximum of 5000 small radio stations are planned for Electronic Warfare platoons in towns too small to support either an armory or an Electronic Warfare drill quarter.

All personnel of the Reserve whose naval duties will involve research, design, production, installation, maintenance, and operation of the equipment and techniques of modern electronics are included in the Electronic Warfare component of the Reserve. The training program has been broken into three general fields:

1) Technical Electronics (training of Electronics Technicians Mates, Fire Control Technicians, Electronics Officers)
2) Combat Information Center (training includes Radarmen, Sonarmen, Telemers, CIC Officers)
3) Operational Communications (training of Radiomen, Signalmen, Communications Officers)

At the present time, Naval reservists who come under the Electronic Warfare program are either enrolled as members of the divisions of the Organized Reserve using the armories as meeting places, or are assigned to Electronic Warfare companies and platoons of the Volunteer Reserve, and in the latter event they may use either the armories or the Electronic Warfare drill quarters. In very small communities even the home of a reservist may occasionally be utilized as a temporary meeting place.

As was expected, some of the most interested and enthusiastic members of the Electronic Warfare component of the new Naval Reserve are amateurs. A considerable number of amateurs who were members of the prewar Naval Communication Reserve are now enrolled in Organized or Volunteer Reserve Electronic Warfare units and usually form the active nucleus of such units.

One of the outstanding operating activities is the Naval Reserve Communication Network, which is a comprehensive network of armory, drill quarters and individual reservists’ radio stations throughout each Naval district. Several hundred such radio stations are now in operation, and true to Navy and amateur tradition have already served the public on many occasions by providing emergency communications, the Texas City and

In the new Naval Reserve, particular emphasis is placed on instruction in the use of new electronic devices. Here a chief explains the workings of a mobile air-search radar.

QST for
Texas-Oklahoma tornado disasters being notable in this connection. To facilitate emergency communications, in addition to the transceivers and gas-engine generators supplied to all radio stations, more than 50 mobile radio stations complete with five kw. of independent power have been strategically placed throughout the continental U.S.A.

Realizing that Naval Reserve radio drills might cause undesirable congestion on the ham bands, it has been directed that only Navy frequencies may be used for such purposes. A recent letter signed by the Chief of Naval Communications allocated these Navy frequencies for the Naval Reserve Communication Network and set forth the conditions under which Naval Reserve radio stations would operate, as follows:

"... Amateur radio call signs, frequencies and operating techniques will be used for the usual amateur radio type operations as well as to provide emergency communications to localities in the event of disasters such as storms, floods and fires, including practicing therefor. When operating on amateur frequencies, FCC amateur radio rules and regulations will be complied with. Only those reservists who are also licensed by the FCC as amateur radio operators may operate Naval Reserve radio equipment on amateur frequencies. Amateur frequencies will not be used for..."

- "The continuing cooperation of radio amateurs with the United States Naval Reserve is gratifying to the Navy Department. Geared as it is to the many advances in the electronics field, the Electronic Warfare component of the new Naval Reserve merits the interest being shown by the skilled operators and technicians of whom amateur radio is comprised. The U.S. Navy is indebted to the thousands of licensed amateurs, who, as Naval Reservists, served faithfully in the prewar Naval Communication Reserve and as technicians, operators and officers during the past war."

T. L. SPRAGUE
Rear Admiral, USN
Chief of Naval Personnel

\* Distinctive "K" amateur calls already assigned to Naval Reserve units, and their locations:

- KINR Providens, R. I.
- KINRA Lynn, Mass.
- KINRB Boston, Mass.
- KINRC Portland, Maine
- KINRD Noroton Hts., Conn.
- KINRE New Haven, Conn.
- KINRH Hartford, Conn.
- KINRI Woonsocket, R. I.
- KINRS Springfield, Mass.
- KINRV Hingham, Mass.
- KINRW Fall River, Mass.
- KINRX New Bedford, Mass.
- KINRE Barq, Maine
- K2UN Jersey City, N. J.
- K2NR Naval Yard, N. Y.
- K2NBB Whitestone Landing, N. Y.
- K2NER Toompkinsville, N. Y.
- K2NED Pt. Schuyler, N. Y.
- K2NER Rochster, N. Y.
- K2NRF U.S.S. Pririca State, N. Y.
- K2NRG Glens Falls, N. Y.
- K2NRH Yorksas, N. Y.
- K2NRI Newburgh, N. Y.
- K2NRR Niagara, N. Y.
- K2NRJ Camden, N. J.
- K2NRE Port Arthur, N. J.
- K2NRU Hackensack, N. J.
- W3US Naval Gun Factory, D. C.
- K3NBB Ft. McHenry, Md.
- K3NRC Chester, Pa.
- K3NRD Erie, Pa.
- K3NRG Reading, Pa.
- K3NRE Navy Dept., Wash., D. C.
- K4NR Jacksonville, Fla.
- K4NRA Miami, Fla.
- K4NRR Pensacola, Fla.
- K4NRC Tampa, Fla.
- K4NKA Tallahassee, Fla.
- K4NRE Da Land, Fla.
- K4NRG Key West, Fla.
- K4NRH Key West, Fla.
- K4NRV Punta Gorda, Tenn.
- K4NRY Louisville, Ky.
- K4NRZ Lexington, Ky.
- W5USN New Orleans, La.
- K5NRB Sabine, Texas
- K5NRR Fort Worth, Texas
- K5NRD Athens, Texas
- K5NRB El Paso, Texas
- K5NRJ Oklahoma City, Okla.

- K5NRE Seattle, Wash.
- K5NRB Portland, Ore.
- K5NRD Topeka, Kans.
- K5NRA Santa Barbara, Calif.
- K5NRD Long Beach, Calif.
- K5NRB Long Beach, Calif.
- K5NRD Los Angeles, Calif.
- K6WBO Stockton, Calif.
- K5NRB Sacramento, Calif.
- K5NRB Treasure Island, Calif.
- K5NRB Oakland, Calif.
- K5NRB Fresno State College, Calif.
- K5NRE Vallejo, Calif.
- K5NRB Seattle, Wash.
- K5NRB Halla Walls, Wash.
- K5NRB Kodiak, Alaska
- K7NRB Gray's Harbor, Wash.
- K7NRE Cheyenne, Wyo.
- K7NRB Salt Lake City, Utah
- K8NRB Cleveland, Ohio
- K8NRB Detroit, Michigan
- K8NRB Battle Creek, Mich.
- K8NRB Jackson, Mich.
- K8NRB Lansing, Mich.
- K8NRB Youngstown, Ohio
- K8NRB Lima, Ohio
- K8NRB Mansfield, Ohio
- K8NRB Cinemat, Ohio
- K8NRB Toledo, Ohio
- K7NRB Warren, Ohio
- K7NRB S. Charlestown, W. Va.
- K8NRB Indianapolis, Ind.
- W9NR Chicago, Ill.
- K9NRB Quincy, Ill.
- K9NRB Green Bay, Wis.
- K9NRB Manitowoc, Wis.
- W9USY Sioux City, Iowa
- K9NRB Minneapolis, Minn.
- K9NRD Denver, Colo.
- K9NRD Des Moines, Iowa
- K9NRD Cedar Rapids, Iowa
- K9NRD St. Louis, Mo.
- K9NRD Kansas City, Mo.
- K9NRD Fargo, N. Dakota
- K9NRB Wichita, Kans.
- K9NRB Winfield, Kansas

* First amateur radio "K" issued in the continental U.S.A.

"Only those Reservists who are licensed by FCC as amateurs may operate Navy gear on amateur frequencies." This installation participated in the recent Texas-Oklahoma disasters.

October 1947
Naval Reserve communications drills or regular Naval Reserve traffic. . . " The Navy Department assures amateurs that the amateur bands will be used for amateur radio purposes only and never encroached upon for official Naval Reserve usage.

In addition to the Navy call signs which are used when drilling on the Naval Reserve Communication Network, arrangements have been made with the FCC to issue amateur call signs to all Reserve radio stations. About 300 of these amateur calls will be of distinctive letter combinations with the prefix "K." QSL cards are being procured for use of these stations when working in the amateur bands.


The Electronic Warfare Plan specifies the maintenance of close liaison between the Planning Officer and the ARRL and Institute of Radio Engineers. Currently, this liaison is maintained for cooperation in the many phases of Naval Reserve activities with Mr. George Bailey, W2KH, who is executive secretary of IRE as well as president of ARRL.

(Continued on page 188)
ARRL's 14th Sweepstakes

Medallions to Section Leaders—C.W. and 'Phone Certificates to Each Club—Use Any Ham Band(s)—Nov. 15th-17th, 22nd-24th

BY F. E. HANDY, * WIBDI

<table>
<thead>
<tr>
<th>Time</th>
<th>Start</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>EST</td>
<td>Nov. 15th &amp; 22nd</td>
<td>Nov. 17th &amp; 24th</td>
</tr>
<tr>
<td>CST</td>
<td>6:00 P.M.</td>
<td>3:01 A.M.</td>
</tr>
<tr>
<td>MST</td>
<td>5:00 P.M.</td>
<td>2:01 A.M.</td>
</tr>
<tr>
<td>PST</td>
<td>4:00 P.M.</td>
<td>1:01 A.M.</td>
</tr>
</tbody>
</table>

This annual competition, one of ARRL's "big three," is for the individual operating leadership of each ARRL section. "SS" operators on c.w. compete with other telegraphing operators; those using 'phone compete only with other voice operators having similar geographical advantages and handicaps. A contestant is regarded as one person, with no help permitted by any other person during the contest. The Sweepstakes is operating fun, tests stations and is a builder of operator confidence and ability. New records are piled up in each SS.

Exchanges between stations (proof of QSO) follow the order of message parts. The aim is to work as many stations as possible. Points derived from such work are multiplied by the number of different ARRL sections worked, i.e, sections with which you have had at least a one-way exchange in the contest. The contest information is like a message preamble, but for city and state we substitute the name of the ARRL section. At the end of the activity each operator merely totals or summarizes his points and sends them in for cross-checking. Mimeographed contest forms will be sent gratis, on receipt of radiogram or postcard request; however, the sheets are not required, nor is any advance entry. You can follow the form shown with this announcement or ask for the mimeographed forms to make it easy to forward your record of exchanges to ARRL.

You can operate a total of 40 hours in the two contest periods, dividing time between week-ends as you wish. Every licensed amateur in every section is urged and invited to take part. On 'phone use "Calling any Sweepstakes station." On c.w. the general call is "CQ SS CQ SS CQ SS"

de W... W... W..." Sometimes a single snappy "CQ SS" will net several exchanges.

Awards

Medallions for this year's SS winners, two in each section, will go to the c.w. and radiotelephone winners. Certificates will recognize competitive effort within clubs, where three or more club members submit logs identifying their work with one particular club. At least three stations must compete and report to rate either a club-'phone or a club-c.w. SS certificate. The three or more individual club members, or new hams invited and reported by such a club, in addition to sending a contest report must have their club secretary write HQ, listing their individual calls and scores and the total of such scores. Only the aggregate of

HOW TO SCORE

All contacts count:

One point for each QSO when "receipt" is completed for an exchange one way.

Two points for each QSO when the required information is exchanged both ways.

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

Multiply this by 1.25 if you used 100-watt-or-less transmitter input at all times.

*Communications Mgr., ARRL.

1 The highest individually-attained score of any one of the operators of amateur stations having more than one operator is the official score for such a station. Circles any entries of stations and/or sections that cannot count in the official total. Awards will be made to the individual operator accredited with this total.

2 See page 6.

This medallion will be presented to c.w. and 'phone winners in the 14th ARRL Sweepstakes. It provides dignified and lasting proof of individual accomplishment in one of the most popular of operating contests.
EXPLANATION OF "SS" CONTEST EXCHANGES

Send Like a Standard
Msg. Preamble, the ........ NR

<table>
<thead>
<tr>
<th>Exchanges</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contest info. numbers, 1, 2, 3, etc., for each station worked</td>
<td>The QSO NR tells how you are doing; aids Hq. in checking</td>
</tr>
<tr>
<td>Send your own call</td>
<td>Identification</td>
</tr>
<tr>
<td>CK (RST report # of station wkld)</td>
<td>All stations exchange complete reports</td>
</tr>
<tr>
<td>Your ARRL section</td>
<td>Establishes locations</td>
</tr>
<tr>
<td>Send time of transmitting this NR</td>
<td>Time and date in contest periods prove claims</td>
</tr>
</tbody>
</table>

Scores confirmed by receipt at ARRL of individual contest logs shall count for the club.

To encourage as many locally-competing operators as possible, and the fostering of individual's operating achievement by clubs, ARRL presents a gavel for the greatest aggregate club-member scores ('phone and c.w.) for which logs are actually submitted to Headquarters. Club officers' claims require at least three 'phone or c.w. entries to validate our receipts for the aggregate score. In addition, some clubs, to equalize differences of either size or geographical location, sometimes make private wagers under their own supplementary arrangements.

The handsome medallion to be presented c.w. and 'phone winners is shown in the photograph. It provides dignified and lasting proof of individual accomplishment.

CONTEST EXCHANGES

EXPLANATION OF "SS" CONTEST EXCHANGES

Send Like a Standard
Msg. Preamble, the ........ NR

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The handsome medallion to be presented c.w. and 'phone winners is shown in the photograph. It provides dignified and lasting proof of individual accomplishment.

STATION W....-SUMMARY OF EXCHANGES, FOURTEENTH A.R.R.L.
ALL-SECTION SWEEPSTAKES

<table>
<thead>
<tr>
<th>Freq. Band (Mc.)</th>
<th>Time On or Off Air</th>
<th>Sent (1 point)</th>
<th>Received (1 point)</th>
<th>Number of Each Different Station as Worked</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td>On 6:10 P.M.</td>
<td>1 WIAW 589 Conn. 6:12 P.M. 15</td>
<td>7 WA9IN 589 Ohio 6:14 P.M. 15</td>
<td>1</td>
</tr>
<tr>
<td>7</td>
<td>Off 2:35 P.M.</td>
<td>4 W6J 579 6:15 P.M. 15</td>
<td>6 W7KB 579 N. H. 6:17 P.M. 15</td>
<td>2</td>
</tr>
<tr>
<td>2.5</td>
<td>Off 2:15 P.M.</td>
<td>10 W6J 479 6:18 P.M. 15</td>
<td>9 W7KEV 569 N. D. 6:20 P.M. 15</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Operating Time: 5 hrs. 55 min. 3.5, 7 and 14 Mc. used. 10 Sec., 21 Pts.

Number and names of operators having a share in above work ...........................................................
Claimed score: 21 points X 10 sections = 210 X 1.25 (85 watts input) = 262.5
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.

Signature ....................................................
Address ....................................................
Tube Line-Up .............................................

Number Different Stations Worked ..................................

48 QST for
Exchanges by Radio

Before points or sections can be claimed, at least a one-way six-part exchange must be completed and acknowledged between two stations as "proof of QSO." It is not essential that each station worked be taking part to make points that count. Ask the operator to take your preamble and come through with like information. Refer to this announcement.

More Rules

1) Contest exchanges must be sent in the order indicated, that of ARRL message preambles. Incomplete exchanges or wrong order of sending justifies disqualification.

2) Entries are (a) in the low-power class, or (b) high-power class. Any work on high power places all the score in the high-power class. Show power used for each QSO or groups of QSOs.

3) Show operating time for each period on the air in the SS, and the total of such operating time.

4) Mark logs for "phone" or "c.w." entry. Group work by either method.

5) All work must fall in the contest periods.

6) Award Committee decisions shall be accepted as final.

7) Reports from all stations must be postmarked no later than December 8, 1947, to be considered for awards.

Report Results

Report to ARRL, West Hartford, Conn., as soon as the contest is over. Use the log form shown in the example. List all persons who were at your station and responsible for any part of the score, indicating any part they played. All hams are requested to submit lists (even if scores are small) to help support claims from other stations. Mail your contest report immediately to insure that your results are credited.

There is no point in working the same station more than once in the contest after two points have been earned. If but one point is made the first time, you can add a point by working this station again for exchange in the opposite direction.

Silent Keys

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

W4ECB, Major Frank C. Ziglar, Charlotte, N. C.
W5CAS, James A. Carney, San Antonio, Texas
W5KUJ, ex-W9HO, L. H. Weeks, Dallas, Texas
W6EMZ, Charles M. Feay, South Gate, Calif.
W7FDL, Charles A. Lynch, Rosalia, Washington
W7KTA, Raymond H. Butler, Pheonix, Arizona
Ex-W8BXX, Robert B. McIntyre, Warrensville, Ohio
W9UTE, Stanton E. Kirk, Adams, Indiana
VE7HA, Fred Taylor, New Westminster, B.C.

W2EMZ, Charles M. Feay, South Gate, Calif.
W7FDL, Charles A. Lynch, Rosalia, Washington
W7KTA, Raymond H. Butler, Pheonix, Arizona
Ex-W8BXX, Robert B. McIntyre, Warrensville, Ohio
W9UTE, Stanton E. Kirk, Adams, Indiana
VE7HA, Fred Taylor, New Westminster, B.C.

Associate Member Roland S. Davidson, West Lynn, Mass.
Engineer-in-Charge Forest Redfern, FCC Eastern Division

RECEIVERS — improved Reinzart tuners, Armstrong superregenerators, and multistage t.r.f. jobs with crystal detector and a.c. filament supply — continue to be lively topics for discussion, we glean from our October 1922 QST.

The trend is certain — there will be rebuilding aplenty this fall in preparation for the 1922 Transatlantics, scheduled for December. Two-way work is the goal this year, and already English, French, and Dutch amateurs have signified their intention of participating.

John L. Reinzart, 1QP, tells in this issue how to add selectivity and audio regeneration to his popular tuner. And from England we learn of superior performance with the Reinzart circuit when r.f. preamplification is added. Reporting on "Another Month of Superregeneration," Editor Warner writes that amateur experience with E. H. Armstrong's new invention continues to be disappointing as concerns reception of c.w. and DX, although many persons claim sensational results in receiving local radiophones. For the amateur interested in the receiver refinements of extra stages and batteryless operation, we have articles by M. C. Bateel, "Multistage Amplifiers," and by P. D. Lowell, "Amplifier Operation from A.C. Supply."

The whys and wherefores of the electric wave filter, a newly-developed device, are thoroughly discussed by Dr. Frank B. Jewett of the Western Electric Company. Design formulas, circuits, and applications for both high- and low-pass filters are treated in detail. Also along mathematical lines is Paul G. Watson's excellent article on "Power Factor Applied to Radio Condensers."

Further timely offerings are Boyd Phelp's "Break-In for C.W.," Alpha A. Learned's (1AAU) "A Calibrated External Heterodyne and Wave Meter," and LeRoy Moffett's (5ZAV) "A 122-Foot Tower."

The rudiments of operating a 3-circuit tuner and reading a hydrometer are outlined in a new department, "The Junior Operator." And to add light touch to this issue, we have "The Prophet's" parable on radiophones and the amateur.

From the Midwest Division comes word that George S. Turner, 9ZAD, has been elected division manager, replacing L. A. Benson, resigned because of business pressure. August divisional reports show c.w. still outrunning spark in traffic-handling volume, responsible for 63% of the total.

Two s.y.t.s — Misses Winifred Dow, 7GB, and Marion Garnhausen, 3BCK— grace the pages of the "Who's Who" section this month. Featured in station descriptions are 4BQ, Rome, (Continued on page 188)
Using Selenium Rectifiers

A Symposium

S.R. Circuits and Their Applications

BY RALPH BERKMAN,* W7HWY

To many, the new selenium rectifiers are just a substitute for the rectifier tube of the more common a.c.-d.c. sets, but to those who have investigated their possibilities, they represent the heart of an ideal power supply for many of the pieces of gear that the ham, for one reason or another, is continually acquiring. Using a rectifier of this type, the power supply will require very little space as compared to the more conventional type, and components may be placed wherever convenient. If operated within their limits, rectifiers of this type will give off very little heat. No warm-up period is required, as in the case of the filaments of tube rectifiers. In VFOs, converters and receivers, heat has always been a problem and in these applications the dry rectifier with its low heat radiation merits special consideration.

Construction of the selenium cell varies with the various manufacturers, but all are basically the same in that the selenium is placed on one electrode and then crystallized. The plate is then formed and the barrier film forms on the surface of the selenium. Against this the other electrode is pressed, making up the cell. Cells are stacked to produce the desired current and voltage rating, making up what is known as the selenium rectifier. Rectification action takes place in much the same manner as in any other rectifier. In the forward direction there is good conductivity but in the back direction there is not perfect cut-off, and, as a result, there will be some a.c. ripple content.

These units come in the 100-, 150- and 200-ma. sizes and the additional cost of the larger sizes is very little. The efficiency of rectifiers of this type run high. The voltage drop across a unit averages about 5 volts. The critical temperature of these units is very close to 155° F. Therefore, protective resistors should be installed in series with them to limit the condenser charging current to a safe value. Temperatures may be kept down by not trying to push the unit to its full capacity, and then some. Give it a little safety margin and you will get longer life and have a trouble-free power supply.

All selenium rectifiers mount with a No. 6 screw and the unit is insulated from the mounting hole. This permits mounting directly to any metal surface, which will help to dissipate some of the heat. It will be found that mounting the unit in a vertical position will provide better air circulation. If these few precautions are observed, up to 450 volts at 200 ma, is available with standard component parts and you won't have a supply that is several times heavier than the rig it powers.

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Transformerless Circuits

Although selenium rectifiers may, of course, be used in any of the standard transformer-rectifier-filter systems, it is natural to associate their advantage of compactness and light weight with transformerless supplies. Fig. 1 is a straightforward half-wave rectifier circuit which may be used in applications where 115 to 130 volts d.c. is desired. It makes an ideal bias supply, for instance. In this, as well as other circuits, it will be observed that the negative side of the output is common with one side of the a.c. line and it is suggested that this side be fused with a 1/2-ampere fuse.

Fig. 2 shows several voltage-doubler circuits. Of the three, the one shown at B is the most desirable since there is no series condenser. It is a full-wave circuit and there will be very little ripple voltage appearing at the output. On the other hand, the circuit of C has one very desirable feature in that point X is common to both condensers in the rectifier and also to the first condenser in the filter. This means that a single-unit three-section condenser may be used, saving space. If less than 100 ma. is being used, this, in the author's opinion, is the best circuit. The ripple content under these conditions, and the leakage between sections, will not be excessive. These three circuits will find ready application in communications receivers, converters, VFOs, test equipment, etc., and especially in cases where heat has been a problem.

Fig. 3-A and -B shows voltage-tripler and quadrupler circuits respectively, for use where higher voltages are desired. They are ideal for powering the small portable or fixed-station rig and the compactness and light weight will be appreciated. The writer uses the tripler circuit for powering a small 'phone-c.w. rig where the weight of a comparable conventional power supply would make portable operation prohibitive.

All components are standard. C1 in all circuits is for “hash” filtering and its value is not critical. A 0.05-µfd. 600-volt-working condenser should serve. All other condensers should be 40-µfd. 200-volt units, except those in the tripler and quadrupler circuits. Those in the circuit of Fig. 3 should have a rating of 450 volts working. In the voltage multipliers and in other circuits where a condenser is passing the full current, good condensers should be used because the a.c. ripple mentioned above appears across the condenser and increases as the load increases. If the current is allowed to become too high, it will cause heating and deterioration of the condenser. This can be kept to a minimum by using a capacitor of high value and making sure it is of good make. Aside from this, no particular difficulties should be encountered even when using voltage-tripler and quadrupler circuits. R1 should be 25 ohms, but if it is found that the rectifier units are running a little too warm, this value may be increased to as high as 100 ohms, with a corresponding drop in output voltage, of course.

A single-section filter, as shown in Fig. 2-C, will provide sufficient smoothing for most applications. At W7HWY the circuit of Fig. 3-A is being used for powering a BC-474 and the circuit in Fig. 1 for the receiver portion. The transmitter is running 15 watts on 75 'phone and 18 watts on 80 c.w., while on the road, and in my estimation it's tops.

Summing it all up, for the guy who is looking for a lot out of little things, this is economical power in a mighty small package.

A Portable-Emergency S.R. Power Supply

BY R. F. KNOCHEL,** W9CO

The compactness of selenium rectifiers and the fact that they do not require filament voltage make them particularly suited to power supplies for portable-emergency work.

Fig. 4 shows the circuit of a vibrator pack which will deliver an output voltage of 400 at 200 ma. It will work with either 115-volt a.c. or 6-volt battery input. The circuit is that of the familiar voltage tripler whose d.c. output voltage is, as a rough approximation, three times the peak voltage delivered by the transformer or line. An

**1002 Wyatt Avenue, Lincoln, Ill.
Circuit diagram of a compact vibrator-a.c. portable power supply.

**Circuit Description**

C1 - 60-µfd. 200-volt electrolytic.
C2 - 60-µfd. 400-volt electrolytic.
C3 - 60-µfd. 600-volt electrolytic.
C4 - 25-µfd. 25-volt electrolytic.
C5 - 25-µfd. 25-volt paper.
C6 - 0.5-µfd. 25-volt paper.
C7 - 0.007-µfd. 1500-volt paper.
R1 - 25,000 ohms, 10 watts.
T1 - 25-ohm, 20-amp. choke.
S1 - 115-volt toggle switch.
S2 - D.p.d.t. heavy-duty knife switch.
S3 - 20-amp. switch.
V - Heavy-duty vibrator.

Interesting feature of the circuit is the fact that the single transformer serves as the vibrator transformer when operating from 6-volt d.c. supply and as the filament transformer when operating from an a.c. line. This is accomplished without complicated switching.

The vibrator transformer, T1, is a dual-secondary 6.3-volt filament transformer connected in reverse. It may also consist of two single transformers of the same type with their primaries connected in series and secondaries in parallel, both windings being properly polarized. In either event, the filament windings must have a rating of 10 amperes if the full load current of 200 ma. is to be used. Some excellent surplus transformers that will handle the required current are now available on the surplus market. The vibrator also must be capable of handling the current. The hash-filter choke, L1, must carry a current of 20 amperes.

The following table shows the output voltage to be expected at various load currents, depending upon the size of condensers used at C1, C2, and C3.

<table>
<thead>
<tr>
<th>C1, C2, C3</th>
<th>Output Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>µfd.</td>
<td>60 ma.</td>
</tr>
<tr>
<td>60</td>
<td>455</td>
</tr>
<tr>
<td>40</td>
<td>425</td>
</tr>
<tr>
<td>20</td>
<td>400</td>
</tr>
</tbody>
</table>

In operating the supply from an a.c. line, it is always wise to determine the plug polarity in respect to ground. Otherwise the rectifier part of the circuit and the transmitter circuit cannot be connected to actual ground except through by-pass condensers.

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**Navy Day Receiving Competition**

**To Be Held on October 27th**

A message to radio operators from the Secretary of the Navy will be transmitted on Navy Day, October 27th. In connection with this message ARRL will conduct its nineteenth Navy Day Receiving Competition. All amateurs are invited to take part in this activity, which constitutes Amateur Radio's participation in the celebration of Navy Day.

Two messages will be transmitted, one from Radio Washington (NSS), the other from Radio San Francisco (NPG). These messages will be substantially the same in thought but will vary slightly in wording. A letter of appreciation from the Navy Department will be sent to every person who makes perfect copy of the text of one message. Should characters for any reason be transmitted with improper spacing such as from tape-punching errors, words containing such characters will not be counted in the grading of papers. Both messages may be copied, but only the best copy should be submitted in the competition. It is not necessary to copy both stations, and no extra credit is given for so doing. However, if both stations should be copied, please mention the fact when submitting your best copy so that the number of operators copying each station may be ascertained.

Only the text (including any punctuation therein) of each message will count (not the preamble, break, signs, and the like). Copy what you hear. Do not guess! Credit will of course be deducted for logging anything that was not actually transmitted!

Mail copies for grading to the ARRL Communications Department, West Hartford, Conn. Send your original copies—recopying invites errors. An honor roll of letter winners and all other participants will appear in QST. In submitting copy please mention if you are, or have been, a member of the Naval service.

Transmissions will be approximately 25 words per minute and will be preceded by a five-minute CQ call on the following schedule: From Washington: NSS, 9:00 p.m. EST (0900 GCT), simultaneously on 122, 4390, 9425 and 12,630 kc. From San Francisco: NPG, 7:30 p.m. PST (0930 GCT), simultaneously on 115, 4390, 9255 and 12,540 kc.
QSL BUREAUS

Here's how to get best service on delivery of your QSLs to foreign stations: Simply mail cards directly to the bureau of the proper country, as listed below. Do not send foreign cards via ARRL except those for which no bureau is here listed.

<table>
<thead>
<tr>
<th>Country</th>
<th>Bureau Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alaska</td>
<td>J. W. McKinley, Box 1538, Juneau.</td>
</tr>
<tr>
<td>Algeria</td>
<td>Via France</td>
</tr>
<tr>
<td>Antigua</td>
<td>A. Tibbits, 27 St. Mary's St., St. Johns.</td>
</tr>
<tr>
<td>Australia</td>
<td>W.I.A., Box 2611 W, G.P.O., Melbourne.</td>
</tr>
<tr>
<td>Austria</td>
<td>O.V.S.V., Kierlinerstrasse 10, Klosterneuburg</td>
</tr>
<tr>
<td>Austria</td>
<td>Vico Portugal.</td>
</tr>
<tr>
<td>Belgium</td>
<td>U.B.A., Postbox 634, Brussels.</td>
</tr>
<tr>
<td>Bermuda</td>
<td>J. A. Marr, R.N., W/T Station, Daniel's Head</td>
</tr>
<tr>
<td>Bolivia</td>
<td>R.C.B., Casa 13, Cochabamba.</td>
</tr>
<tr>
<td>British Honduras</td>
<td>D. Hunter, Box 178, Belize.</td>
</tr>
<tr>
<td>Burma</td>
<td>Via Great Britain.</td>
</tr>
<tr>
<td>Canal Zone</td>
<td>Signal Officer, KZ5AA, Quarry Heights.</td>
</tr>
<tr>
<td>Chile</td>
<td>Luis M. Deumaras, Casa 781, Santiago.</td>
</tr>
<tr>
<td>China</td>
<td>K. L. Koo, P. O. Box 409, Shanghai.</td>
</tr>
<tr>
<td>Colombia</td>
<td>L.C.R.A., P.O. Box 584, Bogota.</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>F. Gonzales, Box 306, San Jose.</td>
</tr>
<tr>
<td>Cuba</td>
<td>James D. Bourne, Lausalan 690, Habana.</td>
</tr>
<tr>
<td>Czechoslovakia</td>
<td>C.A.V., P.O. Box 59, Prague I.</td>
</tr>
<tr>
<td>Denmark</td>
<td>E.D.R., Box 79, Copenhagen K.</td>
</tr>
<tr>
<td>Egypt</td>
<td>Box 380, Cairo.</td>
</tr>
<tr>
<td>Finland</td>
<td>P.O. Box 306, Helsinki.</td>
</tr>
<tr>
<td>France</td>
<td>Service QSL, R.E.F., 6 rue du Pont de lodi, Paris 6</td>
</tr>
<tr>
<td>Germany</td>
<td>(D2 calls only) Capt. J. S. Howe, Entries and Exitis Branch, 100 Hq. CCG (BE), Bad Salzuflen, B.A.O.R.</td>
</tr>
<tr>
<td>Germany</td>
<td>(D4 calls only) Radio Branch, Communications Division, OG-SG, HQ ECOM, APO 757, c/o Postmaster, New York, N. Y.</td>
</tr>
<tr>
<td>Greece</td>
<td>C. Tavaniotis, 17-A Bucharest St., Athens.</td>
</tr>
<tr>
<td>Great Britain</td>
<td>(and British Empire): A. Milne, 29 Kechill Gardens, Hayes, Bromley, Kent.</td>
</tr>
<tr>
<td>Guatemala</td>
<td>Manuel Gomes de Leon, P.O. Box 12, Guatemala City.</td>
</tr>
<tr>
<td>Haiti</td>
<td>Roger Lania, c/o RCA, P.O. Box A-153, Port-au-Prince.</td>
</tr>
<tr>
<td>Hawaii</td>
<td>A. H. Fuchikami, 3543 Namau Dr., Honolulu.</td>
</tr>
<tr>
<td>Hungary</td>
<td>A. Sasi, Dobanyu u l/c, Budapest.</td>
</tr>
<tr>
<td>Iceland</td>
<td>Islandzir Radio Amateur, P.O. Box 1060, Reykjavik.</td>
</tr>
</tbody>
</table>

It is a mystery how QSL managers find time to get on the air, but W. R. Savage, VE6EO, demonstrates that he is able to take time off from his duties as VE6 QSL manager. His transmitter is a conventional c.w., phone 200-watt job. His interests also include frequency measurements.

October 1947
Practical Crystal Control for 144-Mc. Mobile Work

Using the New V.H.F. Crystals To Simplify the Mobile Rig

BY PAUL H. HERTZLER, * WSHWN

Techniques employed on the 2-meter baud have advanced so rapidly in recent months that it is now difficult for the mobile station using the modulated-oscillator type of transmitter to get in many good contacts. The simplest sort of gear still has its place, of course, but the fellow who is after DX and solid QSOs must now go to crystal control, or its equivalent, as a great majority of the receivers now used for home-station work are of the more selective variety. Practically all superhets make the going difficult for the modulated oscillator, and many are so selective that it is utterly impossible to make anything intelligible out of the signals such rigs radiate.

This is all to the good, as far as the home-station set-ups are concerned, for there can be little argument against the use of the most effective gear on any band, and the release of several types of transmitters on the surplus market has made it a simple and economical procedure to set up a 144-Mc. crystal-controlled station for home use. The rub comes, however, when one tries to use these rigs for mobile work -- their numerous tubes place a drain on the battery and power supply far in excess of the capabilities of the usual mobile power sources.

The solution lies in the designing of mobile gear especially for amateur use, incorporating new tubes and crystals that make it possible to run inputs of 15 to 25 watts, and yet stay within the limitations imposed by the average vibrator or generator supply. One of the new 48-Mc. crystals with a 604 triode oscillator, and a 7F8 dual triode operating as a push-pull tripler, will provide sufficient grid drive for an 832-A final stage; yet the total drain of the two exciter stages is only about 25 ma. from the plate supply and 0.45 amp. from the storage battery. Contrast this with the drain imposed by the string of 6V6s or similar tubes required when lower-frequency crystals are used!

Aside from the use of the 48-Mc. crystal, the design of the transmitter is not unusual. This particular unit was to be used for both fixed-station and portable work, so a built-in power supply was included. In the case of mobile installations this would, of course, be omitted, and the unit could be made much smaller physically. The inclusion of the VR-150 regulator tube in the unit is recommended, however, as the plate potential on the oscillator should not be permitted to exceed 150 volts.

Experimentation with the 48-Mc. crystals has shown that best results are obtained with triode oscillators, the 6C4 providing very satisfactory performance when used as shown in Fig. 1. The grid coil, L1, is wound to be self-resonant at a frequency just higher than that of the crystal. It is one of two critical elements in connection with the use of the high-frequency crystals, and should be adjusted by removing turns one at a time, until the 6C4 oscillates only when the crystal is in the socket. Loading of the oscillator is somewhat more critical than with low-frequency crystals, so coupling between the oscillator and tripler stages is made inductive, to provide a means of adjustment. The two coils are mounted parallel to one another, the spacing center to center being about 1½ times the coil diameter. The actual spacing should be adjusted to the point giving maximum grid drive to the tripler, as read in J2, without pulling the 6C4 out of oscillation.

The 7F8 tripler should have approximately 275 volts on its plates. If the supply voltage is higher than this value the dropping resistor, R1, should be inserted in series with the r.f. choke at the center-tap of L4, as shown. A value of 1000 ohms is suitable for a supply voltage of 300, but if a higher voltage is used the value of R1 should be increased. The tripler cathode is not by-passed,

* 70 Standard Piezo Co., Box 164, Carlisle, Penn.
permitting some regeneration. It was found that slightly greater output could be obtained by inserting a small winding between the cathode and resistor $R_a$, and the builder may wish to experiment further along this line. It was possible, however, to obtain satisfactory grid drive for the 832-A with the circuit as shown.

The grid circuit of the final is untuned, consisting of two turns the same diameter as the tripler plate coil, and closely coupled to it. Once this coil is adjusted, by moving its turns and setting its position for maximum grid current in $J_3$, it requires no adjustment for other frequencies within the band. It is suggested that, if more than one crystal is to be used, the adjustment be set for approximately the middle of the band.

It should be noted that the final plate circuit is completely isolated from all other circuits. With the shielded socket used there was no necessity for neutralization, but if the ordinary type of socket is employed for the 832-A it may be necessary to employ a very small neutralizing capacity. This could be supplied by the neutralizing wires so often used in layouts employing 815, 829, and 832 tubes.

No modulator is shown, since any combination capable of delivering 10 to 15 watts of audio is satisfactory. The modulator output should be connected to the feed-through bushings shown in the lower right portion of the bottom view of the unit. These terminals are shorted out when the transmitter is used without modulation. It may be keyed for c.w. operation by plugging a key into the final-stage cathode jack, or the cathode of the tripler may be keyed, provided fixed bias is inserted in series with $J_3$, to hold the final plate current to a safe value when the excitation is removed.

The writer has used this rig extensively in portable and mobile work, and also as an exciter for a higher-powered home station. In field service it is operated at 20 to 25 watts input, and in conjunction with a portable beam antenna it has provided contacts with stations in the first call area, at distances up to 250 miles. Its performance on the air, with any of several crystals, has been comparable to that of transmitters using twice the battery drain to achieve an equivalent power-output level.

October 1947
The World Above 50 Mc.

CONDUCTED BY E. P. TILTON,* WIHDQ

That 27th again! For the fourth consecutive month, the lead paragraphs of this department are being rewritten to report extraordinary happenings on the 27th of the month. This is an important date to remember, because it gives a good indication of the period to watch each month, for DX opportunities through the fall season. Between the 25th and the 27th of August there were at least three events that are front-page news to v.h.f. enthusiasts: the first two-way work between Australia and the Hawaiian Islands on 50 Mc., the first Mexico-Argentina 50-Mc. QSO, and a new DX record for home-station work on 144 Mc.

The 50-Mc. record passed 5000 miles at 1700 Hawaiian Time, on August 25th, when W7ACS/KH6 at Pearl Harbor worked VK5KL, Darwin, Australia, a distance of 5350 miles (5349.8, according to W7ACS!). Details are incomplete at this writing, as the information above was received through the cooperation of numerous relaying stations. To KII6GQ, W5NOH and WIEYP, particularly, our thanks for your help!

On the 27th (exact time unknown) XE1KE, Mexico City, worked LU6DO, Temperley, Argentina, on 6. The QSO lasted 35 minutes, most of which was spent by XE1KE in trying to convince LU6DO that he actually was in contact with an authentic Mexican station. The distance is about 4400 miles.

The 27th made history on 144 Mc. also, and provided your conductor with a thrill equaled only by the trans-Atlantic QSOs on 50 Mc. last fall. At 10 P.M. we signed with W1OSQ, making QST regarding the nightly schedule of VE1IQZ (reported in detail elsewhere in this department). Exhorting the gang along the Coast to look for VE1IQZ on 144.3 Mc., we did likewise—and there he was rolling in S8! The first call established contact, with S7-9 signals each way, a distance of 480 miles.

The QSO was terminated immediately, to give VE1IQZ every opportunity to set a new world's record, as we felt certain that his signal would be heard by hundreds of stations, many of them much farther south than West Hartford. Such was not the case, however, and it was some time before W1HDF, Elmwood, Conn., only two miles from WIHDQ, was worked. Then followed a period of about 15 minutes, during which VE1IQZ made several calls before raising W1CTW, Arlington, Mass. His next (and last) contact was W1OSQ, Milford, Conn., a 520-mile QSO that was possible only through the use of straight c.w. by both parties. This deserves recognition as a record, as it is by far the greatest distance ever covered on 144 Mc. by two stations operating from home locations. VE1IQZ was using an ARC-5, running 30 watts to the 832-A final, a 16-element vertical array (just completed that day), and a VHF-152 feeding into an IFQ-129. W1OSQ runs 120 watts. His antenna is also a 16-element array, and the receiver employs two stages of grounded-grid r.f., with lighthouse tubes, ahead of a VHF-152.

At frequent intervals during the time that VE1IQZ was in, the writer and W1OSQ made QST transmissions directed to W2 and W3, in the hope of running the record down the Atlantic Seaboard. For nearly four hours the signal from Halifax was S7 or better at West Hartford, often peaking well over S9, until the fade-out just before 2 A.M.; yet he was heard only weakly by other stations, and the few other signals heard at Halifax were weak and unstable. Whatever caused this amazing disparity in signal strengths can only be guessed, but it completely reversed previous experiences, when the writer has heard stations all along the Coast working DX that is inaudible at West Hartford. It seems hard to account for a skip...

* V.H.F. Editor, QST.
effect in tropospheric propagation, but such certainty existed in this instance. Scores of well-equipped stations in the vicinity of Boston were unable to hear VE1QZ, yet the path from Halifax to West Hartford passes directly through the Boston area, with the latter 100 miles closer and separated only by water from the Nova Scotian Peninsulas.

It is expected that a period of clear warm weather will reverse the field again, and we feel confident that another new record will soon be set by W2s or W3s who will ride the coastal inversion to Halifax, perhaps before this appears in print.

Inland Record Passes 400 Miles!

But for the international 50-Mc. DX reported earlier, the phenomenal openings of the 2-meter band would have taken first place in the news for August. Probably no one who works on 144 Mc. needs to be told the story of July and August, 1947; but for those who still think of the 2-meter band as a portion of the spectrum where archaic gear is used for backyard gossip, the doings on 144 Mc. in recent weeks will be quite enlightening. Part of the story was told in the earlier, the phenomenal openings of the 2-meter band as a portion of the spectrum where tropospheric propagation, too. Contacts and others totaling 67 different stations, including W9s WOK, IOD, MGP, NQ, AGV, YQI, GGH, CFM and IPO. These contacts, and others totaling 67 different stations, helped W8WJC to rack up a score of 2640 points in the July 16th-Aug. 15th Marathon period, the highest one-month score ever recorded in Marathon history.

The big doings of the 7th and 8th extended as far east as Erie, Penn., that we know of. W9QKI and W3GV of that city worked W9BBU, Elgin, Ill., just shading the W1MNF-W3KUX record of 425 miles. W9BBU, incidentally, now uses a 30-element horizontal array! W3GV, with 800 watts input and a 12-element, horizontal array, is quite capable of providing long-distance propagation, too. Contacts beyond 300 miles were made by scores of 144-Mc. stations in the states along or near the Lakes on both these dates. Here are a few representative reports:

WSUJKS, Lakewood, Ohio, worked W9s BBU, PK, ZIH, BJH, RIW, JPK, PZS, WWH, SOW and ESE, all over 300 miles, on July 31st and August 1st. Between 1 and 4 A.M. on August 9th he added W9s IOD, GGH, AGV and IPO. W8WJC, Everett, Ohio, worked most of the above and added W9s NFK, BOR, MTC and HLR on the July 31st opening. His list for the 7th-8th session included W9s WOK, IOD, MGP, NQ, AGV, YQI, GGH, CFM and IPO. These contacts, and others totaling 67 different stations, helped W8WJC to rack up a score of 2640 points in the July 16th-Aug. 15th Marathon period, the highest one-month score ever recorded in Marathon history.

(Continued on page 126)
Versatile Control Systems for Transmitters

Building Safety and Convenience into Your Transmitter
Power-Switching Circuits

BY LEWIS KANOY,* W4DCW

A control system is probably the last thing the average ham thinks about when he builds his transmitter, and yet it is a factor that requires considerable thought and planning if the rig is to be operated with convenience and safety to the operator and equipment. In designing a control circuit for the half-kilowatt 'phone-c.w. transmitter at W4DCW, several requirements were set forth:

1) A single switch must perform all the functions of changing from transmit to receive.

2) A single switch must shift from c.w. to 'phone.

3) A safety interlock should remove all dangerous voltages when the transmitter enclosure is opened.

4) It should be impossible to turn on plate or bias voltages until filament voltage has been applied, and impossible to turn off filaments without also turning off plate voltage. It is also desirable to have an automatic time delay between the applications of filament and plate voltages.

5) Indicator lamps should show which supplies are on and indicate blown fuses.

6) The system should be readily adaptable to either 115- or 230-volt lines.

7) Provision should be made for shifting to reduced power for tuning up without a Variac.

8) The remote-control wires to the operating position should not have to carry heavy current.

The systems shown in Figs. 1 and 2 meet all of these requirements. Referring to Fig. 1, the control system starts out with a polarized plug, $P_1$, for the line connection. The side of the line indicated should be grounded. One or more utility outlets, which are not affected by the switching, may be connected at $J_1$. The line-fuse indicator lamp, $I_1$, should not light unless the line fuse, $F_1$, is blown.

Turning on $S_1$ at the transmitter or $S_2$ at the operating position turns on all r.f. and r.f. power-supply filament transformers, which are connected in parallel at $T_1$, and the indicator lamp, $I_4$, lights. If the 'phone-c.w. switch, $S_3$, is thrown to the 'phone position, all audio and a.f. power-supply filament transformers, which are connected in parallel at $T_2$, will also be turned on by $S_3$, and the 'phone-indicator lamp, $I_3$, will light. If $S_3$ is in the c.w. position, the c.w. indicator lamp, $I_4$, will light, but the a.f. supplies will be

Fig. 1 — 115-volt control circuit. All switches, except $S_6$ and $S_7$, may be 5-amp. $S_7$ should be 10-amp, and $S_6$, a ceramic rotary. The lamps are 5/16-inch panel type.

* 114 Idlewilde Drive, Winston-Salem, N. C.
out off. A third section of $S_5$ shorts the modulation-transformer secondary, $T_b$, when using c.w.

If the safety interlock switch, $S_4$, is closed, the bias-supply plate and filament voltages ($T_b$) will be turned on. As soon as the rectifier of this supply (an indirectly-heated rectifier such as a 6X5G) warms up and the supply delivers full voltage, the time-delay relay, $R_{y2}$, will close, extinguishing the bias-indicator lamp, $I_7$, and setting up the circuit for the plate-supply relay, $R_{y3}$. The time that the bias rectifier takes to come up to temperature provides the required delay between the application of filament voltage and the time when it becomes possible to turn on the plate voltages on the r.f. and a.f. tubes.

With the contacts of $R_{y2}$ closed, the plate-supply relay, $R_{y3}$, can be operated by closing the transmit-receive switch, $S_5$, or its extension, $S_6$, at the operating position. $R_{y3}$ turns on all plate voltages, lights the high-voltage indicator, $I_8$, and the transmitter is then ready for operation.

Should interlock $S_4$ be open, the indicator lamp, $I_9$, will light. This lamp, in series with the primary of the bias-supply transformer, has sufficient resistance to prevent voltage output from the bias pack, and therefore $R_{y2}$ does not close so that $R_{y3}$ cannot be operated and the transmitter is safe so long as the interlock switch is open.

$R_{y1}$ is an overload breaker which breaks the line to the plate-supply relay whenever the plate current to the final amplifier exceeds a value to which it has been set. The winding of this relay is in the filament center-tap of the final-amplifier tubes. It should be of the reset type so that it will not continue to close and open repeatedly until $S_8$ is opened, as it would do if it were not. $I_9$, $I_{10}$ and $I_{11}$ are fuse-indicator lamps which light when their associated fuses blow. $S_7$ is a switch for changing to low power for tune-up. This system is, of course, applicable only to transformers with dual primaries. With single-primary transformers, a 150- to 200-watt lamp, with a switch to short it out, can be connected in series with the primary for reducing power. Power-amplifier high voltage may be removed for neutralizing by taking out $F_4$.

The only switch that need be thrown for standby is $S_8$. Only $S_2$ need be manipulated in changing from 'phone to c.w.

Fig. 2 shows the same system applied to a 3-wire 220-volt line, the only difference being that the filament and bias transformers are operated from one side of the line, while the plate supplies are operated from the other.

All indicator lamps and panel switches should be marked plainly so that there will be no question as to which circuit each belongs.

**About the Author**

- The inspiration for the shipshape control circuit that Lewis Kanoy describes can be traced to one influence: Naval radio-technician training. Signing W4DCW since 1931, our author has in the meantime acquired not only his Class A ticket but also radiotelephone first-class and radiotelegraph second-class tickets. Lew has been a technician at b.c. station WSJS for a number of years.
CONDUCTED BY JOSEPH E. GRAHN, W1CH

How:
What with rather poor conditions for DX and heat waves that don’t make operating much of a pleasure, the past month was best spent with a glass of cold stuff and a few speculations on where the antenna for 21 Mc. would go. Stacking a 6 over 10 over 14 over 20 is going to make the shack look like the newest in helicopter designs, unless some budding genius comes up with a better solution. The lucky fellows with the rhombic farms have little to worry about, but the average guy who has cracked a clavicle getting up a rotary for 20 is going to have a tough time with another beam for 21 Mc. Maybe we should decline to accept the band. [Come on, boss, get back in here out of the sun. - Jeeves]

What:
W3KJJ insists there is plenty of DX on 7 Mc. and proves it by working ZS5FE, ZL11B, ZL2MN, ZL1BY, VK2AX, VK2JY, VK20Y, F8ZW, F3MA, PY2QW, XE1DA, KZ5FS, E19Q, OZ5HQ, G2HCA, G2ADJ, G3AEP, G3AYL, G3AGP, G3BAQ, G3TO, G4OP, G4QC, G5KT and G8VG. W3YOR, with 23 watts on his crystal 6L6G, got VP9E (7191), KZSCB (7104), KH6IV (7025) and KL7AF (7020).

As usual, 20 turns up the best ones. W6QJ1/9 picked up CIJC (14,082), OK1ZM (14,120), FASBG (14,000), UA6KQA (14,059), KS4AC (14,044), UA3DQ (14,022), HB9X (14,005), VS6AZ (14,022) and O12KAA (14,039). The latest at W2BRV are CR6LI, VR6PL, EK1AJ, TA1BB, PX1V, U18AA, ZM6AF and KPG6, bringing his postwar tally to 118. At KP4KD the newest include I1AICG16, UB5BD, PK6HA, ZD4AI, ZD6DT, VS7DR, UA6AE, UG6WD, ZC6DD, PK2ML, EP2DS, and KG6AG. W6TKX, with a new rotary on a steel tower, is elated over working VSICA (14,025), CYMK (14,022), VQ2GW (14,105), CPIAT (14,000), VU2BX (14,040), VSZAL (14,108), CN8KK (14,005), UA1AB (14,000), O2TUU (14,002), FT4AN (14,000) and SM3UN (14,000). W4CWH took a breather from business and came out with VU7JU (14,100), VS6AY (14,086), UJ8AD (14,080), VU2GJ (14,100), ST2AM (14,170), Y12AM (14,120), UG6AB (14,130), UOSAD (14,125) and V57ES (14,060), all of which he calls the “garden variety.” Yeah! W7K1L, complaining of poor conditions, grabbed GS8I, OK1C6, G8PT, F8EO, OK3GE, OX3ZA and L6AUK. W1JJF, still plugging, snagged VS1AQ (14,945), TA1BT (13,990), ET1JJ (14,000); VR6AA (14,330), KG6AD (14,040) and VK5BI (14,035). Since being licensed in January, 1917, W9PSR has a total of 74 countries, some of the new ones being UA3BD/UC2, U18AF, 16USA, GI5UW, HB9AW, E10N, CN8EG, VQ6LIP, U2KAA, UAI1, LA7N and GW2HHR. A letter from VU2BX acknowledges contacts with W2AGW, W6BGF, W6DRD, W6KUI, W4BP, W6CBP, W6SA, W6CY, W4FU, W6MHH, W6SY, W7FXA, W6PNQ and W6TKX. His full QTH appears later in this column. W2IZX’s folded dipole in the attic helped raise his postwar total to 119, with J9SIR, FQ3AT, W3VMV/CQ, 9A1AM, EP2D, ZS3D, CR7BC and VU2BG.

Back on the air just a short while, W6BIL is warming up on stuff like G2LC, G2H, G5LI, G2HCP, ON4CD, ON4XM, PA9QY, SM6ID, D2KW, UA3KBC, UA3AG, HB9X, Z6SC7, ZS6U, ZS1FA, ZS2CM, ZS5U, VSICX, CI7ZC, J4AAV and TFE3A, plus plenty of VKs and ZLs. W2BHM is now up to 106 postwar with EP2DS, VU2FJ, PK6WS, KM6AB; also AC4BR, who is S9 at W1CH with the beam on Europe—so-o-o-o. W4MBA gets a big kick out of DX with his little 50-watter, sneaking up on RAEM, D4AUK, ON4CO, G6BTA, F3BA, VK3XX, GI4UR, GW4CW and PY7AN. The pick of the latest at W6OBD are UA1KEB, VP5AK, PK5LH, OH6NZ, OX3GC, VS6A2 (14,022) and O12KAA (14,039).
J8ACS, CT1A, 16USA, VO2RM and HB9AW, bringing his postwar pile to 85. W1ME grabbed VR2AO, VR2AM, ZS3D, ARIYL, J8A9F, VS6AD and ZD4AD, boosting him to 146 postwar. WIME grabbed VR2AO, VR2AM, ZS3D, ARI YL, T8AASF, VS6AD and ZD4AD, boosting him to 146 postwar. A 50-letter and report from G6RH tell of contacts v.ith HP4Q (14,095), W6YAW/J8 (14,052), PK6NC (14,105), CPIAX (14,150), VQ5DES (14,305), YS3PL (14,330), XE1BC (14,060), CR7AD (14,020) and VK2B (14,056). With a total of 78 postwar, W2UFT has been averaging two new ones a day with stuff like [TA0KQA, UA9CB, J8G8D, W8LXN/KG6, W2WMV/C9, UG6WD, W6WDN/KW6 and KP6AB. W6ZZ says after much labor he managed to reach his 80th postwar, the new ones being HS1SS, VS6AY, VR5PL and PK1R1. Some of the other sleep-robbing ones are J8A9H, G3B1E, ON4QF, G3AMG, ON4CD, ZS6LW and G6G1, plus VKs and KFs by the handful. W9NDA, with a smashed index finger and a new wide-spaced beam, swapped signals with VQ3HP, OUSAD, U85BD, UQ2AB, Y02F, HA5VV, VK7DK, VS6AC, ET1IR, U86AA, U8JAC, FT4AN and VR5JP. On 20-meter ‘phone, W2MPA has raised his postwar figure to 119. Part of his swell list includes KG6AV/VK9 (14,250), VR6AA (14,335), FP8AA (14,350), ZD6DT (14,310), EK1AS (14,390), J2AAU (14,150), J2CAL (14,230), OK4DT (14,140), KG6AG (14,300), MD5AL (14,320), LX1SI (14,310), ZC6AH (14,245), VK6HT (14,330), YS1MX (14,320), PA9FX (14,310), OZ5BW (14,150), W3JLP/KG6 (14,150), J2JCQ (14,150) and KL7HQ (14,250). A new three-element beam at W1KLE netted him OX3GG, F8NT, OZ7GB, GD6IA, KP6AD, VU2BQ, ZSLBD, J2ACW, UA3CA, KL7KR, VK5CB, ZL4AR, GW2HIR and CE4BP. Switching to ‘phone, W9NDA chinned with VR6AA, ZE1JX, OZ7EDR, OH6NS, CR4HT, FP3GW, KA1FH, CT1QN, VP3LF and MB9AD.

Replacing a long wire with a closed-spaced four-element “plumber’s delight” on 28 Mc., W6ZPL came up with ZL1MR, PY2AJ, OA4BC, CE1AH, W5MQB/KH6, ZK1AA, KJ6AA, J9KC, LU5EE, VR6AA, VK7JT and some VKs, which isn’t bad for the condition 28 Mc. is in at present. W4PAM chinned with PX1MF, KH6FD, SU1WS, ZS6L, ZS6EG, ZS6BI, CX1DB, G2APR, OA4AQ and LU2DM.

**Where:**

A revised listing of QSL bureaus of the world is published in the I.A.R.U. News section of this QST. For the benefit of those who like to put on the pressure direct, here are a number of choice ones:

<table>
<thead>
<tr>
<th>Bureau Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR8AC</td>
<td>Box 4A, Panjim, Goa, Portuguese India</td>
</tr>
<tr>
<td>ZE2/H</td>
<td>Box 690, Bulawayo, Southern Rhodesia</td>
</tr>
<tr>
<td>ET4Z</td>
<td>Box 1036, Addis Ababa, Ethiopia</td>
</tr>
<tr>
<td>FG5D</td>
<td>Box 30, Louvaine, Guadeloupe</td>
</tr>
<tr>
<td>GD6DF</td>
<td>c/o Ronaldsway Airport, Isle of Man</td>
</tr>
<tr>
<td>J5AAG</td>
<td>19th Inf., APO 24, Unit 2, c/o PM, San Francisco, Calif.</td>
</tr>
<tr>
<td>W3KXO/J</td>
<td>624 ACWS, APO 86, c/o PM, San Francisco, Calif.</td>
</tr>
<tr>
<td>J8ACS</td>
<td>Kimpo Air Base, Korea, 59 Det., 139 AAC Sqdn., c/o APO 712, San Francisco, Calif.</td>
</tr>
<tr>
<td>KB6AA</td>
<td>H. C. Robinson, Canton Island, Phoenix Group, South Pacific.</td>
</tr>
<tr>
<td>LX2DN</td>
<td>Rue Robert 46, Vianden, Luxembourg</td>
</tr>
<tr>
<td>MD1D (ex-L12CD, Officers’ Mess, RAF El Aden, British Forces, MEF 7</td>
<td></td>
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</table>

(Continued on page 140)

Just because a fellow manages to get 167 countries confirmed postwar is no indication that the guy is worn out and has-been. As evidence, here is a shot of the special QSL sent to Charlie Mellen, W1FH, for his No. 167. The QSL is hand-painted in several colors on two delicate tropical leaves, and is a real memento of many solid QSOs.

**October 1947**
ANOTHER USE FOR THE CRYSTAL WAVEMETER

For those who have built the crystal-diode absorption wavemeter described in the Handbook, Fig. 1 shows a method of using it as a sensitive r.f. indicator for tuning antenna systems. The plug-in coil of the wavemeter is removed from its socket and in its place a plug made from an old tube base is inserted. The plug is connected to any convenient length of 72-ohm Twin-Lead.

Battery clips may then be used to tap the line across the shorting bar of a stub or at the center of the antenna. The antenna being adjusted should then be loosely coupled to a nearby dipole that is connected to the transmitter. Very little power will be required to get a usable indication on the milliammeter. Matching adjustments on the antenna may then be made, observing the results on the meter. It should be noted that the indicator should never be connected to a portion of the antenna that is above r.f. ground potential, as it would then add capacitance and unbalance, destroying the meaning of any reading obtained.

George S. Woods, W2SHN

VERSATILE ANTENNA COUPLER

The combination tank circuit and antenna coil shown in Fig. 2 permits working into either a single wire or a balanced line. The only extra part required is the loading condenser $C_2$. When the switch is open, and a single-wire antenna is connected to terminal $B$, the output circuit is a single-ended pi network. When the switch is closed, the circuit is the usual link-coupled output arrangement, and is suitable for working into a low-impedance line.

The switch is made by bending an end plate on the rotor of the loading condenser so that it shorts to the stator when turned to minimum capacitance. Both $C_1$ and $C_2$ are 250 µfd, and the tank coil is a standard 75-watt 5-prong plug-in coil with an end link. A shorting jumper was connected between the cold end of the coil and the link.

The arrangement permits use of a 14-Mc. doublet on 7 Mc. as a single wire, and has been used successfully for several months.

Lyman C. Millard, jr., W3OQB

DEVICE FOR BREAKING ARCS IN TRANSMITTERS

Fig. 3 shows the circuit of a device used to stop instantaneously any arc-over that occurs in the final-amplifier tank circuit of a 'phone transmitter. The coil of a relay that will "throw" when passing slightly more current than that drawn by the final amplifier under normal operating conditions is inserted between the center-tap of the high-voltage transformer and ground. The contacts of the relay (normally closed) are arranged to break the primary circuit of the transformer when the relay is energized.

Once the relay has tripped, it resets itself automatically and closes the primary circuit. The entire break-and-make cycle takes only an instant, thus maintaining continuity of the transmitted signal except for an instant so brief that the receiving station often will not even know
"Doghouse" in the Sky

BY BROTHER MARCELLUS, C.F.X.,* W3KBF

A war-surplus inspired version of an old idea — locating the transmitter up in air with the antenna to eliminate feed lines and their losses — is being employed successfully at W3KBF, thanks to wholehearted contributions of brain and brawn by W3FAM, W3IJE and W3MCI. Although in this instance the undertaking proved to be a major constructional project, as is evidenced by the photographs of the hoisting and installing operations, the improved 2-meter performance of the station has been deemed well worth the outlay of months of planning and work. The installation is perched 120 feet above ground atop its mast on the roof of Mt. St. Joseph High School, Baltimore.

A lucky windfall in the form of a surplus radar pedestal from a Cruiser gave incentive to the project. The mount weighed 450 pounds and was equipped with rotator motor, Selsyns, collector rings and various other fittings. With such a favorable start, our little group enthusiastically went to work. A 16-element beam of the familiar eight half-waves, center fed, with half-wave reflectors, was decided on for an antenna. Suitable means for sheltering the transmitter presented a problem for some time; finally, however, a watertight two-story housing was agreed on and built. Dubbed a "doghouse" by the gang, it is made of a varnished plywood case wrapped in surplus Army canvas, with the seams sealed with liquid polystyrene. Three outside coats of varnish complete the covering. A roof ventilator and a rubber gasket for the cover combine to make the interior of the "doghouse" weather-proof, come rain or shine. The antenna, and the "doghouse" with its tenant 2-meter transmitter and power supplies, rotate as a unit atop the pedestal.

Except for a 4-inch coaxial section connecting the p.p. 24-G final to the antenna stub, feed lines for transmitting have been completely eliminated. Plans are now under way to install the superhet receiver in the "doghouse" alongside the transmitter, to eliminate the receiving antenna feed lines. The receiver will be tuned from the shack below by means of synchros.

* Mt. St. Joseph High School, Baltimore 28, Md.

October 1947
SOLIDARITY

Editor, QST:

During these hectic days of unrest amongst members of our world-wide fraternity, we must, more than ever, maintain a united front of international cooperation and understanding, and continue to develop trustworthiness and loyalty to each of us and to our League.

Arthur M. Monkee, W6HJP

75 Hallock Street, Jamestown, N. Y.

Editor, QST:

An amateur friend of mine (a 'phone ham temporarily off the air) tells me that he boarded a friend of his on the 75-meter band chewing the rag with someone. He turned on a low-powered signal-shifter he happened to have handy and gave them a short call on c.w. One of them heard him and forthwith began a lengthy discourse about the "pump-handle operators." He, although in the minority, held the most frequencies and still could not stay within their own limits," and much more. Neither of the stations bothered to give their old friend a call.

It does not amaze me as though this is the spirit of amateur radio. If it is, there is no room in it for me. My friend was contemplating moving back into the c.w. band as soon as contact had been established. Another thing: how did these two rag-chewers know that the station calling them was not in dire need of assistance? The least they could have done was to have given him a chance to explain his reason for calling.

Personally, I feel that this bitterness on the part of many 'phone men is very uncalled for. They forget that they started with c.w. once upon a time. I have talked to men who have tried 'phone and gone back to c.w. because they got disgusted with this high-and-mighty attitude on the part of some 'phone operators.

I don't see why we can't get together and enjoy our hobby without fighting each other. Let's bury the hatchet!

Cecil Logan, W2PNW

SCHEMATIC SHORTHAND

Editor, QST:

What's so hard about reading a schematic diagram? Why complicate matters by using such jargon as the shorthand suggested on page 46 of the August issue of QST? I'm sure it's much easier to count grids than it is to count sides on a "crazy-go," as those optical illusions are.

Milton Kadishian, WINXT

Editor, QST:

The original purpose of schematic diagrams was to make it possible to show a circuit without drawing illustrations of the various components. Therefore, symbols were used, the configuration of which was descriptive of some feature of the components they represented. Thus, a zig-zag line was used to represent resistances, most of which originally were lengths of resistance wire-wound in a zig-zag form on strip of bakelite; the symbol for a capacitor closely represents the opposed plates of same, the looped line of the inductance symbol represents the convolutions of a coil. But these new British symbols are in no way descriptive of the components they represent. Indeed, they would be most misleading to any novice who did not know the true construction of the parts.

Again, the tube circuits give no hint as to the construction of the tubes they are intended to represent. The sides of a triangle do not demonstrate the placement of the grid of a tube between the filament and plate. Also, whereas it is possible in the conventional diagram to bring a grid lead out of either side of the circle representing the envelope of the tube, as convenience might dictate, it is in no way possible to do this with the shorthand symbol. Thus, it is necessary that a diagram be cluttered with leads circling the tube just in order to reach the necessary facet of the polygon representing the element. Incidentally, those regular polygons needed for the diagrams of multielectrode tubes are not easy to draw; therefore, it is very difficult to achieve a neat circuit diagram.

For the aforementioned reasons, I sincerely hope that the shorthand schematic symbols will never be adopted for use in the U. S.

Martin H. Francis

BOUQUET

Editor, QST:

I would like to state that I have been in radio since 1934, and find QST a very excellent magazine. It is nicely put up and consistently comes out with the latest ideas on a variety of subjects of special interest to all amateurs.

In passing, I wish to remark also that the Handbook is quite a remarkable book in its own right. The information therein contained is concise, to the point, and written in simple language easily understood by the average amateur. In fact the Handbook is used quite often by commercial engineers, as it is about the only book containing all the information that is needed at various times. I have seen it used in preference to engineering handbooks.

I think you're doing a swell job, and thanks a lot.

E. O. Daly, W7ETY

PORTABLE PROCEDURE

Editor, QST:

I should like to call attention to a consistent violation of one of our regulations which is most prevalent in the hidden-transmitter buntie that take place at hamfests and the like. This violation, which also may be observed on any of our 'phone bands at almost any time, is the business of a 'phone station signing, "this is W3XXX operating portable in the third class area." FCC Regulation 12.82(6) states specifically "an announcement of the geographical location in which the portable or mobile station is being operated." In evidence of my contention that a call-letter designat ion does not comprise such "geographical location," witness the example that is included in the FCC regulations as published on page 27 of May, 1946, QST.

Albert Hayes, Jr., WA6LVY

(Continued on page 148)
New Apparatus
A 2400-Mc. Oscillator Cavity

Very few amateurs have had an opportunity to explore the bands above 420 Mc., and one reason is the lack of suitable equipment for these frequencies. The newly-announced DM-240-A oscillator seems to be a “natural” for the amateur who wants to get a rig going on 2400 Mc. with a minimum of effort.

The DM-240-A is an oscillator cavity for use with the 2C40 “lighthouse” tube. It can be used as an oscillator for transmission, a superregenerative detector for reception, or as the high-frequency oscillator for a superheterodyne receiver. To use it for transmission, it requires only a 250-volt power supply and a 6V6 (or similar tube) for the modulator. When used as a superregenerative detector, a separate “quench” tube and sufficient audio are needed. For superheterodyne reception, the 1N21B-type crystal detector is recommended for use as the mixer, and the mixer output is then fed into a broad-band i.f. amplifier. The i.f. can be 30 to 70 Mc.

As can be seen in the photograph, the DM-240-A has three control knobs on it. These knobs control plate tuning, cathode tuning, and feedback. The r.f. output is taken out through a piece of RG-8/U coaxial cable. The entire unit is well-built, with a silver-plated cavity and silver-plated spring finger contacts for the tube; the exterior is finished in brown crackle enamel.

A 14-page instruction book is furnished with each cavity, and the book gives full information for using the cavity in any of its several applications. Complete details are included for building a crystal mixer and a typical i.f. stage, if one wants to use a superheterodyne type of receiver, and circuits for a superregenerative receiver and for a modulator are also given. Several types of antennas are described, including a simple parabolic reflector made from wire screen and bits of wood.

The DM-240-A is made by Decimeter, 742 Colfax Ave., Denver, Colo., and sells for $15.

—B.G.

Phone-Band Phunmies

Coy Cuthbert

Here we have a character who is just too cute for words. His specialty is an “I’ll-bet-you-can’t-guess-who-this-is” routine. The way he works it is to screw his VFO down on top of a QSO and then to inject bright remarks into the conversation, preferably while the transmitting station is trying to get across some pertinent information.

When the stations politely call “QRZ?” and stand by on the frequency, our hero makes like a mouse; but as soon as they resume their contact, he is right in there pitching again. Finally, after they stand by for the umpteenth time, he relents enough to go on the air with a falsetto voice or with the mike held against his Adam’s apple and demand that the stations guess who he is. He would probably get a much more enthusiastic answer if he requested them to tell him what he is.

If they finally succeed in guessing his identity — and that is not so terribly hard, for, Allah be praised, there are not too many of this type of moron running loose — he promptly loses all interest in the contact and is off to repeat his endearing little performance elsewhere, leaving the other two stations to gather up the bits of their shattered QSO as best they can.

It is most heartening to learn that the FCC is grimly eager to play Cuthbert’s little game with him; and just as soon as they guess right, they will send him a billet-doux for going on the air without giving his call. There is an even-handed justice! — John T. Frye, W9EGV
Activity at New Highs. Postwar your Communications Department has been up to its ears -- and then some -- to keep up with the rush of amateur radio activity. The high demand for Code Proficiency, WAS, RCC, OTC and DXCC certifications, extreme interest in emergency organizing and tests, station appointments, contests, message-handling information, Training Aids, new-club affiliations, code-practice information, SCM nominations and elections, FD-DX-SS Contest rules, simulated-emergency planning, and other activities have kept the pot boiling. But there have been progress and activity on an expanding scale . . . no summer slump at all!

The new season should see even more progress: We'll soon know just how we will be fixed internationally as a result of Atlantic City; we have NBFM on an experimental basis for one year with ample space for test use (minimizing BCI, etc.) in all A3 bands; and by extending programs started last year we shall go much further with reactivation of all ARRL trunk lines.

Emergency-Leadership Progress. The number of section emergency coordinators, responsible for arranging emergency leadership in all towns and cities in each section, doubled between 1945 and 1946. More than half our ARRL sections now have such coverage. The number of individual communities covered by emergency coordinators increased in the same period -- about 500 are reactivating their groups through activities this fall. SCMs (see page 6) request reader recommendations of more ECs for additional cities and towns, where amateur-service planning for emergencies should be beneficial.

Needed are good qualified leaders to plan soundly and inspire amateurs to give full support to the AEC; experienced amateurs to represent us in liaison with other services. Please recommend men of action for this organization work. We must not rest on our laurels.

Recommendations for the EC post in major towns and cities will be appreciated especially by the SCMs and SECs of the following sections: Western New York, Arkansas, Tennessee, Kentucky, Rhode Island, Santa Clara Valley, San Joaquin Valley, Sacramento Valley, Alabama, San Diego and Oklahoma. As an indication of the close tie-in between affiliated radio clubs and ARRL emergency organization, close to 50% of the affiliated clubs have either an ARRL emergency coordinator or assistant coordinator in the club group. Nearly 1000 AEC forms were sent reporting clubs at the time of the annual club survey to permit them to get started on an emergency program. Coordinators may have emergency stations themselves (good example); but it is more important that they be active organizers with interest and initiative.

Code-Proficiency Transmitting Stations Wanted. At least one West Coast amateur station, as well as a Central U. S. station, having equipment for automatic transmissions at 15, 20, 25, 30 and 35 w.p.m. (using Klein/Cred or Wheatstone perforated tapes), is desired to transmit at the same time as W1AW on monthly qualifying runs for the purpose of extending opportunity to qualify for certificates to the stations in their areas. Any volunteers please get in touch with ARRL.

Do You Identify Correctly? Attention is again invited to the fact that FCC regulations state than when transmitting, identifying call signals should come last! All amateur stations must identify themselves at the beginning and end of each transmission by transmitting the call letters of the station called or being worked and the call letters assigned the station which he is operating." W2SJV says he has been monitoring the bands and notes many offenders in this detail of operating procedure. The station transmitting should give its call last when "turning it over" to another station. One should not say "W2SJV over to W1BDI" when correct procedure calls for "W1BDI from W2SJV." To disturb this order may cost us some "heard" reports. Likewise, we risk conflict with the FCC regulation on station identification.

The proper order of calls is just as necessary on the air as the proper placing of the address at the beginning, and the signature at the end, of a letter. To and from should follow in a natural sequence. The last call heard in a QSO thus always identifies the station transmitting.

It is a matter of good etiquette, as well as a practical necessity for identification, that your call comes last when you send a sequence of calls on the air. It is confusing in voice when the call of the station worked is put at the end, violating these principles.
Most of the foregoing applies specifically to voice work. For all who take pride in the fine points of amateur operating something further should be added about c.w. operation. From ARRL literature we have it that “VA (end of work) shall be used by each c.w. station when signing off, this followed by your own call sent once for identification purposes.” Note that the VA (or SK) doesn’t come at the end of the transmission but at the end of the message or discussion. The identifying call comes at the very end, as before noted, in compliance with the FCC regulation.

Radio-Club Trends. One-third of our reporting affiliated clubs now have club-owned emergency power supplies, an increase of 28% from last year. After VJ-Day many amateur radio clubs reorganized and held meetings monthly. In the last year considerable club growth is indicated. The average club membership is about 42. A few clubs meet irregularly, 47% about twice a month, 36% once a month and 13% weekly.

QLSL Percentages. G6CB writes to plead that our stations, especially those in the “more difficult” states, adopt a policy of 100% QSL to first contacts, at least when requested! Though conceived originally as a domestic achievement, working for WAS is an increasingly popular activity with all Gs. The net return from all Ws contacted by G6CB is reported in this case to be 50%. In Michigan, Connecticut and New York his returns are reported to run 30 to 40%. In Indiana, Illinois and Southern States the cards sent brought a 75% return. Let’s each try to raise the “standing” of our own states for friendliness by 100% cooperation in QSLing!

Here is a good slogan that reached us from W8TU, via W1AW: “The QSL is the final courtesy of a QSO.”

CD Staff Notes. Since we lost one of our top staff men when Ev Battey (now W4HA) went back to the Navy, we have struggled with the effects of a personnel shortage over the last few months. When no summer slump developed, a few desks rendering membership services began to run behind. We apologize to some members for unavoidable delays in handling their WAS and DXCC applications during this period; it may require 30 to 60 days from the time this QST appears and new personnel get on the job to put all our matters on a current basis. But appropriate arrangements have now been concluded to cope with the increased level of activities, and the quality of our checking and research to maintain high standards in awards has not been allowed to suffer.

It gives us pleasure now to announce the names of some well-known amateurs who are joining our staff to fill our vacancies and develop our special ARRL programs.

Albert F. Hill, jr., W6JQB, leaves the field assignment of Asst. SCM of the Los Angeles Section to assume the Hq. post of communications assistant, specializing in the duties earlier handled by Joe Moskey, W1JMY. Promotion of traffic and trunk-line work will be a “natural” since JQB has been an ORS, active in net operation and support of organized communicating since about 1935... RM and OBS since 1940. His wartime work was in Naval communications. JQB was first licensed in 1933, and holds a shiny new Code Proficiency Certificate at the top figure. His record of participation in DX and SS Contests, LO Nites, etc., insures his understanding of your problems in these fields.

Albert E. Hayes, jr., W3LVY, will fill our new post of National Emergency Coordinator in early September. Licensed since 1934, Doc also has a wealth of ARRL and operating experience in addition to his work in the patent field, and membership in IRE and the Physical Society. Doc Hayes was operator at W1MX in the '38 hurricane, and has more recently been emergency coordinator for Baltimore, Md. In addition to boasting a Class A ticket, W3LVY has managed the Traffic Outlet, held down a TLC post, and has participated in our recent conferences with the National Offices of the American Red Cross. The continued growth of the ARRL Emergency Corps, development of new aids to local ARRL emergency leaders, and rendering of direct assistance to ECs and SECs on all problems relative to emergency preparedness are Doc's special interests. This big assignment takes a big man to fill it... see page 70, March QST, and you will see that A.E.H. fills the bill!

With regret we announce that Jim White, W1PHW, will no longer be with us as a W1AW attendant. Jim is going to college this fall under the GI Bill of Rights. We wish him well in all his studies and future work! Rod Newkirk, W9BRD, who has operated all c.w. bands as well as 10-, 11- and 20-meter 'phone, will take up W1AW projects and duties where Jim leaves off. Rod has about 80 countries to his credit, is a BPL-size

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traffic man from prewar, has won the SS for Illinois, and has spent three years in Signal Corps aircraft-warning work with additional tape-transmitter experience at WAR. W9BRD’s results have been obtained with low power, mostly using under 100 watts, so you can be sure he won’t pass you up if your signal is weak. Rod not only has our top Code Proficiency ticket but can take the stuff at 50 w.p.m. or better, so if you send decent stuff don’t worry about snowing him under if conditions are right. Also, you can depend on W1AW to slow down to your own choice of speed if you happen to be rusty. You’re invited to get acquainted with Rod over the air, whether you use voice or c.w. It’s just a coincidence, but his station picture appeared in QST for July, page 65.

--- F.E.H.

**PRIZE-ARTICLE CONTEST**

* The article by Mr. Herbert S. Brier,* W9EGQ, wins a prize in the CD Article Contest. You are invited to submit entries in this contest. The author of each article used is awarded a $10 prize, consisting of $5 in Victory Stamps and $5 in ARRL supplies or publications (except QST). Contributions may be on any subject of interest to amateur radio operators. Articles are selected on originality and value to the fraternity.

Give this contest a try. You may wish to write on Emergency Corps planning work and drills; phone or c.w. operating procedures; work on radio club committees; organizing or running a club; the most interesting band for you; code proficiency techniques; DX activities; traffic work; getting the most out of ham radio; or some subject we haven’t mentioned. You are not limited; make your contribution on any topic of interest to radio amateurs. Please mark your contribution “for the CD Contest.”

---

**THE GOLDEN RULE**

By Herbert S. Brier,* W9EGQ

In every communications emergency Amateur Radio has covered itself with glory; however, the operation of individual stations often leaves much to be desired. This article, based on observation of the 3.9-Mc. ‘phone band during the recent disasters in Oklahoma, Southwestern Iowa, and Texas, discusses the operation of some stations far from the primary disaster areas.

Unnecessary interference made the handling of emergency traffic difficult, and a frequent cause of it was long CQs. Almost every station contacted after one, when told he was interfering with emergency traffic, replied with something like, “Gee, OM, I’m sorry, but I just flipped the transmitter on and called CQ while the receiver warmed up, and I didn’t know...,” and so on for several minutes.

A second group did listen long enough to find a reasonably clear channel without paying attention to what the weak signals on it were doing. The last and smallest group knew that emergency traffic was being handled, but claimed as much right as anyone to the frequency. Groups one and two cooperated either by closing down or shifting frequency as soon as the situation was explained to them. If their number was not so great, they could be dismissed with a shrug, but there was an unending stream of them. Under any circumstances “blind” calling of CQs is inconsiderate. During an emergency it borders on the criminal, being in the same class as a man picking up a shotgun, closing his eyes, firing both barrels, and then opening them to see what he has bagged. Sooner or later someone is bound to get hurt.

Most of the group who claimed they had as much right to the frequency as anyone did consent to move after considerable discussion or having an FCC order quoted; however there were a few whom even this failed to impress because they had not received an “official notice” that an emergency existed. Some of them later received telegrams from the FCC which were “official” enough even for them.

The group who refused to move frequently claimed that the emergency nets were doing nothing but rag-chewing; and it was often true that they did much of it between messages. Nevertheless, they did handle emergency traffic efficiently the moment it appeared. The wisdom of needless conversation on an emergency net is doubtful; yet it does help keep other stations from moving in on an apparently unoccupied channel.

On the basis of these observations, two impressions were obtained: First, the interference would be reduced if all stations would listen before transmitting. It appeared that the more power a station had, the less likely he was to listen first, because he knew he could plow through anything. Second, that a further reduction would obtain if all stations, on being informed that they were causing interference, would acknowledge with a brief, “OK, sorry OM,” and reserve discussion until the emergency was past.

Only the FCC can take care of those who have never heard of the Golden Rule.

---

**BRIEF**

Members of the Black Hills Amateur Radio Club (South Dakota) furnished 11-meter communications successfully in connection with the local Soap Box Derby held July 27th. Calls used were those of members W0IW and W0QH.

---

* 385 Johnson St., Gary, Indiana.
DX CENTURY CLUB

Postwar DX accomplishment seems to be surpassing that of prewar days by a wide margin if the number of DX Century Club applications being received is any criterion. Headquarters is being swamped these days with batches of cards both from those DX hounds who are working strictly for the postwar award and those who are adding postwar confirmations to their prewar totals to qualify for the award under the special rules published on page 76 of June 1946 QST.

Many of the applicants for the postwar award have accumulated the necessary pasteboards in a period of about one year! As we recall, there were few if any DX experts who made the grade in such a short time before the war.

Since the last listing of postwar DXCC awards there have been 27 new certificates issued, 3 for telephone work. Top place in each category is still retained by W1FH. A glance at the tabulation below, however, will show that the gang are hot on Charlie’s tail, though he still maintains a comfortable lead. In the telephone group W1CW, No. 2 and W1HKK No. 3.

Our heartfelt congratulations to the latest crop of DX Century Club members.

<table>
<thead>
<tr>
<th>Call</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1FH</td>
<td>168</td>
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<tr>
<td>W1FH</td>
<td>151</td>
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<tr>
<td>W1BH</td>
<td>144</td>
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<td>W1TW</td>
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<td>ZLHY</td>
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<td>W2CY</td>
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<tr>
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<td>104</td>
</tr>
<tr>
<td>WIH</td>
<td>105</td>
</tr>
</tbody>
</table>

BRIEF

Oops, sorry! Our attention is invited to the fact that the Puerto Rican station mentioned in connection, with the radio chess matches described on page 64 of August QST was KP4AM, not KP4CM.

MEET THE SCMs

In January, 1942, the Western Massachusetts SCM, Prentiss M. “Prent” Bailey, received the call W1AZW, which he has held ever since.

Bailey’s main interest has been in operating, with emphasis on traffic. He has been RM and presently holds ORS appointment. A zealous contest man, Prent tries to participate in all operating competitions and was winner for Western Massachusetts in one of the early Sweepstakes. A dyed-in-the-wool e.w. man, W1AZW nevertheless has an NFM rig on 28 Mc. which is used occasionally. He holds a Code Proficiency Certificate for 30 w.p.m., along with WAS and Old Timers Certificates. He has participated in all emergencies that have involved New England, notably the 1927 flood and the 1938 hurricane-flood-tidal wave disaster, for which work he was issued a Public Service Certificate. Most of his work in the 1927 flood was accomplished while he was a key relay station between Vermont and the rest of the country; during that emergency he handled 360 messages in two days, in addition to plenty of press. He is an active Pittsfield Radio Club member and has held all the offices in that organization.

During the war Bailey was communications representative for the Massachusetts Committee on Public Safety and handled all WERS liaison work in Region 1. He also was an active member of the WERS as WKHW-12.

W1AZW is situated in the basement and consists of a 6V6-crystal-or-ECCO-6L6-6L6-807 transmitter running 50 watts input on 3.5, 7, 14 and 28 Mc.; a 144-Mc. portable transmitter; a home-built s.s. superhet receiver. Antennas are a 138-ft. flat-top with 96-ft. feeders and a 14-Mc. doublet. For emergency purposes W1AZW has a 3.5- and 7-Mc. portable rig and receiver built in one case and arranged for storage-battery power supply.

Prent has a wide variety of interests, including swimming, football, basketball, enjoys a good game of pinochle, and, last but by no means least, his family of three children. Although no longer actively engaged in amateur radio, Bailey’s wife, ex-W1AJJ, is an enthusiastic follower of his DX and SCM work and of radio in general.

BRIEF

KH6AW advises that Hawaii has advanced its clock one-half hour. Hawaiian Time now is two hours behind PST.
TRAFFIC TOPICS

The Communications Department desires to run an up-to-date listing of all active traffic nets in QST as soon as possible. The cooperation of all RMs, PAMS, ECs and net organizers will be appreciated. Please send a postal or radiogram stating the name of your net, times and days of operation, and frequency. This is to be a completely new listing. Even if your net was listed in last year’s directory, please submit the requested information so that we will know your group is active this season.

The Traffic Outlet will begin its regular season on October 6, 1947. The net will meet at 10 P.M. EST on 3705 kc. The call is CQTO. New members are cordially invited to participate.

From W6REB, net control station of the Pioneer Net, we hear the net is meeting on 3725 kc., Monday through Friday, at 7 P.M. and 10 P.M. PST.

W8JM, SCM for West Virginia, advises that the West Virginia Net meets nightly, Monday through Friday, 7:30 P.M. EST, on 3770 kc.

Word was received from W6CMN, RM for Los Angeles Section, that the Southern California Net will meet at 8 P.M. PST Monday, Wednesday and Friday, on 3695 kc. The net will meet more frequently as traffic needs increase.

The Hit & Bounce Net has been maintaining full operation all summer, according to W4PL, net manager. Operation has been on 7 Mc. and complete coverage of the U.S.A. and Pacific areas has been maintained.

Message-Handling Note: W1EMG suggests that we point out that the word “same” normally should not be sent as a preamble for messages sent in series from the same originator. It may be well enough to follow such a practice on commercial circuits where printed blanks are used between fixed points. However, on amateur traffic nets the receiving operator must go over all his traffic and type in the proper heading before filing. If he handles a considerable volume there is the possibility of error and confusion in forwarding or delivering the messages. In any event, the practice saves time for no one but the sending operator. It is detrimental to efficiency as well as lacking in courtesy. So the preamble should spell out the city of origin clearly with appropriate abbreviation for the state.

The Southern Texas Emergency Net at the Curro, Texas meeting elected W5PNY net control officer, W5CIX alternate, and W5FNH secretary-treasurer, with controls for Zone 1, W5GMT, Zone 2, W5BGO (alternate W5IC), and Zone 3, W5IVU (alternate W5FU). Tokens of appreciation were awarded to W5EYV, retiring net control officer, and to W5JBZ, editor of the net publication, Stenoscope.

JULY CD QSO PARTY

Despite summer QRN and otherwise poor conditions, Communications Department appointees and ARRL officials produced an excellent batch of scores in the July CD QSO Party. W6TM summed it up quite well: “Conditions got worse as the time went on, but who ever heard of poor conditions breaking up a CD Party!” W6YYW sent the gang an orchid after taking part for the first time, saying “Notfoed that the operating procedure was exceptionally good. Wish the DX gang would operate the same way.” Participants made good use of 7 and 15 Mc., newcomers especially expressed enthusiasm about their progress toward WAS in working the rarer states on those bands.

After being a strong contender for top honors in most of the parties held since the war, W4KFC finally tasted the fruits of victory with a first-place score. Apparently inspired by the performance of W3DGM (operating W6RBQ) in putting W6 at the head of the list in the April Party, W6EYH and W6WNI succeeded in snagging second and third place. Several of the top-scoring “regulars” were notable by their absence from the score list. It’s suspected that they’re resting up for a grand assault on the fall party!

The ARRL Activities Calendar calls for another CD QSO Party October 25th-26th. Any amateur who holds an official appointment or office in the League organization is eligible to take part. The pleasure to be derived from these quarterly get-
togethers can be fully appreciated only by participation. There is an ARRL appointment for you if you're interested in good 'phone operating, traffic handling, frequency measurement or v.h.f. experimentation; you may be eligible for a leadership appointment as emergency coordinator to assist in organizing local amateurs for emergency work. Write your SCM (address on page 6 in each QST) for information on how to get into organized amateur activities in your section. The present operating season promises to be one of the busiest and most interesting ever. Get in on the fun now!

Claimed Scores (C.W.)

<table>
<thead>
<tr>
<th>Station</th>
<th>Score</th>
<th>Contacts</th>
<th>Different Stations</th>
<th>Sections</th>
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</thead>
<tbody>
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<td>273</td>
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<td>W6YTH</td>
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<td>W8WNI</td>
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<td>W4KFX</td>
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<td>W8JM</td>
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<td>W8GBF</td>
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<td>W1OJM</td>
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<td>W5CMH</td>
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<tr>
<td>W1NXX</td>
<td>75,030</td>
<td>116</td>
<td>91</td>
<td>32</td>
</tr>
</tbody>
</table>

Other stations with scores over 50,000: W6JQB 74,538, W4BZE 73,450, W4MQG 71,440, WSCMN 70,460, W2GZV 62,400, W5Y7 62,370, W1AJB 61,585, W8JF 59,390, W8YKR 59,000, W7JQU 58,844, W4FWZ 50,050.

TRAINING AIDS

Looking ahead, the activities manager of a club can tell on just what meetings dates he has need of time to make complete and proper arrangements, and to change them if necessary. When he lets it go until the last minute, he has that much harder a task finding a satisfactory stopgap.

The ARRL Training Aids Program is not intended to supply stopgap entertainment and program material — although it can sometimes do so. It is intended to supply continuing training facilities for both code and technical training of amateurs: would-be, new and old. If the material is scheduled far enough in advance, you can book pretty much what you want; and what is just as important, you can generally book it in the order in which you want it. Except for motion-picture films, we don't care how far ahead you book Training Aids. Three months ahead is the limit for motion pictures, but even here you can figure out a chronological scheme and make it work if you have one showing per month and book each film three months in advance. Clubs who want to conduct a chronological training program should get themselves a list of ARRL Training Aids and copies of all reviews, and "look ahead."

A new series of mimeographs which will be ready for circulation by the time this appears in print includes a complete list of revised rules for all Training Aids, a complete list of ARRL Training Aids available, and application forms for your convenience in requesting material. These are, of course, in addition to reviews which will continue to be mimeographed on all films reviewed by the ARRL staff. Any of this printed material is available to any affiliated club upon request.

BRIEFS

The annual trans-Pacific sail race to Honolulu commenced on July 4th from Los Angeles. Only manager reports on the progress of the various entries were received until July 10th, when W6AM made contact with W6FZC/MM aboard the Morning Star. Position reports on fourteen of the boats were received at W6AM and given to various press bureaus, Western newspapers, broadcast chains and local broadcast stations.

The Delaware Valley Radio Association (Trenton, N. J.) is working toward the goal of having all its members qualify for ARRL Code Proficiency Certificates — ahead of any other ARRL-affiliated club, they hope. We divulge their intentions in order to plant the idea in other club groups and perhaps thereby stir up a bit of competition. A little application on the Monday-through-Friday W1AW practice transmissions, and attention to the dates of the monthly qualifying runs, will help. Which ARRL-affiliated club will reach the goal first?

BRASS POUNDERS LEAGUE

(July Traffic)

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<tr>
<th>Call</th>
<th>Orig. Del. Rel. Credit</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>W4PL</td>
<td>12 134 529 131</td>
<td>895</td>
</tr>
<tr>
<td>W2TU</td>
<td>11 30 7</td>
<td>86</td>
</tr>
</tbody>
</table>

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

W6AM 150

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."

October 1947
AMATEUR RADIO HELPS TO SAVE A LIFE

On July 8th, while listening for DX, W3JCR, Cumberland, Md., heard KP6AA on Palmyra Island calling CQ, the call occasioned by result of a plane crash. On making contact W3JCR was advised that medical supplies were at hand but that advice was needed in the treatment of a crew member who had lost a hand and a leg in the crash-up. There were no doctors on Palmyra.

Detailed instructions were obtained by W3JCR from a doctor at Cumberland Hospital and radiated to KP6AA. Following receipt of these initial instructions, KP6AA requested dietary information to aid the injured man; the required details were obtained by W3JCR and transmitted in short order. W2EQ also worked KP6AA and sent instructions obtained from his local hospital. W3JRF/KG6 and W9YJ contacted during the proceedings and relayed information from KP6AA which was turned over to the military commandant of the Marianas and became the basis for getting assistance by plane from Honolulu.

VERMONT FLOOD EMERGENCY

A flood of water loosed by the breaking of a dam at East Pittsfield, Vermont, swept through the western section of Rutland on June 5th and caused general disruption of power and telephone service. While commercial power was still available, W1AAJ in that city went on the air as auxiliary to W1AAJ; W1AVP also put his transmitter on the air to help handle incoming messages.

In addition to those amateurs already mentioned, the following are known to have assisted in handling emergency traffic: WIMJL, W1AD, W1AZV, W1MKM/1 and W2GFW. Numerous other amateurs at more remote points cooperated in various ways. The emergency was declared over at 6:00 P.M., June 5th, when W1AAJ went off the air as the central control station in the affected area.

BRIEFS

Here's a story with a one-in-a-million twist, told by W6VCN: "One night last June I contacted W7IEY, who was operating 25-Mc. mobile from Twin Peaks in San Francisco. He was on vacation and had just arrived from his home town, Ruppett, Idaho. After the usual formalities, I mentioned that I worked for KPO. He came back and said he had installed the first KPO transmitter. That was coincidence Number 1. Then he asked for my QTH and I replied that it was 915 Fulton St. In a voice filled with excitement he came back and remarked that he had lived at the same address during 1920. I invited him to visit. We spent an enjoyable hour together inspecting 915 Fulton St. W7IEY pointed out the former locations of his rig and antennas. I had placed mine in the same spots twenty-seven years later!"

Corrections: The contest committee of the Canadian Amateur Radio Operators’ Association advises that through an inadvertent error in the original compilation the score of W5DJB, 722 points and high for the Iowa Section, was omitted from the results of the W7VE Contest published in QST. Also, the leader for Northern New Jersey was W3KTH with 10,912 points and the runner-up W2EQS. A typographical error was responsible for listing W5VPC as the Southern Texas winner; actual winner was W5JPC.
HAVE YOU QUALIFIED FOR A CODE-PROFICIENCY CERTIFICATE?

The next opportunity to qualify for a certificate or endorsement sticker in the ARRL Code Proficiency Program is on October 17th. 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 received successfully by ear at the highest speed you can copy should be sent to ARRL for checking. To avoid errors in transmitting your original copy, attach a statement certifying your signature that the text submitted is correct, made from reception of W1AW by ear, without any kind of assistance, personal or mechanical. If you qualify, you will receive a certificate or appropriate endorsement sticker for certificate or endorsement sticker already held. Those who qualify in the past should submit copy only if speed is higher than previously notified.

Each night, Monday through Friday, at 10:00 P.M. EST, on the frequencies mentioned above, W1AW transmits practice material. Tuesday and Thursday transmissions are made at speeds of 15 through 35 w.p.m. in 5-w.p.m. steps. On Monday, Wednesday and Friday practice is on 9, 12, 18, 25 and 35 w.p.m. References to text to be used on several of the practice runs appear below. 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 your own 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 August QST
Oct. 7th: Curing Interference to Television Reception, p. 19
Oct. 9th: The "Load-Discriminator," p. 24
Oct. 13th: Atlantic City Report, p. 28
Oct. 15th: In Electronic Multicircuit Breaker, p. 34
Oct. 17th: Qualifying Run, 10:00 P.M. EST
Oct. 21st: Cathode-Coupled Converters for Suction Receivers, p. 37
Oct. 23rd: Technical Topics, p. 43
Oct. 27th: Inexpensive Rig for Local Duplex Operation, p. 52
Oct. 31st: The World Above 50 Mc., p. 54

ELECTION NOTICE

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

You are hereby notified that an election for Section Communications Manager for this Section 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.

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.

**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.

Iowa William G. Davis, WBPP June 16, 1947
Nebraska William T. Gemmer, W XQ June 16, 1947
Western Florida Luther M. Hall, W AO July 2, 1947
East Bay Horace R. Greer, WPT August 16, 1947
In the New York City and Long Island Section of the Hudson Division, Mr. Charles Harren, Jr., W2EDC, and Mr. August A. Nickel, W2HMM, were nominated. Mr. Harren received 422 votes and Mr. Nickel received 277 votes. Mr. Harren's term of office began July 31, 1947.
In the North Dakota Section of the Dakota Division, Mr. Paul M. Bossoletti, W4CDZ, and Mr. H. E. Parmeter, W4GMI, were nominated. Mr. Bossoletti received 46 votes and Mr. Parmeter received 18 votes.
In the Eastern Florida Section of the Southeastern Division, Mr. John W. Hollister, W4FZV, Mr. W. E. MacArthur, W4BFY, Mr. R. E. Lowrey, W4DQW, and Mr. R. H. Bennett, W4ANY, were nominated. Mr. Hollister received 76 votes, Mr. MacArthur received 54 votes, Mr. Lowrey received 45 votes, and Mr. Bennett received 43 votes. Mr. Hollister's term of office began July 31, 1947.
In the Southern New Jersey Section of the Atlantic Division, Mr. George W. Tunnell, W20XK, and Mr. W. Raymond Tomlinson, W2CGU, were nominated. Mr. Tunnell received 125 votes and Mr. Tomlinson received 103 votes. Mr. Tunnell's term of office began July 31, 1947.
In the Washington Section of the Northwestern Division, Mr. Laurence M. Sebring, W7CZY, and Mr. Lloyd Norberg, W8EWC, were nominated. Mr. Sebring received 238 votes and Mr. Norberg received 114 votes. Mr. Sebring's term of office began July 31, 1947.

* 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.

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Section Manager

Maritime Oct. 15, 1947 Arthur M. Crowell
West Indies Oct. 15, 1947 Maria de la Torre Deceased
Kentucky Oct. 15, 1947 Joseph P. Colvin Resigned
Quebec Oct. 15, 1947 Gordon F. J. Proctor Resigned
Alabama Oct. 15, 1947 Lawrence J. Smyth Resigned

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**ATLANTIC DIVISION**  

**EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES** — The SVARC of Sunbury supplied communication for the 175th birthday parade of the City of Sunbury. All operation was on 144 Mc., one mobile rig leading the parade and four fixed stations at Fairbury Park. The net members were doing a conscientious job as an OER, this from SCM. Those participating were: WHL, KPH, LYU, MXE, GCU and MGL. The SVARC held a picnic and banquet at Fairbury Park. Sunbury Club is proud owner of a new Yaesu 144-Mc. mobile in his new Frazier. The York Amateur Emergency Corps assisted with communications during the big fire in the York business district. EU has a new location which is much quieter than the old one along a 66-kv. line. C.A.U. is making arrangements to take part in all occasions. LUE is raising his four-element beam and rotating with motor. EQK is on 28-Mc. with 250 watts to a two-element beam, using Hytron 5514s in final. KKH is using a three-element beam on 28 Mc. and gets out well. He is using 5514s and modulators. FNG, GKP, EYX, MNA, KUX, and JDQ attended York, Pa., Hamfest on July 13th. EYX worked KCA/4 at Skyline Drive, Va., while parked on Sears Roebuck roof using his car portable rig. He also worked Admiral Islands on 14-Mc. from his home station. MKS gets out well on 28-Mc. with 20 watts. ECP is rebuilding and pimping up a brand new VFO. MNA is leaving the section for the South. The gang will miss his presence and his signal. LUE is doing a conscientious job as an OER. Those participating were: W3KIIJ, AKB 15, ECP 13, AKR 6, ISF 3, BWT 2.

**SOUTHERN NEW JERSEY — SCM, Ray Tolimiao, W2GCU** — Well, fellows, this report will wind up my activities as SCM for this section, and I am grateful to those who helped with news for this column during my term of office. Your new SCM is George W. Tunnell, OXX, 22 Wyoming Avenue, Audubon, and I hope you will give him all possible cooperation. WI one of our most valuable and active Class B's, is now a Class C. OX is on 144 Mc., and is working on getting a new antenna. OX and 44 and 50 Mc. are now being used. QGZ has all been on vacation and are now back in "de grove." BO, who passed away on June 27th following a lengthy illness, will be greatly missed by his many friends. SXK is on 28-Mc. with 250 watts on his new antenna. SRX is doing a swell job with the Washington Valley Emergency Corps. Don has done considerable organizing work with their local EC. Traffic: W3QJ 17, BXT 14, QEW 14, EAN 7, EER 5, KIL 5, AQN 3, CAU 3.

**MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Eppa W. Durso, W3BWT — Asst. SCM, Frances Durso, SARB; RM: ECP** — The Washington Radio Club held an election of officers for the coming year at its first July meeting. Following were elected: MIW, pres.; MO, vice-pres.; MSK, sec.; AKB, reg. sec.; AIP, corr. sec. At the second July meeting DK gave a talk on "Mobile Telephone Apparatus." All Washington area hams have received personal invitations to visit the Airways and Air Communication Service, ATC, during the Bolling Field "Open House" on August 7th. Capt. Biggs extended a personal welcome to all hams to visit the AACS headquarters whenever they were in the neighborhood. The Section Net has suspended operation until Oct. 1st when it will resume on 3650 kc. at 7:30 EST with ISF as NCS. The Potomac Valley Emergency Net continued operations during the summer and the gang is to be congratulated on a fine job, well done. HS is doing a swell job with the Washington Area Emergency Corps. Don has done considerable organizing work, tabulating apparatus available and operating personnel. LIV has left the section to take up duties at League Headquarters. "Doc" did an admirable job while in the section, and among his many appointments were RM and ISF in the Washington area. He is very much missed. NHT is a new station in Washington, and already has many DX contacts to his credit using 14-Mc., 5-w., and 25 watts input. ISF is convulsing after a major operation and has been getting out well with a one-watt transmitter at his bedside. CJT is building a 20-watt portable transmitter for emergency work, using both e.w. and 'phone. AKR is experimenting with various types of antennas. KHI is running morning schedule with "Hit and Bounce Net." CDQ has been getting out much better since he changed operating points. LUE is raising his four-element beam and rotating with motor. EQK is on 28-Mc. with 250 watts to a two-element beam, using Hytron 5514s in final. KKH is using a three-element beam on 28 Mc. and gets out well. He is using 5514s and modulators. FNG, GKP, EYX, MNA, KUX, and JDQ attended York, Pa., Hamfest on July 13th. EYX worked KCA/4 at Skyline Drive, Va., while parked on Sears Roebuck roof using his car portable rig. He also worked Admiral Islands on 14-Mc. from his home station. MKS gets out well on 28-Mc. with 20 watts. ECP is rebuilding and pimping up a brand new VFO. MNA is leaving the section for the South. The gang will miss his presence and his signal. LUE is doing a conscientious job as an OER. Those participating were: W3KIIJ, AKB 15, ECP 13, AKR 6, ISF 3, BWT 2.

**Continued on page 78**
Radiotelephone communication used to be so simple when all we had to contend with was amplitude modulation or A.M., plus unintentional F.M. when the oscillator happened to be unstable. But now, just keeping abreast of some of the new modulation techniques is a major project. It is anybody's guess as to what modulation system the amateur of 1975 will be using.

The amateur might well wonder how some of these newer communication techniques, such as Narrow Band Frequency Modulation, Narrow Band Phase Modulation, Frequency Shift Telegraphy, Pulse Time Modulation, Pulse Count or Pulse Code Modulation, Pulse Amplitude Modulation, Pulse Frequency Modulation, and Pulse Width Modulation will change the D.X. or V.H.F. picture. Will they complicate or simplify the apparatus involved? This is the stage of the game where predictions of things to come are many, and differ widely. Basically, there are some fundamental facts which can be applied to give a clearer understanding of the situation.

Concerning A.M., F.M. and P.M., as the unmodulated carrier at the receiver becomes weaker it finally gets lost in the noise at a level governed by selectivity, and all three systems are equal in this respect. When the carrier is modulated it becomes readily apparent that the effectiveness of any one of these three systems for weak signal reception is determined by its ability to combat noise.

A little investigation into the characteristics of noise shows that with tube hiss and thermal noise, the noise reaches an average value, but noise peaks or very short pulses are as much as 13 decibels (approximately) above the average level. Ignition noise and man-made static are of this character but often have a much larger ratio of peak-to-average value. As the R.F. signal level decreases toward the average noise level these noise peaks obliterate the R.F. signal for very short intervals of time and no type of modulation can be effective. Improvement in reception under these circumstances can then be obtained by techniques which will permit the receiver to recover more rapidly after each paralyzing pulse of noise. If one system of modulation permits receiver designs which allow the receiver to recover more rapidly than another, that system will ultimately be superior in providing readability from a weak signal.

Many practical factors enter the situation, such as complication or simplification of receiver or transmitter, cost of parts, bandwidth to be used, and last, but not least, reduction of broadcast interference, for a few examples.

The F.C.C. in its recent order allowing narrow-band F.M. and P.M. within amateur phone bands for a one year period clearly indicates its desire to gather data on practical operating experience. NATIONAL, developing components and producing equipments, will continue its efforts to help the amateur improve the art of radio communication, and will have an announcement of interest to N.B.F.M. experimenters.

The years have shown the amateur to be truly progressive and we expect to see N.B.F.M. given a real tryout between now and August 1, 1948.

W. A. Ready
ville, says a ham radio is "plumb legal" until golf scores go bad. Reports from Oil City show LS'T has 48-AC as a VFO. KQF 537 has decided that fishing in Canada is more fun than radio. IQX finds 53 has sure kept him QRL. DJ1 and LXR are taking it easy, working from their rigs in the fall looks better than P-YR. Traffic: JUNO WA-MK 37, KQF 537, NA-MIHE 69, MKF 45, RAT 15, MIN 2, NCI 2, VNE 2.

CENTRAL DIVISION

ILLINOIS — SCM, Wesley E. Marriott, W9AND — The ILN continues to operate through the summer on 3765 kc. Most other state nets have closed down for the fall. Looks better than P-YR. Traffic: HAT 1765 kc. Most other slate nets have closed down for the fall looks better than P-YR. Traffic: JUNO WA-MK 37, KQF 537, NA-MIHE 69, MKF 45, RAT 15, MIN 2, NCI 2, VNE 2.

1765 kc. Most other slate nets have closed down for the fall looks better than P-YR. Traffic: JUNO WA-MK 37, KQF 537, NA-MIHE 69, MKF 45, RAT 15, MIN 2, NCI 2, VNE 2.

TRAFFIC: JUNO WA-MK 37, KQF 537, NA-MIHE 69, MKF 45, RAT 15, MIN 2, NCI 2, VNE 2.

Traffic: JUNO WA-MK 37, KQF 537, NA-MIHE 69, MKF 45, RAT 15, MIN 2, NCI 2, VNE 2.
"Looks like you're out of the band, old man. Of course, my receiver may be off but according to my readings you're ... etc." — "There's a CW sig on you ... better check your frequency" — "I can't find you since you moved up, Bill. You said you'd move up 25 kaycees but can't hear you there" — "Sorry, Charlie, I am monitoring the spot set for our sked but no soap. Guess you must be on the wrong frequency." — How much of this kind of talk do you hear these days? Plenty. Unless you are CRYSTAL CONTROLLED you can never be sure where you are. Get set to enjoy yourself this winter. Pick PR Precision CRYSTALS at your jobber's for your favorite spots. Go PR... and KNOW WHERE YOU ARE! — Petersen Radio Company, Inc., 2800 W. Broadway, Council Bluffs, Iowa. (Telephone 2760)

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<th>Description</th>
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<td>40 &amp; 80 METERS</td>
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<td>Harmonic oscillator. Low drift. High activity. Can be keyed in most circuits. High power output. Just as stable as fundamental oscillators</td>
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<td>40 &amp; 80 METERS</td>
<td>PR Type Z-2</td>
<td>Rugged, low drift fundamental oscillators. High activity and power output with maximum crystal currents. Accurate calibration</td>
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Net. VJH is acting as alternate NCS on the MSN C.W. Net. The St. Paul Radio Club completed several transmitters and receivers. Incoming reports include the new K50 station at Kellar Field. SKJ spent his vacation in Northern Minn. BHY is QRT with a big paint job. V4L4C visited RPT and BHY. For a beautiful 28-Mc. mobile job take a look at the one ZWW has. Not only did ex-FPL now EAI LDH receive a new call P50, he can find you on 2750-60 kc. EJF is back on from new QTH with antenna by ITQ and YPN. New ORS of the month is FAH. Our Director, SW, visited the Arrowhead Radio Amateurs and on the way home dropped in on the 28-Mc. ZCQ. As a result ORS has set up a radio station. YKJ is home after finishing radio school. How about some volunteers for ORS on the low-frequency band? We need them badly! Traffic: W8CBW 19, RFY 18, KPT 12, QIO 9, FBI 3, VJJ 3.

DELA THA DIVISION

ARKANSAS — SCM, Marshall Riggs, WSJMC — MAR is back in the saddle. He had a holiday in the mountains. As usual have you, Paul. ICS has new first-class commercial license. JXO will be on shortly with kilowatt on all bands. The boys on the 3.85-Mc. phone net, 3855 kc., are having good luck getting emergency gear working. They have good attendance. A new W4EC interested in 3.5-Mc. c.w. net. Please set in touch with AQB, who is planning on some 3.5-Mc. c.w. So he can read 6LY9 EGY says, “Let George do it.” The Little Rock Club is organizing a local emergency net to work with the Army. WCW says that he is moving to see some more of the world. We hope to see you, Dave. There is good interest in AEC work. MRX in on 14-Mc. c.w. with p.p. 812. MAR has moved to Fort Smith from Little Rock. Welcome here, Don. How about some new equipment? Our old LRP is digiting away, looking well, looking for water. BJJ is net weather man. What’s your blood pressure?

LOUISIANA — SCM, W. J. Wilkinson, jr., WSVT — Hot weather (88 to 106 degrees) must have sent the gang to cool off and obtain more equipment. Only a few of the boys completely closed down during July. LSZ, LUU, and KIHJ are all on 7 Mc, KUZ, formerly of Jonesboro, has moved to Monroe where he now is active on 3.85-Mc. phone. DX has lured FAI to 14-Mc. phone. HJY, KFY, and NUN are on 28-Mc. phone from Winnaboo. KIM is active on 7 Mc. KTE has been vacationing but managed to get some traffic from Rebels. The Burksdale Field Club is being organized so plenty of activity is planned for the fall. HUI will be on the Pelican Net. KUG wants to hear from all who want spots on the Net. LDH is back from vacation and is resuming all OBS schedules. The SCM hopes to see most of you, again. Let’s have more dope next month. Traffic: WKTE 16, VTS.

TENNESSEE — SCM, James W. Watkins, W4YLS — PFC, active on 7 and 14 Mc. reports contact with 6M6H on 14 Mc., who said he was using 1-kw input and putting out at least 250 kw. W6P4X, active on 22 Mc. and 3.85 Mc., reports 2TYU, f.m., at 5:30 a.m. July 26th. FLW is about ready to work 7- and 14-Mc. c.w. QT is busy working DX on 14-Mc. phone and in two nights operation worked 1720, 1729, 1733, 1736, 1739, 1740, 1741, 1742, 1743, and 1745. MCD opened on 28 Mc. with an HT-9 and an IC-120XQ. QT is new OBS in Chattanooga. GHL is new OBS at Kingsport. AAW is on with a new c.e.o. and an 813 booster. AFR is rebuilding using p.p. 813a and Class B 813a. AFR is active on 14-Mc. c.w. EBIQ is now 3.85 and 7 Mc., and on 112 kc. for local contacts. GXM put a new rig on 14 Mc., making use of a five-year-old Class A license for the first time. GYE is making the best of his W3LJ equipment and is now using 3.85 and 3.7 Mc. YXK is building a new 11-tube Super that works swell. JSM is putting a new small rig on 28 Mc. FUN soon will be on 7 Mc. from Dale Hollow Dam. MEQ is now in Knoxville on 7 Mc. FHW is active on 50 Mc. nightly. MRB is on 28 Mc. with a low PSV. HOJ is active on 7 Mc. GHL’s first postwar activity on 7 Mc. netted 8 states with 3 watts to a WV, MCZ and MFA are new calls in Kingsport. LNF is new AEC member. GHL is new OBS at Kingsport. AWF is on 14-Mc. and OBS for Memphis. Traffic: W4PL 806, HOJ 10, GHL 4.

GREAT LAKES DIVISION

KENTUCKY — SCM, Joseph P. Colvin, WSFEZ 1 — BAZ sent in the following report. LUNI lost a daughter — by marriage, QBW relays traffic, but slow, KKG is rebuilding shack and transmitter, commercial style, JPP, on route to California with 28-Mc. mobile rig. scheduled BPE. Doug McIntosh now is M38, KRF has new 300-watt rig on 7 and 28 Mc. JEB works Evansville, Ind., on 28 Mc. KFB works 7 Mc. religiously but is building 28-Mc. rig. PRW has a new NC-240D. KMO has a new 807 hot by IEZ/4, LMV, MFH, NJY, and YXF. LQQ is running an 807 on 3.5- and 7-Mc. c.w. ERH has an 807 on 28 Mc. CDA and IJH are keeping 7021 kc. busy. KNY has now 5 states on 28 Mc. and 6 on 7 Mc. KHT and KRU are now 28 Mc. TWI is rebuilding with T740 p.p. for 14 and 28 Mc. NYQ worked plenty of real DX before discovering that his antenna was not connected to the transmitter. MBD, with 30 watts on 14 Mc., worked several Gs. KFP is building seven-element Yagi beam for 28 Mc. to his credit. KPR won a cup in ARTS Field Day Contest. TBG is getting code practice locally. NDY is building 28-Mc. mobile rig. UWR built e.e.o. CMP is working KYP on 8 watts. TRC wants more towns on KYP. If interested, try 2955 kc. an hour. CIC is back on KYN and KXP. KWO is installing long wire antenna. YPR is pounding 3810 kc. regularly. KYN needs more towns. Anyone interested in c.w. can work 2810 kc. is asked to write Alab. C.W. care.

MICHIGAN — SCM, Joseph R. Beljan. WSBCW — SEC: SAY. New appointments: ORS — YJU and VPE. OPS — OAT. A Section Net Certificate was issued to YJU. FALL is once again with us and it is time to dust off the old equipment. Now that the midsummer slump in traffic and reports is really with us, there are an awful lot that should be endorsed. Send them to me at once before your appointments are lost. Some new equipment has been obtained by some of the boys. To start this month’s report we announce the arrival of a YL alerted. Nice going, fellows, and congrats on the fine show. To our new field club officers are: UJS, pres.; WZY, vice-pres.; DOI, secy.; LR, treas.; SBG, secy.; JFU, treas. NQG is building badly-needed modulator. 144 Mc. is kept in silence and sends in traffic report. YCT received 19 sets of certificates there are an awful lot that should be endorsed. Send them to me at once before your appointments are lost. Our former Director, AVH, returned from a trip to England and has 50-ft. mast of pipe under construction. YKD has a new home — it’s not dipoles that he’s folding. HUB has a new home — it’s not dipoles that he’s folding. KFB recently was appointed EC for the state. ICW, ex-BSK, is new EC and ORR for Memphis. Getting those reports rolling again. Also, look at your appointment cards. FOX, ex-BSDK, alerts. New member, to the ionosphere. Work信es toward keeping the signal high. A new 144-Mc. emergency equipment, once again made a show showing how well our hobby can be performed by people who work together. The motorcycle races south of Grand Blanc, and between the track and Flint. When a motorcycle hurtled into the crowd injuring six persons, the gang alerted the hospital at Flint and received a call from the hospital. We hope to see everyone at the Tech Field Day Contest. The Genesee County Radio Club is using邀请 to the XYL at QBO, who now has the car. ARJ, ex-BSK, is new field club officer. 

Continued on page 30
Because they fill a real need for conserving filament power, Hytron instant-heating tubes are in. Yes, the 2E25, 2E30, HY69, HY1269, and 5516 are in the new mobile transmitter designs of many famous friends—too many to thank in this small space. The 2E25 and 2E30 also appear on the Army-Navy Preferred List. Why so popular? With no standby current, battery drain can be cut to 4% of that with cathode types—attainable power output and range increase. Potentials of rugged filaments are centered for battery operation. Beam pentode versatility simplifies the space problem—one type can power all stages. Join the leaders. If you build mobile equipment—for land, sea, air—put Hytron original instant-heating, easy-on-the-battery tubes on your preferred list.

Bendix MRT-25, 152-162 mc. 2E25's generously.

HAR-CAM
HARNESS LABORATORY'S CHOICE
2130's, 5516's for its Model 542 f-m transmitter.

Motorola
5516's power both driver-doubler and final of Motorola's Model FMTRU-200.

Jefferson's Model 351, 33-watt marine radio-telephone employs HY69.'s.

Kuo4 FM-30X features 2E25, HY69 throughout.

Hytron instant-heating tubes since 1929.
now, CFP made the discovery that even a good receiver won't work when it's in series with the ball light. PNG won the two-way on the balance with DX feeder Ken."}

**HUDSON DIVISION**

NEW YORK CITY & LONG ISLAND — SCM, Charles Ham, jr., W2KDC — The July meeting of the AEC Brooklyn Net treated changes in procedure; all traffic will henceforth be handled in strictly AARL form to facilitate net operation. A 28-Mc. net has been organized and will be functioning soon. OHP is eager to hear from all Brooklyn stations interested in AEC operation. While the 144-Mc. Net has fallen away a bit, those who are continuing through the summer are especially active. EFP is added to the crystal-controlled net on 144 Mc., KB and FG are going strong on 220 Mc. and looking for contacts every Tuesday evening. HQT is back on 144 Mc. after rebuilding. HQZ sports a new beam on 144 Mc. N'AY zubs the "502" band. From Queens BPS reports continued activity on 144 Mc., with an average of ten stations at weekly drills and increased activity on 3.5 Mc. AEC Net: OIE, CIQ, OZA, and BPS have joined the "BC-522" Club, with 144 Mc. To the south, the Nassau Section is making a good showing on 144 Mc. Asst. EC SYW is reconditioning, 144 Mc. is very active on 144 Mc. OIE, CIQ, CDS, BYH, TFA, PQD, LGK, and BPS are going strong on 144 Mc. and informing every third Monday night of the month to message-handling. BPS is kept schedule with A YC to keep the latter informed of the station's activity. HCR-522 to use as a "flexible" station — he can hit as many as two different frequencies on the same band, but fortunately at different times! CGG has a new Millen VFO. EUI is working portable on weekends, from his summer QTH in Pennsylvania. INN will help to report N.N.J. at the American Legion Conventions in New York and Trenton, and the Hudson Division Convention at Asbury Park. COG is on 144 Mc. Traffic: W3CGG 179, TZY 169, DRV 125, CWK 97, OEC 54, CQB 50, CJX 40, NKD 40, QEM 3, EGM 23, VGW 16, HI 14, QF 10, LFR 9, HXZ 7, OXL 6, BRC 2, KMT 2.

**MIDWEST DIVISION**

IOWA — SCM, Wm. G. Davis, W6FP — WHG has rigs on all bands, HKN is on 3.85-Mc., phone. NXP visited HKN, NUD and PIC are on 28 Mc., LKK is working for KCRB, WISG, is 144-Ham-television, and the Midwest Division Convention at Asbury Park. WDQ has new, 144-Mc. beams. WQQ has worked 19 states on 50 Mc.; BVG 18 states on same band. BQG is on 28-Mc., mobile. AY is an ex-1 UE, now is 41A in Arlington, Va. BWI is converting an SCR-522. The UCARA started meetings Sept. 8th and will meet every 2nd and 4th Mondays at 830 p.m. at the Elizabeth YMCA. PHY, IZC, and PIX are doing nicely with their 522s. RCL is very proud of his "flexible" station — he can hit as many as two different frequencies on the same band, but fortunately at different times!


KANSAS — SCM, Alvin B. Unruh, W6AY — Although news is a low ebb in the Kansas section, with the temperature at 105 degrees, full activities should be getting off to a good start by this time. The QKS State Traffic Net will need members in all towns of any size. It is suggested that small towns place more emphasis on placing ham activity in any form. SQG is active on 14-Mc., phone. TCW goes for the catfish when 28 Mc. goes dead. DTV and BCC are recovering from Tall Corn Hamfest. UFL has new jr. operator. SCU kept schedule with AYC to keep the latter informed of the condition of his daughter while in the hospital. PP spent.

**Continued on page B1!**
SPEAKER CONCERT* SERIES

PM SPEAKERS with Alnico 5 "R" Motors

The new JENSEN Concert Series speakers illustrated are now available at price levels only slightly higher than the well-known Standard Series models P12-S, P10-S, and P8-S. These new "R" speakers offer unequalled values in power handling capacity, in efficiency, and in response-frequency. Overall performance is just a notch below that of the famous JENSEN PM12-H (now P12-Q), PM10-H (now P10-Q), and PAH-8 (now P8-Q), at substantial price savings.

Model P12-R, ST-103 - 12 watts ....... $19.50
Model P10-R, ST-112 - 10 watts ....... $18.50
Model P8-R, ST-169 - 9 watts ....... $15.25

For complete information on all models in the Concert series, as well as on other JENSEN equipment, send today for JENSEN Catalog No. 1010. Use the handy coupon below.
saw orchard, berries, and been limit his ham activities. EPX is operating mobile in Kansas City, but activities are limited by approaching marriage. ESL has SX-42 and GAK beams. GCL reports no activity except on CAA Net. KIK issued a recording made in Tokyo of his transmissions to WA2L. W0VBQ5.

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There are some jobs for which direct current is better—other jobs where direct current is a "must." High gain speech amplifiers, for instance, can be made more hum-free by operating the tube heaters from DC. Solenoids, a "must." High gain, speech amplifiers, for smooth operation when powered by direct current. Rectifiers are ideal for all low voltage, medium and high voltage transformers and relays operate more smoothly. Other jobs where direct current is better—other jobs where direct current is necessary. Mallory Approved Precision Products Catalog.

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(Continued on page 89)
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A Line of PLASTICON* GLASSMIKE RF Transmitting Capacitors

Superior to mica capacitors because:

- Greater safety factor
  (3500VDC Operating; 7500VDC Test)
- Lower RF losses
  (See current ratings below)
- More conveniently mounted
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The above advantages are possible by the use of the Type L film dielectric which has lower losses than mica.

**TYPE LSG—PLASTICON* GLASSMIKES**

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touch with your SEC, NLO, or your SCM. Contact your SCM for information on any appointments in which you are really interested. Traffic: W1MCQ 2.

NORTHWESTERN DIVISION

ALASKA - SCM, August G. Klibert, K7CBF - OES W2SLW/KL7 and 7RT reached end of daily 144-Mc. schedules with no contact as all v.h.f. bands were dead. 28LW is having trouble with self-oscillation in crystal-controlled 144-Mc. rig. KL7BF returned State-side to resume W1 call leaving him without a partner. KL7BD is having crystal-cracking trouble. KL7AG returned from State-side furlough but a backlog of work keeps him off the air most of the time. KL7BK received Class A license but will stick to 7-Mc. c.w. for some time. Operating activity seems low because of summertime outdoor activities, but many KL7s are rebuilding. How about some more reports, gang? Traffic: KL7BD 21.

IDAHO - SCM, Alan K. Rose, W7IWU - Kuna: EMT is our new RM for the Gem Net. He recently purchased 24 surplus crystals between 3516 and 3580 kc. and says "so am nearly a crystal VFO at lower end of 3.5 Mc. Swell for 3a Parties." Aberdeen: First report from FBD since about 1980. He is on again on 14 Mc. with 100 watts going after the DX. I wish more of you fellows would get on 3.5 and 4 Mc. so we all could get to know each other. Since 3745 kc. is the Gem Net frequency, how about all of Idaho meeting within a few kc. of that frequency on October 17th after 7 p.m. local time for an Idaho Party. Any phone boys will have to drop me a line so we can work out something similar on phone. We have no organized phone net in Idaho. Boise: JAIH reports that JBA has been transferred to Boise from Medford, Ore. Let's have lots of reports next time — pile me up! Traffic: W7EI\IT 2.

OREGON - SCM, Raleigh A. Munkskr, W7HUP - Portland: JGC had a fine business vacation to Crater Lake, Mt. Shasta, and Oregon Caves with 15-watt mobile rig in car. The Portland Mobile Net on 28 Mc. is operating on every other Thursday during the summer. OZC, formerly S0ZC, has moved to Portland from Sausalito, Calif. He is OS8. LaGrande: HBO's folks visited him from Iowa and kept him off the air for about an hour! ARZ is moving back to Salem on account of the housing shortage. KVG is adding to his collection of antennas up at Starkey. He also has a new 28-Mc. rig complete with "bugs." Baker: A0L has had his vacation and is ready for some serious antenna-building before winter sets in. JLC is very conscientiously sending official bulletins on 3.85 and 7 Mc. every evening. GVX has added a room to his house but advises it isn't a new shack, merely a bedroom for the jr. operator. Oregon: JFZ has tired of fighting parasitics so has rebuilt without any provisions for them in the new rig. He also has a new antenna ready to go. IAM has a mast up and is concentrating on the building of a 28-Mc. beam for his coming winter's operations. No news was received from cities not mentioned. The clubs especially are asked to elect or appoint a reporter to give me an item or two before the first of each month. Traffic: W7EHT 2.

WASHINGTON - SCM, Larry Selving, W7CZY - IVJ is president of the Puget Sound Radio Club, which holds meetings the 2nd and 4th Wednesdays. LEC schedules KF3, Yakima. JRI is making hay instead of QSOs. FXD says no more Field Days on top of mountains. LEA, LAN and KGV are on 7 Mc. from Anacortes. JKB works 3.85- and 14-Mc. phone when not busy with flying lessons. APS painted his house, also insulators and feeders. JFP has trouble. RT, 1840 Mc. in 3.85 and bugs in 14-Mc. rig. ACB is NCS and DGN is Alternate NCS on Washington Section Net. Net meets 7:15 P.M. PST Mon. through Fri. 3035 kc. Members are: ACF, CFT, DGN, DRT, ER, FRU, DRL, JKB, LEC, LIL, and LIA. The net needs operators interested in traffic handling in many parts of the section. See any of the members for details. HRC is back on the air and looking for old friends. WY is able to operate only on week ends. DET spends his time on 14 Mc. working European DX. JCT has new rig with p.p. 812C. DYL deci- ded one crystal is not enough and is building a VFO. DF, BXQ, BT, DYT, and EUR are getting good results on 144 Mc. DMN spends his time on 60 Mc. JFC is the proud father of a boy. CE keeps schedules with K17a. PRT spends a lot of time handling traffic with the Pioneer Net. DGN has schedule arranged with BYG for daily ski reports from Stevens Pass. LIL is making lots of contacts on 3.5-Mc. c.w.

(Continued on page 88)
A MESSAGE from the President

In response to hundreds of inquiries, we wish to announce that there will be no new HAMMARLUND receiver in the price range of the HQ-129-X until the summer of 1948 at the very earliest.

Extra engineering effort, extra precision and extra care in manufacturing have made the HQ-129-X famous as the Ham's receiver that is built to professional standards.

You can buy the HQ-129-X with confidence. It has every up-to-the-minute improvement that radio science has so far developed for amateur radio receivers.

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CHECK YOUR VOLUME CONTROLS NOW!

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PACIFIC DIVISION


JLW has a crystal on 3.5-Mc. c.w. and is erecting a 60-ft. vertical. KZL is on 5.5-Mc. c.w. and IOR is operating in a 1000-watt shack with 40 watts c.w. on 7 and 14 Mc. WTVZ has a Miller exciter. The AEC in Boulder City was alerted recently to supply communications for the Forest Service when a bad fire broke out in the Mt. Charleston area. BTJ now has another rig for 7- and 3.5-Mc. c.w. QYK and MSG are working 235 Mc. as well as 3660 kc. 6TYQ now is 7LZJ.

KWA is knocking out the DX on 14-Mc. c.w. KLL is back on 385 Mc. KHU has another new 14-Mc. transmitter. Traffic: W7JU 22, CX 20, BVZ 12, BTJ 7, OPP 4, QYK 2.

SANTA CLARA VALLEY—SCM, Roy E. Pinkham, W6BP—Asst. SCM, Geoffrey Almy, 6TBE, RM: CIS, PAM: QLP. KMM has moved to new QTH at Rt. 2, Ex-UPV has a Crystal Oscillator and a noise blinder. KG and BEH are using multi-wire-driven elements in their rotary 28-Mc. beams and both report good results with wide-band tuning. LCF is putting up HP arrays after talking to GD. 6TW has 3.5 Mc half-wave antenna up and is building monoband units. HC has new SX-28 receiver. Harry will be on with a full jug and will work on 14 Mc. RFP is trying 7 Mc. for traffic. He has added two new countries to his list. WNT reports a total of 45 contacts in last CD Party for a score of 240,402. KH6DD was a visitor at W7N's shack. PBV is back on 7 and 14 Mc. with 400 watts. ZZ has a total of 50 countries with 69 confirmed to date. Mile's wants to know how to raise W50A. The W7FRU rig is ready for that DX. UPV is installing ART-13 u.h.f.: OJU, California - God's Wonderland, with the breeze of the Pacific Ocean peacefully rolling onto glistening white sands; the land of a million wonders -- snow-capped peaks, gleaming white glaciers, rugged precipices, beautiful lakes set in the heart of pine forests. Dashing waters of our beautiful streams and the delicate beauties of our national parks, makes this a never-to-be-forgotten hams' paradise. It is summertime; I can tell by the large lack of reports this month. Remember, to hold ArrLl appointments it is necessary to send in reports each month without fail. PB has his 14-Mc. beam up once again. IKQ is getting his new 28-Mc. beam ready for that DX. UPV is installing ART-13 in his ex-WP rebuiding house. OPY is playing with multivibes in his ex-6TU element on his beam, RM likes his old Johnson Q beam and claims it compares in some respects with his rhombic. UZ is thinking of buying an HQ-129X receiver. O8Y is back on the air after a long layoff trying out 14-Mc. "phone. BE reports that the Richmond Radio Club is hunting for a new meeting place. CDA is QRL. YDL was away on vacation. RRH has converted Motores with 20 watts mobile using a C-Q-Set converter and noise silencer. TT has 1322 postwar countries, TI 113, PB 106, BUX 106, RM and UZ 106, SB gave an 8B talk on antennas to the Oakland Radio Club at a recent meeting. EE is waiting for his new transmitter. EX has some new antenna up, SARRO enjoys phone talk at the last meeting. Members of the Northern California DX Club, Inc., can always be found at one time or another chasing that rare DX. That hard-to-get zone Z6 was worked by TT, TJ, PB, and MBB on c.w. and TT, BUU, and IKQ on "phone. The Mission Trail Net (Continued on page 90)
HERE is a personal communications unit that will greatly facilitate the work of surveyors, construction men, police officers, fire fighters, forest rangers, and others... the new Motorola “FM Handie-Talkie.”

Smaller than an 8½ x 11 loose-leaf notebook, and weighing only 8½ lbs., this new complete FM transmitter-receiver, strapped to the back or carried by hand, permits two-way conversations in excess of 2 miles between units, depending on terrain. The range is greatly increased when working with mobile units, or fixed stations of an existing 25-44 mc. system.

The new Motorola “FM Handie-Talkie” is crystal-controlled to operate at any fixed frequency in the 25-44 mc. band and utilizes a full-fledged superheterodyne circuit. Its small size, weight, and high sensitivity have been attained, in part, by the use of 16 Raytheon* Subminiature Tubes.


Why Motorola and other manufacturers use RAYTHEON Subminiature Tubes...

1. MORE COMPACT AND SALEABLE PRODUCT can be produced, due to flat shape of tubes and reduced size of battery which results from low filament drain.

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3. READILY AVAILABLE — OVER 30 TYPES — standard throughout the world.

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Write for data sheets on Raytheon Subminiature Tubes, including those used in the Motorola “Handie-Talkie.”

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ran through the summer months in full swing, according to ZM, vice-pres. Don't forget, when you say you will QSL please do so, as the other station has a right to expect a card as promised. Traffic: W6CRF 14, TI 8, YDI 8, EJA 6.

SACRAMENTO VALLEY — SCM, John R. Kinney, W6NAIC — Asst SCM, R. G. Martin, 6ZF. SEC: KME, RM: REB, OES: PTV, OO: GWJ and ZF. The Golden Empire Radio Club of Chico and surrounding territory elected new officers with GUV, pres., WYX, vice-pres., WXX, reg. secre., and RHC, secy.-treas. Plans are under way for a bigger and better hamfest in 1948. GHG is on the air temporarily. TKE has two new 50-foot masts and kw. RHC has abandoned its 25-Mc. phone for 3.5-Mc. c.w. and 7-Mc. phone. WVR has developed into a red hot contest station, and spends most of his operating time on 14-1Mc. c.w. ART is on vacation. IYR is doing lots of brass pounding. SR is well pleased with his new location and has been working some nice DX lately. He is using 813 final with input of 300 watts and spends most of his operating time on 14-Mc. c.w. ART is constructing a 14-Mc. rotary beam and toward the end of the month he is planning to put it up. The antenna is in the process of being installed and the lampens and control for DX. His report shows 80 per cent operating time on DX — good hunting. Bill also is on Pioneer Net nightly at 7 P.M., 3725 kc. LY is working just hard-to-get DX stations with ease on that 14-Mc. vertical. His antenna, BIP has been replaced at the hospital and is getting around nicely. JWF is handling Mission Trail Net traffic on 3864 kc. Traffic: W6JWF 62, RBQ 23, MFF 7, EY 6.

SAN FRANCISCO — SCM, Samuel C. Van Liew, W6NLG — Asst SCM, Joseph Horvath, 6GPF. RM: RBQ. SEC: PTS, CEC: SRT, KNZ. MHF is building 814 7-Mc. rig. EBY has worked 105 postwar countries. WUJ is busy Baying for P.A.A. GMF (c.w./c.w.) and 7 Mc. is busy getting "bugs" out of his pig. JRIP writes from Minneapolis that he is operating fixed portable from that location on 28 Mc. He is installing a new three-element Workshop beam and is eagerly anticipating working a lot of DX during the winter months. Art returned to Minneapolis from the Air R.O.T.C. summer camp at Chanute Field, III. EY 7 is suffering with bad power leak. He has been rebuilding and cleaning up shack. JGW, member and chief radio man of the Eureka Naval Reserve, writes that Naval Reserve is going strong there. He operates on 7164 and 3570 kc. The Humboldt Amateur Radio Club of Eureka holds meetings the first and third Fridays of each month at 7:30 p.m. with code class at 7 p.m. NAON has been on vacation. JYR is doing lots of brass pounding. SR is well pleased with his new location and has been working some nice DX lately. He is using 813 final with input of 300 watts and spends most of his operating time on 14-Mc. c.w. ART is constructing a 14-Mc. rotary beam and toward the end of the month he is planning to put it up. The antenna is in the process of being installed and the lampens and control for DX. His report shows 80 per cent operating time on DX — good hunting. Bill also is on Pioneer Net nightly at 7 P.M., 3725 kc. LY is working just hard-to-get DX stations with ease on that 14-Mc. vertical. His antenna, BIP has been replaced at the hospital and is getting around nicely. JWF is handling Mission Trail Net traffic on 3864 kc. Traffic: W6JWF 62, RBQ 23, MFF 7, EY 6.

14-MC. ICH is QRT for improvements. Get your reports 15 zones and 21 countries worked on 14-Mc. c.w. EBY has worked 105 postwar countries. OJW has replaced 3.5Ts with 75Ts and now has 42 states to his WAS. W6JEK is there and is getting around nicely. JWF is handling Mission Trail Net traffic on 3864 kc. Traffic: W6JWF 62, RBQ 23, MFF 7, EY 6.

ROANOKE DIVISION

NORTH CAROLINA — SCM, W. J. Worman, W4CYB — The Key and Mike Club in Winston played host to the W. S. Amateur Radio Club with a good meeting, well attended by both gangs. The idea of refreshments and a door prize will add to attendance at meetings. BYA has been tutoring a new crop of hams between activity on 50 Mc. and 28-Mc. and has just returned from that location on 28 Mc. He is installing a new three-element Workshop beam and is eagerly anticipating working a lot of DX during the winter months. Art also is on Pioneer Net nightly at 7 P.M., 3725 kc. LY is working just hard-to-get DX stations with ease on that 14-Mc. vertical. His antenna, BIP has been replaced at the hospital and is getting around nicely. JWF is handling Mission Trail Net traffic on 3864 kc. Traffic: W6JWF 62, RBQ 23, MFF 7, EY 6.

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(Continued on page 98)
STN CONDENSER
This type has a maximum capacity of 18 mmf (300 v.). It is supplied with two stand-off insulators.

NC-75
For 75T, 806, 811, 812 and similar tubes.

NC-500
For WE-251, 450TH, 450TL, 750TL and similar tubes.

NC-150
These larger disk-type neutralizing condensers are for the higher powered tubes, such as HK354, RK36, 300T, 852, etc. Disks are aluminum, insulation steatite.

NC-800A
The NC-800A disk-type neutralizing condenser is used with the RCA-800, 35T, HK-54 and similar tubes. It is equipped with a clamp to lock its setting. The chart below gives capacity and air gap for different settings.

NC-600
For neutralizing low power beam tubes requiring from .5 to 4 mmf and 1500 maximum total volts, such as the 6L6. The NC-600U is supplied with a GS-10 standoff insulator screwed on one end, which may be removed for pi-foil mounting.

R-152 CHOKE
For the 80 and 160 meter bands. Inductance 1 mh, DC resistance 10 ohms, maximum DC 600 ma. Coils universal wound on steatite core.

R-154 CHOKE
For the 20, 40, and 80 meter bands. Inductance 4 mh, DC resistance 6 ohms, maximum DC 600 ma. Coils universal wound on steatite core. The R-154U does not have the third mounting foot and the small insulator, but is otherwise the same as the R-154.

R-175 CHOKE
Unlike conventional chokes, the reactance of the R-175 is high throughout the 10 and 20 meter bands as well as the 40, 80 and 160 meter bands. Inductance 225 microhenries, distributed capacity 0.6 mmf, DC resistance 6 ohms, maximum DC 800 ma., voltage breakdown to base 12,500 volts.

For the 80 and 160 meter bands. Inductance 4 mh, DC resistance 6 ohms, maximum DC 600 ma. Coils universal wound on steatite core.

National parts have long been famous among hams for the quality of their workmanship and their ruggedness of construction.

These proven parts have been particularly tailored to the needs of hams throughout the world — and embody the traditional quality of National products.

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The new Amphenol All-Wave Antenna out-gains the best double doublet. It assures interference-free reception of 52 ohm coaxial transmission line reduces interference to the minimum.

For standard broadcast and short wave. A special wave filter channels energy to receiver input. A Jeadin • The All-Wave Antenna combines a horizontally polarized FM dipole with a 65-foot copper wire antenna for standard broadcast and short wave. A special wave filter channels energy to receiver input. A lead-in of 52 ohm coaxial transmission line reduces interference to the minimum.

The All-Wave Antenna is individually packaged for shipping.

- In actual tests, over the 500 kc-108 mc frequency range, the new Amphenol All-Wave Antenna out-gains the best double doublet. It assures interference-free reception, even in areas of low signal strength.

- The All-Wave Antenna combines a horizontally polarized FM dipole with a 65-foot copper wire antenna for standard broadcast and short wave. A special wave filter channels energy to receiver input. A lead-in of 52 ohm coaxial transmission line reduces interference to the minimum.

- The All-Wave Antenna is individually packaged for unit sale with installation instructions, all hardware (except guy wires), and a guy wire clamp.

- Amphenol dipoles, and reflector arrays, build up ample gain for finest reception of FM. Efficient, even in areas of low signal strength, they virtually eliminate multi-path reception. Mounting bracket and masthead (of reflector types) swivel, thus allowing antenna plane to be tilted to optimum angle. Kit contains everything for a complete 88-108 mc band antenna, except guy wires, a guy wire clamp.

- Amphenol Dipole Antennas are available now thru your jobber, or get prices and technical data by writing direct.

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phone, QRM and all. LAH is upping his power from 70 to a couple of hundred watts. At odd times DCE can be found on 28 Mc, now that his house is painted. Wm. L. Starke, 744 8th St., N.W., Washington, D. C., wants to contact some hams in North Wilkesboro. We welcome to North Carolina, 4MFK, ex-2PYM, over Durham way, who is engineer at WTK. We want to repeat that the gang up in Asheville really put on a hamfest. Don't forget that the Charlotte gang is planning a super-duper for the 1st Sunday in October. Please send in something to include in this column. One guy stated that we should get on c.w. if we want to obtain some news. Better informed members of the gang know that we have been operating c.w. exclusively for almost two years. any other suggestions?

SOUTH CAROLINA— SCM. Ted Ferguson, W4BQ-A, ANG— DPN reports that he is active on 3.86-Mc. phone. FM is changing his QTH to Orangeburg. IJF spends his time on 7-Mc. South Carolina and Crackers Nets and also reports that he has talked to his brother in Japan several times. We welcome back to this section SEDQ, formerly 4EDQ, and 4DQY. There is always room for fellows of their quality in this section. BPD reports that he has acquired a 150-zero farm and has a new array of sky wires from rombrellas to ten-element Stetha Curtain. LJI keeps them busy on 14- and 7-Mc. c.w. The new boys, MAO, MAP, MAQ, MAB, and MAH, better known as the Queens, are busy building transmitters that look FB to us. A nice bunch of fellows, these "young squirts." Traffic: W4AZT 16, BPD 7.

VIRGINIA— SCM, Walter B. Bullington, W4JK—EOJ has added "Nawth" to Boston, Pa., as 380P once more, as chief engineer of b.e. station there. Best of luck, Charlie, from the gang. KFT is now OW in Arlington and says he had a lot of fun in the CD Party, BZE is rebuilding, planning, and dreaming. He made 78,000 points in the last CD Party with 30 watts in 8 hours operating. Nice going, Tom, "Ev," IUE, now is 41A in Arlington and looks forward to traffic-handling and nets this fall. KFT is now ORS.

Carolina DX, NUN is a new ticket in Alexander. He has a Super-Pro receiver and a BC-510E transmitter. Gl<;ad to have you with us, OM, FJ, CYW, IWW, KVP, and even JHK are on 144 Mc, mostly with SCR-522s. How about some dope to put in the column, fellows? Traffic: W4NLN 4, BZE 1.

WEST VIRGINIA— SCM, Donald B. Morris, W4JM— GBF, RM and NCS for the West Virginia Net, with CB8, ANCS, report everything ready for a banner season. The net operates Monday through Friday at 7:30 P.M. on 3770 kc. MOL and VPO are shaping up a 75-meter 'phone box and would like to hear from you 75-meter 'phone hams.

The net had a very successful outing on the 3770 kc. band. Everyone has fun and plans to continue in the future.


ROCKY MOUNTAIN DIVISION

COLORADO— SCM, Glen Bond, WQXY— There was no Colorado report for June as your SCM was out of the State on vacation. Had a fine time visiting in Wyoming and worked lots of stations with the mobile 28-Mc. rig. The Western Slope Radio Club has a war surplus SCR-284 rig for field tests and emergency use. PXZ also has one of the rigs and says it is FB. Here is what goes on in the Western Slope: FOJ has finished his new shack and will be on the air soon; GK and VZ7 are repairing radios; PXZ is an engineer at KFXJ and hopes to be on the air soon with a new type rig; GMB is busy with his torch job; EDF is on 14 Mc., with a new SCR-284; F-40 and MGX, 250 Mc., are really sure, and CXW and Major ZKB promoted an amateur radio hamfest at Lowery Field Aug. 1st and 2nd. Emergency communications in cooperation with the armed forces was the main (Continued on page 94)
available for your amateur rig, a completely packed oscillator unit designed and engineered to utilize the many advantages of crystal control on 2-6-10-11 meters. With the CCO-2A output is obtained directly on 6-10-11 meters; operation on 2 meters requires only a tripler stage.

The CCO-2A is the ideal oscillator for an efficient 4-band transmitter such as the Millen 90810*; or as a basic unit in new construction. Features include: adequate drive for h.f. medium power tubes, single dial tuning for maximum output, no self-oscillation under any operating conditions. Peak performance of the CCO-2A is obtainable only when used with Bliley type AX2 plated crystals for 10-11 meters and the new Bliley AX3 plated crystals which multiply to the 2-6 meter bands. See table for relation between crystal frequency and output.

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<th>CCO-2A OUTPUT</th>
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<tr>
<td>AX2</td>
<td>25-27 Mc</td>
<td>50-54 Mc</td>
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<td>AX2</td>
<td>24-24.6 Mc</td>
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<td>AX2</td>
<td>14-14.85 Mc</td>
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Type AX2 units supplied + 30 Kc of specified frequency
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The Bliley CCO-2A is employed as a built-in component of the Millen 90810 high frequency transmitter.
4. Multi-impedance Switch for Low, Medium, or High Impedance.
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SOUTHEASTERN DIVISION

LABANIA — SCJ, Lawrence J. Smyth, W4GBY—From Birmingham: The club is building a new rig with 45 watts. DTD is on the air now with a 400-watt rig using 1,000 watts off T-55s on 7 Mc, and also a new NC-173. DXB has a rig on 7 Mc, using 500 watts input to an 810 in the final and two crystals, with front panel controls. Q5F, of Greensboro, is building a new final using 813s. LZY is running 160 watts to a TS-40. Q5 is total is about 550 including 100 DX from May 16 to July 31. Selma's 52X is portable 5 at Monticello, Tenn., running six watts.

EASTERN FLORIDA—Acting SCM, W. E. MacArthur, W4BY—SEC: QQ, RJ: BNR and BYF, PAM: QQ. DOO sent a photo of a good looking new final. That Palmer is now running on kerosene and furnishes all power requirements. QJY holds regular schedules on 1765 kc, with PL and IKI and is making a lot of the boys and their families happy by originating traffic from the local VA hospital. Also, with NN and AGB, he is starting code classes for the local aspirants. You are doing a fine job, Al, and we are all proud of you. RT, FPK, and LVV are doing some remarkable DXing on 14-Mc. c.w. ST also sounds good nearby on that 14,140 kc spot with the midnight broadcast while IKI is bearing the brunt of the 7-Mc. OBS service on 7170 kc, at 8:30 p.m. BXL took a shot at the last CQ Contest and had some good looking runs. AEC holds regular schedules in Spanish on 28 Mc. CQR is putting in his last on traffic for the winter, now puts in the same percentage on DX. LZX builds ICIC and says that GIC has a new SCR-522, Bob is polishing the rig for that winter traffic load. JAV schedules COFL and COZRA on 7075 kc, at 5-6 p.m. Also puts out bulletins of international interest in Spanish on 28 Mc. CQR has visited him and then went to Tampa to say hello to IVD. FWZ says that the weather is too hot to do anything but he managed to run up 50,050 points in 8 hours in the last CQ Party. I went to thank all of the Eastern Florida gurus for having helped me over the rough spots for the past four months. I am grateful to you for the reports you sent in because they made my temporary job so much easier. Let's all get behind our new SCM, and give him every bit of cooperation we can. We are all with you, Johnny, and wish you the very best.

JAV 3.

WESTERN FLORIDA—SCM, Luther M. Holt, W4DAO—JC is a proud papa. MS erected a 40-ft. tower. EQR and CNK work 50 Mc. LT has kw. on 3,856-Mc. phone. LCL moved to Warrington, BRT QS6Y to 26-Mc. phone. DXZ is building 500-watt phone. YON works 22-Mc. DX. KA6 moved to Tampa. KIR is building high-power 28-Mc. phone. AXP bought a new receiver and works Europeans. BFD built f.m. transmitter. HFQ uses f.s.c. power on 7 Mc. JPA is building a kw. rig. KFP and QK have new rotary beam. LAX is on 7 Mc. at Chipley.

(Continued on page 98)
1. NEW 2-WATT MOLDED COMPOSITION POTENTIOMETER

Now—a 2-watt unit with a good margin of safety, for industrial use. The resistance element is a thick, solid-molded ring, heat treated under pressure—not a film. It is unaffected by heat, cold, moisture, or length of service. Sold only through Ohmite jobbers.

2. NEW ± 5% TOLERANCE LITTLE DEVIL COMPOSITION RESISTORS

These popular resistors are now available in ½ and 1-watt sizes in tolerances of ±5%, in addition to the standard ±10%. The resistance and wattage are clearly marked on every unit. Sold only through Ohmite jobbers.

3. NEW 5-WATT BROWN DEVIL WIRE-WOUND RESISTORS

A rugged, new Ohmite wire-wound, vitreous-enameded resistor of unusual compactness. Easily mounted by its ¼-inch tinned copper-wire leads. Tolerance ±10%.

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A compact, low-cost unit used in a simple potentiometer circuit as a transmitting element to indicate, remotely, the position of a rotary beam antenna, wind vane, or other rotating device. Used with a six-volt battery and a simple 0-1 milliammeter.

5. NEW R. F. PLATE CHOKE S

These tiny, high-frequency chokes are single-layer wound on low power factor bakelite cores, covered with a moisture-proof coating. Six stock sizes for all frequencies from 7 mc to 520 mc. Two lowest frequency chokes rated 600 ma; all others 1000 ma.

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Illustrated Bulletin on Request

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Mc. DX, EQZ and UW are busy running W8SR, BCC and HIZ have mobile rigs. GXRN bought an HT-9, 8AA/A operates a radio store in Pensacola. MENplus trouble loading antenna. The Pensacola Amateur Radio Club meets the 2nd Friday of each month. BRK built an FB plumber's delight rotary. JNP keeps busy with new job as club secretary. Traffic: W4AXP 6.

GEORGIA — SCM, Thomas M. Moss, W4HYW — GQR sends along a newspaper clipping outlining emergency plan for Barrow County. We now have public recognition for emergency service in several counties. We still can use ECs for many counties. BCR reports new three-element beam and a visit from CT2AB. YC is moving to Vocational School. JD and BYK are new DJs. Class 1 DW and 8U7S turned to Jonesboro and wants to know where those huhf boys are hiding. He has some nice rigs on, but huhf activity has been practically nil except for OK in Hapeville. DCK, PWA, JU, LJN, LAM, K 4, and HYW are a few of the latest additions to the Eastern Air Lines gang in Atlanta. GDD is with Eastern in Columbus. The boys have a net known as the "Silverliner" Net on 7220 kc. The SCM finally got down on 7 Me. and should also be on 3.5 Mc. by the time you read this. Let's hear from all those with ambitions for traffic nets during the coming winter season. We still are short of nets. The Rebel, CAA, and ISAL Nets are our only traffic outlets. However, the Cracker Emergency Net stations are available for traffic on their Sunday periods. Traffic: W4BCR 23, HYW 5, JDR 5, BRU 1.

WEST INDIES — Acting SCM, Everett Mauer, KP4KD — AM has consolidated equipment into convenient compact unit. He worked 8U, LU, VPQ, and K6QG on 28 Mc. during the month. BE is active and working WS. DV schedules W3EIV and handles traffic. He worked 11, FY7, O2Z, PA4, 284M, D4, FS, and a flock of Gs. Look for him on 14068 kc when you have QTC for KPM. BJ's bleeder meter plate went up in smoke. NY4CM radios in his report and reports nice DX score. KD still calls "CQ DX NO W." The San Juan gang had an FB get-together at CN's shack at which CN, BJ, CV, CU, AC, DQ, OC, EC, BY, and KD were present. CU worked ES in Pozone on 28 Mc., phone on reflected skip, JA and KD received CAROA member pins presented by Mr. and Mrs. YRESRI, EX, EZ, FC, and EF are new calls. With 28 Mc. down and out with the summer slumber activity seems to have hit rock bottom in the section. Traffic: KP4DV 35, NY4CM 17.

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, Ben W. Osterkink, W6QWZ — Acting SCM, Vincent J. Haggerty, D5X, Santa Barbara. The Aset. SCM is managing the activities in his area so address your inquiries to him if you are in that area. I hear from RUU that some of the AMX Club members are installing transmitters in one of those yellow life rafts to use when they go out fishing. I'm guessing this is one of those things he fell out, clothes and all. The Los Angeles section need more mobile gear for the various Emergency Corps groups and with all those PE-103 generators lying around you wouldn't have to worry. If you would like to have a time set up, let your local Emergency Coordinator know of your availability. New Emergency Coordinator for Inglewood is HAW, whose address is 1327 Centinella. EC for Santa Barbara is KZA, whose QTH is 1417 Mountain Ave. There's still a need for more Emergency Coordinators in many districts. How about the clubs in those districts that don't have an EC picking one out and letting me know about it? W4VY is on 14 Mc. with a pair of 807s. UC6, RPH, EOZ, GI, SEY, UZL, WEX, 289C, ZUK, Z6M, UAH, YDQ, and HDY were some of the stations that operated the San Bernardino Club equipment on Field Day. Their score was 7955. VDE and VIX were on the south end of LA and worked DX record on 430 Mc. and worked ZBN 105 miles away. VGY is back on 14-Mc. c.w., as is SQO. IOX is going strong on 3.5 Mc. with the traffic nets. CMN has a net on 3015 kc. and would like to have some more outlets in some of our around Los Angeles. How about several of you fellows on 8.5 Mc. giving him a call? AM handled traffic for the Los Angeles to Honolulu Yacht Race. VYJ schedules KL7, VAG made 71,440 points in the CD Party. MFB is going on 430 Mc. DUC received QSL from China with 804 dollars 

(Continued on page 100)
EXPERIMENTS now being conducted with narrow band frequency modulation, by many Amateurs, indicate the need for a microphone with characteristics possessed by Astatic's Model D-104 for maximum intelligibility. High output, as obtained with the D-104 Crystal Microphone, long a favorite with Hams, aids materially in simplifying amplifier construction.
ACTIVE DEVELOPMENT of loudspeakers moved forward after World War I, when Western Electric produced the 196W, employing a non-magnetic diaphragm driven by an armature. First used in the Victory Loan campaign of 1919, the 196W took part in the national political conventions of 1920, the presidential inauguration of 1921, and the burial of the Unknown Soldier later the same year. Success of these pioneer public address systems rested not only on loudspeakers but also on high quality microphones and amplifiers—all Western Electric developments.

Continual progress in the intervening years has kept pace with the development in Bell Telephone Laboratories of telephone transmitters and receivers for the Bell System. Fundamental to both loudspeakers and telephones have been the Laboratories’ pioneering studies in sound, speech, hearing and the theory of vibrating systems.

Sound distribution systems, sound motion pictures and radio broadcasting—all have benefited from the teamwork which has done so much to make possible today’s efficient, powerful, wide-range loudspeakers.

1919. New York’s Victory Loan celebration pioneered the art of reaching tremendous audiences. Western Electric speakers made possible this mass demonstration of the new art of sound distribution.

1924. Non-directional, small in size, yet extremely wide-range for its day, the 540 cone speaker designed for broadcasting was so popular for home receivers that it became a symbol of early radio.

1926. The 555 Receiver, with its large wooden horn, contributed to the success of sound motion pictures. From this single-unit loudspeaker grew the high quality wide-range theatre speaker systems of today.

1937. The introduction of the 750 series of loudspeakers provided the first really wide-range direct radiator. With the proper mounting, this speaker covers a frequency band from 80 to 10,000 cycles. Still a popular speaker.
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728B 12" direct radiator, 30 watts continuous capacity. Frequency response 60 to 10,000 cps.

757A two unit system, using 728B plus separate high frequency speaker. Frequency response 60 to 15,000 cps.

756A 10" direct radiator, power handling capacity 20 watts. Frequency response 65 to 10,000 cps.

755A 8" direct radiator, 8 watts capacity. Frequency response 70 to 13,000 cps.

TODAY Western Electric offers a complete line of wide-range direct radiators, high frequency speakers, horns and multi-unit systems all designed by Bell Telephone Laboratories. There's one to meet your requirements for highest quality sound whether you want an eight inch, eight watt speaker, or a giant theatre-type system with 120 watts capacity.

No matter which you select, you get the benefit of a broad experience which long antedates the public address art.

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1943. Battle announce speaker designed for the United States Navy hit a new high in intelligibility and power. Used on all types of Navy ships, they passed commands to fighting men over the noise of battle.
A perfect ECO Exciter for any amateur transmitter. Reactance Modulator for narrow band FM. Output on 80, 40, 20 and 10 meters. Visual indication of frequency deviation. Self-contained, regulated power supply. Provision for CW keying. (FM permitted at present on certain portions of all Amateur phone bands.)

Amateur net price: $79.50

Two ranges: 27 to 30 megacycles and 50 to 54 megacycles. Embodies a 6AK5 high gain RF amplifier stage, a 6KD1 mixer, and a 6C4 stable oscillator. Self-contained, regulated power supply. Provides sharp tuning and separation between stations. Low internal noise. Imagefree reception. Smooth tuning, directly calibrated dial.

Amateur net price, complete: $79.50

(Continued from page 80)

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WEST GULF DIVISION

NORTHERN TEXAS - SCM, N. C. Settle, W5DAS/MNL - (JA is guest reporter this month. Well, fellows, the good old Northern Texas section is getting emergency minded. We now have more EC members than any other section. Activity is running pretty high although summer Wx seems to have brought on a lot of moving around and hunting for DX. I had a visit with KF5 at Cross Plains. He is active on 7- and 3.5-Mc. e.w., HZK, at Bal- langer, has new HQ-129X and is rebuilding transmitter. L1O has moved from Cogas, Okla., to Perryton, DN is now on 50- and 7-Mc. with 808A Mc., report is that he bought a home. JDZ has finally gotten his Class A ticket and is working everybody. Other hams in Coleman are CZR, 28- and 3.56-Mc. 'phone; LMY, 7- and 3.5-Mc. e.w.; LCH, 7- and 14-Mc. e.w.; AT, 7- and 3.5-Mc. e.w.; LFO, 7 and 28 Mc., HPG, HSE, and AKU are active in Brownwood. HOF is active in Gatesville and is trying hard to get contacts on 144 Mc. with ECE and the Dallas-Ft. Worth bunch, where activity on 144 Mc. seems to be high. Lubbock has a large bunch of active hams. I don't have a complete list but here are some of them: KTX, JQD, EWB, and CLB. EGJ and YU0 are active in Gatesville and is trying hard to get contacts on 144 Mc. with ECE and the Dallas-Ft. Worth bunch, where activity on 144 Mc. seems to be high. Lubbock has a large bunch of active hams. I don't have a complete list but here are some of them: KTX, JQD, EWB, and CLB. EGJ and YU0 are active in Gatesville and is trying hard to get contacts on 144 Mc. with ECE and the Dallas-Ft. Worth bunch, where activity on 144 Mc. seems to be high. Lubbock has a large bunch of active hams. I don't have a complete list but here are some of them: KTX, JQD, EWB, and CLB. EGJ and YU0 are active in Gatesville and is trying hard to get contacts on 144 Mc. with ECE and the Dallas-Ft. Worth bunch, where activity on 144 Mc. seems to be high. Lubbock has a large bunch of active hams. 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WHAT metal tube for your intermediate-frequency system? To answer that question properly, a distinction must be made between narrow and medium-band-width systems.

The former, as you know, is the type used in AM communication or home receivers, and the latter in FM receivers. (FM may not interest you now, but the time is coming when it will play an important part in ham activities.)

Selecting the right tube for either type of IF system, narrow or medium-band-width, is based on simple circuit logic. In narrow-band IF work we want as much gain as possible, but using high-gm tubes for that purpose is apt to cause oscillation difficulties. Low-gm tubes will "stay put"—also, will provide a greater measure of stability, which is important. (Observe that there is, after all, a definite use for low-gm tubes!)

We nominate Type 6SK7, with two runners-up as alternate candidates—the 6SS7, which is the same tube with a low-current heater; and the 6SF7, which is a 6SK7 with a diode section added for use as the second detector. In practice, as many as three 6SK7 metal tubes may be applied in cascade with no oscillation troubles.

For medium-band-width work, lower load impedances are necessary to achieve band widths of some 150 kilocycles. This means less gain is produced; so, as an offsetting factor, high-gain (high-gm) tubes are called for. In medium-band-width service high-gm tubes will not cause oscillations, since grid and plate loading act as deterrents.

Two metal tubes are logical selections—6SG7 and 6AC7. The latter, however, has much the higher gm and takes precedence over the 6SG7 where the greatest possible gain is desired.

Generally when comparing tube types for IF work, it is helpful to apply a figure of merit. The narrow-band-width f. m. of a tube is divided by its grid-plate capacitance. The medium-band-width f. m. of a tube is the gm divided by the sum of input capacitance and output capacitance.

The higher the quotient, the better that tube is for the job. A brief table of characteristics for different tube types is given here-with. In conclusion: if there are any further facts you would like to have on metal receiving tubes for IF work, by all means write me.

Lighthouse Larry Comments:

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<th>Tube</th>
<th>Gm</th>
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<th>Output</th>
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OKLAHOMA—SCM, Bert Weidner, W5HXI—Asst.
SCM, George Bird, S5HC. SEC: AHT, Oklahoma c.w. Net, OLZ, has operated all summer six nights a week. AHT is co-author of the monthly OLZ Bulletin, that is quite a sheet. The Stillwater Club held a Bar-B-Q Sept. 21st at the Fairgrounds. EGO has plans for a new home with 25-meter ari-radiator. GPT/6, former Oklahoma SCM, reported into OLZ from Minneapolis. SCRl now is on the air at Pawhuska with SHND. AHT reports ECs have been appointed for six counties of the seventy-seven in the section. Fourteen members of the Bartlesville club and their families attended a birthday party for GOL. Please contact AHT for County Emergency Coordinator appointments. There should be at least one in each county. Traffic: (June) W5COG 36, GVS 27, AHT 40, GCO 11, TOW 6, FMF 6, ADC 5, (July) W5AHT 36, GYS 31, IOG 18, FMF 17, IOW 9.

SOUTHERN TEXAS—Ted Chastain, W5HIF—SEC: HQR, PAM: EYV. There is a rumor making the rounds that STEN is a closed net. This is not true—anyone who will participate on a regular basis, STEN also would like to have other nets in this section join with it in furthering the cause of emergency service. Information may be obtained from Net Control Officer, Charles Burford, FNY, San Antonio. HJZ is an endorser and OBS, and reports the San Antonio Radio Club has a WAS and DX Contest for members in process. IVU has new rig, RE-432 final-807 modulator. LCR received Class A license. EYV has 10-kw. transmitter, with new and antenna on hillside. LUN in EC at Freeport and has new 40-watt emergency portable, DDL, Galveston, is on 144 Mc. Houston's 144-Mc. emergency net is working hard to prove the value of this band for emergency service. ACL in new OBS, M1L is new EC for Orange. PFC is EC at Willis. EWZ worked UA9KKA. LWV reports from El Paso that NBC and NGW are new calls on 30 Mc. The El Paso Radio Club elected the following new officers: EYV, pres.; MFW, 1st Vice-Admiral; CDF, secy. Add CDF, P.O. Box 3113. The Corpus Christi 27-Mc. emergency net drills on alternate Thursdays at 8 P.M. Recently when a tropical storm was threatening the Gulf Coast, STEN stood by for those in the alert with mobile transmitters located at strategic points. HQR has new HT-9. HIF has NC-173 and VHF-125. DAQ is new OBS. CCD and AQK are having a private DX feud. This section could use a few more Official Observers. How about some of the VHF gang making application for appointment as Official Experimental Station, STEN advises that a new Zone Four is in the process of formation. All CD appointees should check their certificates and send them in for endorsement if appointments have expired. EUO has moved back to Corpus Christi. EWZ works 7Mc. only. Traffic: W5MN 134, EYV 12, ACL 10, PFC 9, CCD 8, MKL 6.

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**ONTARIO DIVISION**

ONTARIO - SCM, David S. Hutchinson, VESDU — TC is on 28 and 14 Mc. AMB has new wide-spaced beam on 28 Mc. AQO is pounding out on 28 Mc. ATM has fine wide-spaced beam. MT has n.f.m. on 29.5 Mc. AZI works the Porto Ricans regularly, IT pulls them in with 39 watts. AIW has four-element beam and cathode modulation. AIW AGM is trying new beam. XY, with Triplex and 813s, works around. AHA and ABP are doing FB on 14 Mc. GM works all bands and has five b.c. f.m. sets. LL works the world on 14 Mc. BBU will soon have new beam with p.p. 813s. The infinite rag-chewers, BEO and NO, are building the XYL at home. BQF is working plenty of QSOs with his 807s. PA is working 14-Mc. phone. PH has moved into the bush with a Command Set on 7 and 3.5 Mc. BBQ is on 144 Mc. BHU replaced 816 with 807. BJE is building new beam. TZ is working 7 Mc. exclusively. WI has a vertical and 16 kw. on all bands, c.w. and "phone. AIII and ANJ are using pair of 807s. AZN is tunning BC-191 apart to convert for 813s. CAT, the KLARL station, is on every second Thursday evening. HY is reworking. TADT/2 is very active on 7 and 14 Mc. A01 is new operator on 3.5 and 7 Mc. in Halleybury. BQJ is a new transmitter. GH has 804R and is revamping the transmitter. GB and BBI are experimenting on 144 Mc. ADC has Bendix TA12G rig working on all bands through 28 Mc. AJO, AE0 and AJP are working DX in the wee hours. DU is converting Bendix TA12G. BBQ is our first ORS. Traffic: VE3ATR 20, AWJ T0, BGL 10, HP 9, BMG 4, CP 2.

**QUEBEC DIVISION**

QUEBEC — Acting SCM, Gordon A. Lynn, VE2GL — RE reports 97 VK contacts; BE and BK schedule VK3HF daily; and CA, SA, AX, BE, BG, and UJ are among the early morning gang on 14-Mc. phone. HH is rebuilding. ZZ, on 3.5-Mc. "phone from summer location, reports poor results with his flea power. UC and TY now have unrestricted 'phone and are trying 3.85 and 14 Mc. CO is doing FB on 3.5-Mc. c.w. with 25 watts and is giving 7 Mc. a try. OR has been hearing quite a few Ws on 30 Mc. but no luck working them yet. OG and UW are doing OBS work on 28 Mc. GT is on 50 Mc. and has worked between 40 and 50 Ws. TN has worked 16 states, W2, 4, 9, and 8 on 50 Mc. and has heard W5, 6, and 7 also. New Canadian regulations appear to have chased some of the boys who were using modulated oscillator. NR and BB are gratified to see results of their code practice transmissions. George Pendlebury has passed exams and is awaiting call. NR has new NC-173. RP moved to Vancouver and has converted Bendix TA12G. DJ is on 14-Mc. "phone with 250 watts to pair of 812s with 811 modulators. JJ reports poor success on 14 Mc., particularly to the east. MG, ZB, ZL, ZF, IQ, and AAD are new calls heard. Ex-VIC2LE now is G3BLT and is heard on 14 Mc. JJ, XY, and RD worked W2SY just below the border on 29 Mc. Please send reports.

(Continued on page 109)
FOR SALE—IQ-12X receiver complete with speaker used only 3 months $125; also crystal-line signal generator $25. O. C. Kuberski, W9OSV, Rt. 2, Beverly, Mass.

FOR SALE—Hi-tron HY-Q-25 all assembled, never used, at 100% discount, complete with speaker used only 3 months $160; also crystal-liner signal generator FOR SALE—HQ-129-X receiver complete with speaker used only 3 months $160; also crystal-liner signal generator full lines for sales. Write William Berhardt, Hotel Penn Hunt, Huntingdon, Pa.

FOR SALE—Blue Racer $12.50; QST, 1923-1939, $55; Electronics, 1946, $10; RCA Review, 1946, $5; T & T Age 1946, $3. Cash only, Ralph V. Osborn W1AHT, 1130 Liberty Ave., Doylestown, Pa.


FOR SALE—National NC-100A receiver less speaker. Excellent condition $150. W2OPD, 62 East 46th St., Clifton, N.J.

FOR SALE—BC-654 Army transmitter and receiver with dynamotor and vibrator power supply; also set of Continental code recorders. Write William R. Ware, 536 Maple Ave., Boyceville, Wisc.

FOR SALE—Hytron HY-Q-75 all assembled, never used, won at hamfest, less than $50.

FOR SALE—Parts, tubes and meters worth over $300. Want good communication receiver, L. R. Ware, 336 Maple Ave., Doylestown, Pa.

WILL TRADE—Complete college course in accounting, auditing and business administration, 24 leatherette volumes of over 300 pages each. Worth over $200. Want AN/ ART-13 or good receiver, V. L. Kruger, 3015 G. S.E., Washington, D. C.

WANTED—Hallcrafters SX26 or similar receiver. Will answer all letters. L. C. Waddell, 401 Vine St., Irwin, Pa.

FOR SALE—Filament and bias transformers (Raytheon); primary 110 v. 60 cycles, secondary 10 v. 260 cycles, 24 inductance volumes of over 300 pages each. Worth over $200. Want AN/ AR2-13 or good receiver, V. L. Kruger, 3015 G. S.E., Washington, D. C.

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FOR SALE—Parts, tubes and meters worth over $300. Want good communication receiver, L. R. Ware, 336 Maple Ave., Doylestown, Pa.
A radically new and highly efficient transmitter for operation on the 10-11, 6 and 2 meter amateur bands. Conservatively rated at 75 watts output. Complete provision for quick band shifts by means of the new Millen "A9000" series high-frequency plug-in coils.

Line-up consists of Bliley CCO-2A crystal oscillator unit, 6AG7 power amplifier. For 10 meters conventional crystal control is used to drive the 8298 direct. For 6 meters an overtone crystal is used in the crystal stage to drive the 8298 direct as a power amplifier. For 2 meters the overtone crystal is also used but feeds through the 2226 tripler.

The Millen No. 90810 is normally equipped with grid and tank coils for the 10 meter band. Coils for 6 and 2 meter operation are also available at low cost.

Write today for catalog sheets and technical data on this latest Millen contribution to amateur radio.

NO. 90810 H.F. Transmitter less tubes, power supply and crystal but including complete coil set for 10 meters

Shipping weight 25 lbs. $69.75

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<thead>
<tr>
<th>Type</th>
<th>Each</th>
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<tr>
<td>T240</td>
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<td>6AK5</td>
<td>.90</td>
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<td>H7Y5</td>
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<tr>
<td>HY1148</td>
<td>.75</td>
<td>VR15D</td>
<td>.75</td>
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VANALTA DIVISION

ALBERTA — SCM, W. W. Butchart, VE6LO — The Alberta Hamfest staged by NARC was a complete success. 8AI, of Teelin; 7MQ, of Vancouver; 2WW, of Montreal; and ex-5CP, of Prince George; were "out-of-provinces" visitors. DN, of Glenwood, took in both Waterton and Edmonton Festas, as did LC, of Strathmore. EG set up Alberta QSL Bureau at Edmonton Fest and did a brisk business. MP and HZ, of Chancellor, and KU and TA, of Husser, motored in for the doings. Calgary was represented by a gang of 26. IX, of Hackett, walked off with the men's top attendance prize. To LC, president of NARC, goes the honor of carrying out the successful arrangements for the Edmonton Fest. WS, of Edmonton, visited Spokane and Waterton Fest. EA wandered down to Portland for a holiday. WS, of Medicine Hat, is working in the Edmonton area temporarily. EL and LL, of Camrose, met lots of old pals in Edmonton. HM was visitor in Kelowna and Penticton. EX-4AC, of Winnipeg, now is EKN, stationed in Edmonton as technical for BCMQ network. BW attended Magicians' Convention in Seattle. AI has QC-123, DT, formerly of Glendon, is set up in Stony Plain and on 3.8 Mc. with FB signal. EZ has returned from New Zealand. Traffic: VE6MJ 8, LQ 5.

BRITISH COLUMBIA — SCM, W. W. Storey, VE7WS — AXY and his XYL are back after spending a month in California. ALQ and family have arrived back in town from Mount Rainier. Wash. Vancouver was "saved from a hostile power" only very recently when a pair of thieves broke into a hotel and took just 49 minutes to locate a "hidden transmitter." The test was sponsored by the Vancouver Amateur Radio Club. The portable transmitter was hidden in a clump of trees on Queen Elizabeth golf course. Intermittent sending was started at 10 a.m. At 10:49, Civic Matheson burst into the thicket from the golf course while his partner, Jim Laughton, closed in from the interurban tracks. To make it tough for the searchers who used "directional" receiving equipment on automobiles, King Cavalsky, president of the club, and Ernie Savage, owner of the transmitter and technician for the "underground," chose a spot just a little below the Arbutus and Twenty-fifth power station, with its high tension lines and noisy transformers. Cavalsky and Savage arrived on "location" at 9:35 and had the transmitter ready by 9:45 a.m. At 10 a.m. Savage went on the air for five minutes with voice. After five minutes of silence the secret transmitter went back on the ether waves with Cavalsky tapping out code on a key. Thereafter the transmitter alternated with five minutes operation and five minutes silence until captured. At 11 a.m. FQ, WS, and Ry jumped on the "bootleg" broadcaster. Third patrol, two or three minutes later, included TAFN and ZAKF.

PRAIRIE DIVISION

MANITOBA — SCM, A. W. Morley, VE4AM — During the first month high wind conditions have kept the usual ham activities down. All were repaired within 24 hours. Fortunately these high winds did not occur the previous month as the flood conditions would have made it impossible to get such a fast repair job. If the two (flood and windstorm) happen at the same time, this section will be unable to handle their share of lack of emergency equipment. Have you any? If so, let me know, and join the Emergency Corps. This section can use anyone interested in ORS, OPS, OES, or any other ARRL appointment. WF is back on his feet after having an operation. ZK is heard on 14-Mc. "phone, QV not his beam up. DL is on 14-Mc. c.w. NI has been busy with visitors, including G. AM worked his first DX since '36 and is going to libenate to 3.5 Mc. for the winter. JM sends official bulletins on 3825 kc. Mon., Wed., and Fri. at 10 p.m. CST. BG is leaving Canada for sunny California. Best of luck to all of us, Alex. We'll be looking for you from W6Land. TJ has new rig completed. No traffic reports reached me although 15-F band lots of traffic being handled. Please report it.

SASKATCHEWAN — SCM, Norman Thommen, VE5CO — I would like to have any reports on 80-Mc. activities in the district. WA has heard KB6RQ around coming states coming in FB. He's using his SX-42. HR is active with 40 watt on 7 Mc. DP has a 1165 and it really seems hot. OM has his beam tower lying in the yard. He'll be wanting help very soon. SWP is occasionally on phone testing. DQ has a 10 meter transceiver running about 25 watts which he converted putting in a s.v.c. control and a r.f. gain in the receiver and changing the coupling in the transmitter. CW

(Continued on page 108)
RA-200 SPEECH AMPLIFIER AND MODULATOR UNIT

The RA-200 speech amplifier-modulator unit has been designed to modulate a tetrode or pentode power amplifier at voice frequencies between 200 and 5000 c.p.s., with inputs up to 150 watts. While output is only 50 watts for sinusoidal waveform, the sharp peaks occurring in ordinary voice waveforms are easily supplied by this modulator so that inputs of 150 watts to a final amplifier (rather than 100 watts as might be expected when sine wave modulation is used), can be successfully modulated.

The push-pull parallel 6L6 modulator circuit has been laboratory tested in order to carefully check its operation to highly critical standards. This unit is completely free of self-oscillation at any condition, from no signal to peak signal operation; thus eliminating AF distortion and spurious side bands on output carrier.

The CW man who wants to convert his present telegraph transmitter for phone operation, will find the RA-200 and its associated power supply, RA-100, the most convenient solution to his problem. The RA-200 is recommended for use with RA-600, 150 watt power amplifier and wide band frequency multipliers.

Ask your dealer for a complete TEMCO RA catalog or write to Temco.

RA-300 NARROW BAND FM EXCITER

Addition of this unit to an existing or contemplated transmitter, will permit the transmitter to be used for Narrow Band Frequency modulated emissions for reception along the IF slope of ordinary AM receivers. Naturally, the cost of an Amplitude Modulator may be saved, if the equipment is designed specifically for NBFM, but usually the consideration dictating use of NBFM is existence of complaints from broadcast listeners. The TEMCO RA-300 exciter is practically a sure-cure for trouble of this kind.

Circuit consists of a grid-to-screen Pierce oscillator (6AC7), "electron-coupled" to a plate load so arranged as to supply RF excitation of proper phase-relation to the balanced modulator (6SA7's) grids. Signal grids of the balanced modulators are driven in push-pull by audio from a PM/FM 150 microsecond filter, while the plates are parallel connected to a permeability tuned plate load inductor. AF input from the microphone jack is first amplified by a 6S17, ½-6SN7 amplifier, then split by the other half of the 6SN7 and fed into the PM/FM network. Frequency Deviation Monitoring facilities consist of meter mounted on the front panel and another 6SN7, half of which, is used as a cathode follower; the other half as a rectifier.

For incorporation in existing or home-built transmitters, only a Jones “2412” series socket is needed, with choice of high or low impedance output for coupling to multiplier stages.
is very active on 7 Mc. TX is pushing a pair of 813s on 14 Mc. e.w. and worked PZlFM the first night. Cliff intends to use a Wilcox CW3 receiver as a converter on 28 Mc. DF is trying to get back on the air. BJ is working all bands but hangs out on 14 Mc. mostly. BJ is working all bands but hangs out on 14 Mc. mostly. BB is rebuilding and now has a VFO which may be heard at the end of 14 feet of bed spring. RC is running his 8½ watts (2 watts dissipation) and is passing traffic regularly. RA is running 100 watts after a power boost. GD has been working 28-Mc. 'phone at noon (MDT). AX is heard on 7 Mc. at intervals.

LA now is in VE4 country. Traffic: VE5HR 8, DQ 3.

BOOK REVIEW


This book is the story of the Army Airways Communications System, from its earliest beginnings to the peak of its development shortly after V-J Day. The skilled hand of the author, takes the reader first to Washington, where an officer in the Office of the Chief of the Air Corps receives a directive saying, in effect, "Let there be Highways in the Sky." From there we follow the development of the AACS from a handful of officers and men struggling for recognition and autonomy to a separate command of the Army Air Forces, culminating in the triumphal landing of a plane at Atsugi airdrome bearing AACS communications equipment and personnel, the first American plane to land in Japan after V-J Day.

AACS was the organization assigned the task of performing the unglamorous duty of establishing and maintaining communications required by our Air Force during the war—a duty that was relatively unimportant during peacetime when planes needed to fly only when weather permitted and then over pre-established well-traveled routes, but which mushroomed alarmingly when the requirements of combat made it necessary for planes to fly in all weather and through skies herefore unexplored. The book explains in graphic and well-illustrated style how the Highways in the Sky were established in each theater of the war, and how the central headquarters was constantly under the necessity to fight off attempts of other military organizations to control and regulate the AACS. Some readers may find themselves skeptical of the importance of AACS and the apparent faultlessness of its leaders.

The part played by amateurs in the AACS is not touted nor even explicitly commented upon at any length, but implied throughout by occasional use of amateur terminology and passages like "The AACSmen accepted the challenge. Were they not Hams, just like their CO, Ivan the Terrible?" and phrases like "... Farman and his Hams." No glowing tribute is paid to amateur radio in so many words. As a matter of fact the author completely neglects an opportunity to include amateur radio in his description of where the AACSmen came from when he says, in the Foreword, that the Highways in the Sky were put there by "A civilian Army recruited right out of classrooms. Out of business, trades and professions." Late in the first chapter, when describing the difficulties of obtaining promotions and higher ratings for the men, he furthers the commonly mistaken impression that radio amateurs are a bunch of kids by saying "... Increased ratings and pay were obtained for the men on a technical basis, permitting the recruiting of a number of promising radio 'hams' just out of high school and junior college."

If you can forgive these few minor faults, however, you will find the book is written in lively, entertaining and dramatic style and is well worth reading. — G. H.

SWITCH TO SAFETY!
MODEL 701 Transmitter, 80 through 6 meters, crystal controlled, 75 watts CW input, 28 watts 100% modulated AM phone, built-in modulator — yet only $36.95 net ready to go, less four tubes, coils and the power supply you probably have...

We think that's quite a value ... was worth waiting for. We thank you for your patient wait. Today MODEL 701 is here, at your favorite jobber — all ready to get going for you.

Whether you want what we believe is the smallest, most compact — only 5" x 10" x 5¼" standard "ATOM-X" size and construction — transmitter you can buy for portable/mobile operation, or whether you want a miniature "power-house" for your main station, we think you'll fall in love with MODEL 701 when you see it. On 6 meters as on 80, it's a little honey. Run it crystal control, drive it with a v.f.o., use it to drive the biggest final the law allows, MODEL 701 is still an outstanding value.

MODEL 908 "MICROMATCH"

When QST said "simply astonishing" to describe the "MICROMATCH" standing-wave-ratio and r.f. power meter in its April, 1946 issue, there could be no doubt that here was something of tremendous value. Already hundreds in use prove it to be probably the greatest transmitter power gainer you can buy.

"MICROMATCH" connected in your antenna feeders — in any link coupling lines — lets you measure the standing wave ratio — power your transmitter generates but isn't putting into your antenna. With "MICROMATCH" you can tune your antenna to look like a pure resistive load — easily and quickly. This means a possibly tremendous radiated power gain to you — possibly as much as many hundred percent!

Yet MODEL 908 "MICROMATCH," licensed and approved by inventor M. C. Jones, is only $29.90 net — at your favorite jobber. In "ATOM-X" size and style, range 50 through 300 ohms impedance, 10 through 1000 watts power, with big, open 4¾" meter, it will pay its way for you as will no other transmitter investment.

Mail postcard for NEW 16-page, just-released catalog of transmitters, receivers, xtal-controlled v.f.o., test equipment, etc.

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"Twin-Lamp" (Continued from page 89)

Using the "Twin-Lamp"

To assure yourself that the indicator works as stated, connect the test section to your transmitter output coupling in place of your regular 300-ohm line. Hang a 300-ohm noninductive resistor across the other end of the test section and apply power. As you increase the power, the lamp toward the transmitter will start to burn, but the other one should remain dark. The coupling can be increased until the one lamp shows full brilliance without the other one showing any color, if the resistor is nonreactive. Reduce the power from the transmitter and short the resistor, and both lamps will light. This indicates a high order of standing-wave ratio. If the resistor is removed and the test-section end left open, it will probably be difficult to get any indication in the lamps, indicating that the sensitivity of the device depends to some extent upon its position in the line, for high values of standing-wave ratio.

Comparison tests show that with the lamp on the transmitter side burning at almost full brilliance, the other lamp will start to show color when the s.w.r. exceeds about 1.5. You can check this by substituting other values of resistance for the 300-ohm termination, remembering that the s.w.r. will be the ratio of the terminating resistance to 300 (if the termination is greater than 300 ohms) or the ratio of 300 to the termination (if the termination is less than 300 ohms). For example, either a 450- or a 200-ohm termination will give a 1.5 s.w.r. Since a ratio of 1.5 or less is good in amateur practice, if the lamp toward the transmitter shows full brilliance when the other shows nothing, you know your feedline is up among the elite!

It should be pointed out that this is only a standing-wave indicator, and the relative brilliance of the bulbs does not necessarily indicate the actual ratio on the line. In fact, it has not yet been proven that there is not some load condition other than $Z_L = Z_0$ that will cause the load-side bulb to extinguish. Unfortunately, a rigid mathematical proof of the device is not as simple as its mechanical construction, and the validity of the device under all possible conditions is still being checked.

However, the gadget is so simple that it was thought best to describe it at the present time. Its convenience lies in its simple construction and the fact that, with two lamps, one always has a check on the power level in the line as well as a standing-wave indication. To use the indicator while adjusting an antenna match, connect it in the line within sight of the matching device. Make your adjustments until the bulb away from the transmitter is completely extinguished, with the other one burning. If your adjustments reflect a large change in impedance at the transmitter, the coupling may change, but this will be indicated by the brilliance of the lamp on the transmitter side. For a cross-check, the indicator can

(Continued on page 118)
ORIGINATORS OF NBFM EQUIPMENT FOR THE HAM

THREE OUTSTANDING PHASE MODULATED PRODUCTS

by SONAR

THE XE-10, first of the SONAR products, was designed to give the Ham a modulation unit for his complete AM rig. The XE-10 will convert any CW rig (regardless of power) to NBFM. Your VFO can be used to regulate the frequency input to the XE-10 or the xtal can be inserted directly into the XE-10.

XE-10 AMATEUR NET $3945

THE MB-611 is another SONAR product incorporating NBFM, designed for mobile or fixed operation, on 6 to 11 mtrs—40 watts input with a pi-network to match any antenna. Further details on this xmitter and other new SONAR developments will be found in future advertisements. The engineering staff at SONAR has many new designs including low, medium, and high power xmitters.

MB-611 AMATEUR NET $7245

THE VFX 680 was designed to meet the demands for a stable VFO-xtal exciter and also incorporates the exclusive SONAR NBFM circuit giving a complete 4 to 6 watt all band exciter, with NBFM phone and/or straight CW. The VFX 680 also has VFX (rubberizes any cut xtal) giving xtal stability with a variable signal. An ideal "pre-stage" for that new rig.

VFX-680 AMATEUR NET $8745

NOW AVAILABLE FREE. The new finger-tip controlled, calibrated dial (80 Mtrs) for your VFX 680. Send in your xmit serial number and call letters. State color desired.

Available at your dealers—the Table cabinet for the VFX 680 at a nominal cost.
be connected in the line near the transmitter, and the relative brightness should be the same as it was in the position near the antenna, provided your line doesn’t pick up some impedance “bumps” or unbalance to ground by being run too close to metallic objects. If the indicator bulb burns only on the transmitter side, it shows that you’re in business with more r.f. in the antenna than you’ve had in a long time!

Acknowledgment

I wish to express my gratitude to R. R. Brown, professor of electrical engineering, North Carolina State College, for his help in deriving an explanation for the indicator, and to the technical staff of the ARRL for aid in testing the device.

Bandpass Frequency Multiplier

(Continued from page 81)

circuit for 80 meters, with switch $S_{1E}$ then tapping down upon this coil for 40-meter output. Coil $La$ similarly takes care of 20 and 14 meters while $La$ (in this case really two separate windings, although diagrammed as a tapped coil) takes care of 11-10- and 6-meter output.

Construction

The photographs show the arrangement of parts above and below the aluminum chassis which is 6 inches wide, 3½ inches high and 10½ inches deep. The row of tubes along the front-to-back center line are the 80- to 40-meter doubler, the 40- to 20-meter doubler which also functions as the 40- to 14-meter tripler, the 20- to 10-meter doubler, the 10- to 6-meter doubler and, at rear, the 807 final amplifier, always operated “straight-through.” The multitude of air-trimmer capacitors on either side of the 6AG7 frequency-multiplying tubes are for the dual-tuned bandpass filters. These are disposed, two to each filter, in the six pairs along the horizontal axes. The four odd trimmers, three on the left and one located at right center, are progressively switched in to compensate for differences in load capacitance mentioned previously when connected to the input of another 6AG7 or the 807.

The 807 plate coils are wound upon Micanol low-loss plug-in forms for convenience of mounting only. They do not need to be changed in operation. $L_1$ is to the right of the 807 socket, $L_2$ to the left of the 807, and $La$ is at the right rear of chassis. Mounting the 807 in a horizontal position enables its plate and grid leads to be kept short enough to provide efficient operation, including bandswirthing through 54 Mc.

Power requirements are 6.3 volts — a.c. or d.c. — at 3.4 amperes for the five tube heaters and 300 volts and 30 ma. d.c. for each multiplier, or 120 ma. when all four multipliers are operating. The 807 requires 600 volts at 100 ma. for full output, but may be operated at as low as 300 volts with still quite respectable power output.

(Continued on page 114)
THE RADIO AMATEUR'S LIBRARY

These are the publications which every Amateur needs. They form a complete reference library for the Amateur Radio field; are authoritative, accurate and up to date.

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$2.00, postpaid, elsewhere. (No stamps, please)

THE AMERICAN RADIO RELAY LEAGUE, INC.
WEST HARTFORD 7, CONNECTICUT
Adjustment Procedure

Tuning up such filters as those used in this multiplier is not at all difficult. It consists of feeding a frequency of 3250 kc. into the primary of T1, setting switch S1 to position A, tuning the 807 plate circuit for maximum brilliancy of a lamp load connected to the link at L1, and then tuning C1 for maximum output-lamp brilliancy. This process then is repeated with C2, after resetting the exciter to 3750 kc. and retuning the 807 output circuit. This done, tuning the exciter from 3000 through 4000 kc. will result in only minor variation in brilliancy of the lamp load when the 807 plate circuit is retuned along with the exciter. Actually it is hardly necessary to reset the 807 plate capacitor more than once to obtain good output to cover the whole band of 3500 through 4000 kc.

All succeeding filters, T3 through T6, then are similarly tuned, the primary tuned at a frequency 25 per cent in from the low-frequency end of each band, and the secondary at a point 25 per cent in from the high-frequency end of each band.

Remember that "each band" as used immediately above does not mean only the 40-, 20-, 14-, 11-, or 6-meter band itself, but also the highest and lowest limit frequencies that will have to be passed by any following stages in terms of harmonics of the stage being tuned, of course.

C5 is adjusted after T5 has been tuned as above. C5 is set as was C3, except that it is adjusted only when switch S1 is in position B; C3 when S1 is set to C; C4 when S1 is set to E; C14 when S1 is set to F.

While it is admitted that the job of building and correctly adjusting an exciter of this type is not one to be recommended to the beginner who is not familiar with the various factors which come into play in adjusting circuits of this type for the desired results, there is no reason why a reasonably-skilled amateur cannot duplicate this unit with good results. While it does not constitute the complete answer for full single-dial control with bandswitching, it is believed that it goes a long way toward achieving that objective.

Sonnet of a Ham

Today I held the wide world in my hand;
Space rolled away and England’s sun was low,
As Ken of Cambridge told me of his land.
Next, fast as thought, as he said, “Cheerio,”
I raced the sun, until at zenith time
O’er western plains I said “Hello” to Lee—
Then “73,” and morning skies were mine
As John became my host at Waikiki.
The XYL recalled my wandering
To Georgia’s pines, for dinertime was nigh.
When, afterward, with Venus shimmering
Beside a thin new moon and Mars’ red light,
I gazed their way, and wondered as night fell—
“Cannot we hold these in our hands as well?”

— Ewell Pigg, W4KGD
Another unit in the Heintz and Kaufman line of FS equipment which assures improved communications

Frequency shift communication systems require use of a transmitter exciter which will shift the carrier around a center frequency. Shifts normally used vary from 600 to 830 cycles between mark and space frequencies. The frequency shift keyer replaces the usual crystal oscillator stage in the transmitter.

The H&K Type A-4625 is a frequency shift exciter designed for this purpose. The output of a 200 k.c. stabilized oscillator is mixed with the output of a crystal oscillator which operates in the 2 to 6 megacycle band. The highest frequency derived from this mixing operation is selected, amplified.

A reactance tube and keyer tube are provided for obtainance of frequency shift. The reactance tube shunts the 200 k.c. oscillator circuit and is so arranged that keying voltages applied to the grid of the keyer tube cause changes in oscillator frequency in accordance with the telegraphic impulses transmitted.

**TUNING CONTROLS**
The unit is designed for maximum ease of operator adjustment. A control is provided for small variations in output carrier (center) frequency. Adjustments of 1000 cycles at the shifter output frequency can be made with this control. A calibrated shift spread control is also furnished which establishes the amount of shift required at the fundamental frequency. The relationship between extremes of shift is not changed by adjustment of the carrier center output frequency. Mixer plate and amplifier plate circuits are tuned by calibrated panel dials. A test switch for the purpose of establishing mark and space frequencies is provided to permit placing the unit on assigned frequency and then adjusting the desired amount of frequency shift.

**POWER SUPPLY**
A separate power supply of heavy duty construction is included with the shifter exciter. It is capable of providing 200 ma. at 300 volts together with required filament voltage of 6.3 volts.

**PHYSICAL DESIGN**
The shifter and power supply are constructed on separate 2" x 8" x 17" chassis with 8 ¾" x 19" panels. The units may be installed in a standard 19" relay rack or cabinet. Chassis are chrome plated steel or anodized aluminum. Panels are finished in platinum grey crackle.

Write for detailed information. We make a complete line of FS equipment. Our Engineering Department will be glad to correspond with you about your requirements.
NOW!
TRANSMITTING
AND HIGH SPEED KEYS
MANUFACTURED
BY JOHNSON
IMMEDIATE DELIVERY
ON ALL PARTS
Illustrated No. 320 Key
List Price $4.25

• Constant Frequency Buzzer
List Price $1.60

Illustrated No. 515
Semi-Automatic Key
List Price $12.50

Also 27 additional manual keys, 6 additional semi-automatic keys, practice set and repair parts for any automatic key. See your jobber or write Johnson for catalog and more information.

E. F. JOHNSON COMPANY
WASECA, MINNESOTA

CLIPPER CHOKES and FILTERS
Triple speech power on carrier without over-modulation, as suggested in QST Nov. 1944, page 23.

SHEilded CHOKE, 3.75 hy. 5%., hi-alloy laminations high efficiency. Model C-375 $4.75

COMPLETE FILTER ASSEMBLY, including laboratory selected choke C-375, capacitors C3, C4, C5 and terminating resistor R5, sealed in 1¼ x 1¾ x 2¼ shield can.
Model LP-5000, cut-off freq. 5000 cy. $5.95
Model LP-3500, cut-off freq. 3500 cy. $5.95

IMMEDIATE DELIVERY, postpaid in U. S.

Preferably order through your jobber

Kenneth Richardson Laboratories
254 Vincent Avenue, Lynbrook, L. I., N. Y.

Happenings

(Continued from page 58)

arrangement: “Possibilities of interference to television from such sources as harmonic radiations, television receiver response to stations on intermediate or image frequencies and television receiver oscillator radiations are engineering equipment problems which the Commission expects can more properly be solved by equipment development rather than further revisions of frequency allocations.”

SIGNAL CORPS RESERVISTS

Because of the immediate need for additional technically-qualified commissioned personnel, the Signal Corps has been authorized the voluntary recall of 100 reserve officers to active duty, most of which will be in company officer grades. Reserve officers volunteering may apply either for an indefinite period, or a fixed period of two years.

3-Element Beams

(Continued from page 48)

With the parasitic elements replaced, they not only were rather critical of adjustment, but immediately showed a tremendous increase in gain over the driven element alone.7

Checking all s.w.r.s with the Micromatch disclosed inherently higher values with one or both elements close-spaced than with the wider spacings. This was no doubt caused by the decreased radiation resistance and the fact that all adjustments of the “T”-match were critical for close spacing. Five close-spaced beams were tested at many different locations, all using different arrangements of the “T”-match. Contrary to most recent published data, it was impossible to get a low s.w.r. on any of them when fed with 300-ohm Twin-Lead or open-wire line. Changing to 70-ohm Twin-Lead in three cases brought the s.w.r. down to more reasonable values. But only with the wider spacings was it possible to get the s.w.r. down to 2/1 or better.

Many stations worked during changeable band conditions verified the efficiency of the well-matched R-0.2-A-0.15-D array. S8 reports were received on several occasions from South America with the beam 20 feet off the ground and using 15 watts input on 'phone. The West Coast was worked consistently at either end of the 'phone band with the same low power.

(Continued on page 118)

7 No satisfactory explanation is at hand for this apparently critical behavior of the driven element; it is hard to reconcile it with the fairly wide-band acceptance of the wider-spaced systems, inasmuch as the detuning from the resonant frequency in these tests represents a greater percentage change than the differences between most of the published formulas for resonant frequency. Nor is there any obvious theoretical reason why the driven-element length should have to be exact, aside from matching difficulties that prevent efficient power transfer from the transmitter to the antenna. — Editor
Every time your modulation exceeds 100 percent, harmonic distortion is introduced which causes interference with other stations, and violation of FCC Regulations. With this Modulation Monitor you can modulate to the fullest for top power-output, yet you know instantly when you are over-modulating. Model 3296 provides four separate circuits for measuring amplitude modulation—(1) percent modulation, average; (2) peak flash percent modulation; (3) carrier shift; and (4) audio output for headphones. These methods may be used separately, all at once, or in any combination. The peak indicator can be pre-set for any percent of modulation from 20 to 120, and will flash when pre-determined modulation is reached. You can figuratively "see" the signal received by your listener!

A handsome, precision-built instrument, Model 3296 blends with any standard amateur equipment, enhances the appearance of your station, and will greatly step up your operating efficiency.

SEE YOUR DISTRIBUTOR FOR DETAILS OR WRITE TODAY. Address Dept. J107

ELECTRICAL INSTRUMENT CO. BLUFFTON, OHIO

A new streamlined tester with wider ranges: A.C. and D.C. Volts 0-10-50-250-1000-5000 at 1000 ohms per volt; D.C. Milliamperes 0-10-100-500; ohms 0-2,000-400,000. Molded, insulated, pocket-size case. A top value.
The use of co-ax cable for feeding low center-impedance arrays is also generally indicated, but it has fallen into disfavor because of its unbalanced characteristics. This unbalance can be readily circumvented by using some form of "bazooka" or line balancer, but a simpler method would be the use of two pieces of co-ax side by side in the manner of a two-wire line, with the shields tied together. The resulting series impedance would still be reasonably low, and of course the line would be completely impervious to weather conditions. In any event it is recommended that, regardless of the method of feed, every effort be made to reduce the s.w.r. to a minimum. Line radiation caused by a high s.w.r. can only result in poor transfer efficiency and an unsymmetrical beam pattern.

**About the Author**

- After a daily stint studio-controlling soap-box operas for CBS, New York, it must be welcome relief for W2LAIH to carry on his beam experiments in the peace and quiet of the busy 10-meter band. Besides his b.c. engineering duties, Philip C. Erhorn's radio interests are DXing and v.h.f. experimenting. A member of the Garden City Radio Club, W2LAIH is holder of an ARRL Public Service Certificate for notable work during the 1938 Long Island hurricane.

**Strays**

The following experience, related by W9LZP, is certainly one for the book!

"While tuning the 28-28.5-Mc. end of the 10-meter band, listening for a station on Guam, I ran across a signal that beats anything I have ever heard in 20-odd years of ham radio. "Hearing a GI's voice, I listened until the stand-by. He signed EL2A. Not being the KG6 I was looking for, I tuned by him a bit, but then, thinking about it a little, I tuned back to his frequency. When he came back, sure enough it was EL2A. Well, that would not have been unusual a few hours earlier, but at 7:15 P.M. CST it was not the ordinary. EL2A, perfectly readable, was in contact with a W8. My curiosity got me. I tuned up to 20, and for the pay-off I heard him there, too, although not as well as on 10. I had been hearing his second harmonic on 10! Going back to 28 Mc., I rotated the 4-element beam. With the array in a westerly direction he came in best — peaking to an S6. That proved it! EL2A's second harmonic was reaching Delphi, Indiana, over the long path around — nearly 20,000 miles!"
THE NEW THORDARSON LINE
OF SPLATTER SUPPRESSOR CHOKES!

Here at last is the new line of Thordarson Splatter Suppressor Chokes you have been waiting for! Engineered and manufactured by Thordarson for amateur use, these quality units make narrow channel AM transmission with minimum band-widths a reality. Designed to permit a higher percentage of modulation, these components considerably increase the get-through ability of the signal.

These new chokes have 10,000 volt insulation, variable inductive range from .2 to 1.5 henries, low distributed capacity, good "Q" and chatter-proof construction. Harmonic distortion is minimized and broadcast interference sharply reduced. No critical adjustments are required.

For complete specifications write today to the address below:

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EXPORT–SCHEEL INTERNATIONAL
4237 N. LINCOLN AVENUE • CHICAGO 18, ILLINOIS • CABLE—HARSCHEEL
**Volume Compressor**

(Continued from page 43)

The required fixed negative bias appearing from point B to ground is obtained conveniently by inserting the variable resistor, R2, between ground and the high-voltage center-tap of the power transformer. It is assumed that the amplifier's total plate-current drain is at least 60 ma. or so. The "B"-supply voltage available to the plate circuits of the amplifier will be reduced by an amount equal to the drop across $R_7$. This decrease can usually be tolerated in a speech input amplifier.

**Adjustment**

Only two simple adjustments are required. They are semipermanent and not critical to obtain. Potentiometer $R_8$ determines the degree of compression which the circuit will provide. A maximum power compression of at least 27 db. should be available with but a few volts of driving voltage. Thus the modulation level will be increased about 22 times.

The second adjustment should be made with no signal input into the amplifier. Simply adjust $R_7$ until the voltage at A with respect to ground is $-$3 volts. This voltage will increase to about $-$55 volts when the 6AC7 is driven to cut-off. Compression in the order of 27 db. will be obtained when the bias to the 6AC7 is $-$25 volts. If the audio power tubes of your amplifier operate on a Class AB instead of Class A even more compression should result.

A 50-volt d.c. voltmeter connected from point A to ground will indicate the degree of compression which the amplifier undergoes. This meter could then also serve as a modulation indicator. The slight complication of delayed a.v.c. was not considered particularly necessary for amateur applications.

**Distortion**

Practically all compressor circuits introduce some distortion, the distortion increasing with the amount of compression. Logically, for least distortion the compressor stage should be located at the front end of the speech amplifier, where the signal voltage (grid swing) is small and consequently the distortion would be minimum. However, a compromise must be made, since the tendency toward motorboating increases with the gain (number of stages) between the compressor tube and the source of the biasing voltage.

Measuring the distortion of the speech amplifier alone at 400 cycles, it was found to be 3.3 per cent at 8 watts output. With 27-db. compression the distortion was only 3.7 per cent. This small amount of distortion is negligible for all practical work, and the 27 db. of compression is a range wide enough to take care of almost any condition.

It should be pointed out that if an existing stage of the amplifier is to be used as the compressor, and the entire compressing ability of the proposed circuit is to be attained, it will be necessary to have an additional amplification (ahead of the compressor tube) of 27 db.
NATIONAL'S Latest Receiver... 
Packed with Features and Value!

Here is the new, completely modern receiver. Hams and SWL's have been waiting for—designed for maximum performance at a moderate price. The National NC-57 features extended frequency range, tuning 550 Kc. to 56 Mc., continuous in 5 bands. Has electrical bandspread for pinpoint tuning on SW and Amateur bands. Features include: Accurate calibration on all bands; automatic noise limiter; antenna trimmer; voltage-regulated RF, Oscillator and BFO; Loktal tubes in RF circuits for maximum efficiency at high frequencies; universal antenna input; emergency battery-power socket; built-in 6" dynamic speaker; 3-position tone control; BFO pitch control; 1 RF and 2 IF stages. 7 tubes plus VR tube and rectifier. An outstanding receiver guaranteeing fine performance at an amazing—low price. AMATEUR NET, Complete...

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THE NEW 
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NC-57 
Communications 
Receiver

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Amateurs everywhere know that the best way to keep up with all the new developments in the field, is through ALLIED'S Catalogs and advertising. New receivers, transmitters, and station equipment come to you first through ALLIED—first choice of Hams since the early days of radio. For all the FIRSTS, look to ALLIED—the World's Largest Distributors of Amateur Equipment.

For Earliest Delivery, Order Your 
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National NC-46 and Speaker... $107.40
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☐ Send Literature on Receivers and Time Payment Plan

Name..........................................................
Address.......................................................
City.........................................................Zone......State............
Come Aboard
(Continued from page 40)

Amateurs, both those who are now Naval reservists and those interested in the Naval Reserve, are cordially invited to visit the headquarters of a nearby Electronic Warfare unit. The services of amateurs are useful in coordinating local civil emergency communications plans. The assistance of amateurs who volunteer as training advisors, instructors and lecturers to Reserve units will be appreciated.

Those amateurs desiring more information on the Naval Reserve Electronic Warfare program are invited to write to the commandant of the Naval district in which they reside (see map). Addresses are: 1ND, 405 Summer St., Boston; 2ND, 90 Church St., N.Y.C.; 3ND, NAvy Yard, Phila.; 4ND, Naval Operating Base, Norfolk; 5ND, Naval Base, Charleston; 6ND, Naval Air Station, Jacksonville; 8ND, New Federal Bldg., New Orleans; 9ND, Naval Training Center, Great Lakes, Ill.; 11ND, Naval Operating Base, San Diego; 12ND, Civic Center, San Francisco; 13ND, Naval Station, Seattle.

About the Author

• Commander Delbert S. Wicks, USN, is a native of Providence, R.I., where he held the call WIIZO. He received his A.B. and M.Sc. degrees from Brown University for work in mathematics and electronics. An officer in NCR, he was ordered to duty in 1940, serving first as instructor in math and navigation at the Academy, later at Radiation Labs of M.I.T., and finally as assistant head of radar design in the BuShips, Washington. Soon after V-J Day, Cmdr. Wicks was ordered to the office of the Assistant Chief of Naval Personnel (Naval Reserve) where he developed and placed in operation the Naval Reserve Electronic Warfare Plan. Commander Wicks has been a member of ARRL and the Providence Radio Association since 1933 and is also a member of IRE. He is the proud father of three children, the younger two being leap-year twins born February 29, 1944.

25 Years Ago
(Continued from page 49)

Georgia, SBO, Detroit, portable SOI, Parkesburg, Pa., and Naval "SA," San Juan, as it appeared in 1904.

Strays comes up with two good hints for the receiver constructor: (1) Use an all-aluminum panel and do away with the messy handling of tinfoil, and (2) simplify filament control by using a common rheostat for all vacuum-tube filament circuits.

SWITCH TO SAFETY!

122
Get on the air with Narrow Band FM with this Sonar equipment... NBFM exciter, mobile rig or VFX exciter.

**MODEL VFX 680**

Wrapped up in one package is an xtal exciter; a VFO; a VFX that permits deviation of xtal frequency as much as 30 kc. on 80, 240 kc. on 10; FM phone on all bands; CW or phone monitor, with dual tuning eye. $87.45

**MODEL XE-10**

* 2-3 kc. deviation. Penetrates QRM, can be heard on any AM receiver. More output from final than with AM. Eliminates BCI. Price, less xtal. $39.45

**HARVEY'S HITS OF THE MONTH**

Harvey has 20 meter crystals for a buck! Mounted in holder with ½” pin spacing. Also 40 and 80 meter and 6 and 13 mc. bands at the same low price. $1.00

Special 8 mc. xtal for 2 meter xtal control, only. $1.50

Also in stock complete line of Willey AX-2 xtal... include 10¢ postage with your crystal order

**HARVEY'S HAMFESTIVAL OF VALUES**

**Heavy Duty 12-Inch Speaker** completely encased in steel with wall mounting brackets. Type T12LS, 600 ohms impedance with volume control. Excellent for monitor, projection booth or factory. Brand New. $14.95

Silver Micromatch, 3-30 mc., 0-1 kw. 4’’ square meter, extended scale. $29.90

**Millen VFO 90700**. $42.50

**Broad Band Converters**, BB-27 for 10-11, BB-50 for 6, BB-144 for 2 meters. Takes power from receiver. $27.50

Power supply for above. $19.50

**Hammarlund 4-11 Modulator** — 11 watts audio output, perfect as speech amplifier and modulator for 4-20 or any other transmitter. Complete with tubes. $72.50

**Hammarlund 4-20 Transmitter** — complete CW rig for 10, 11, 20, 40 and 80 meters. 20 watts power output; tunes four different circuits to four different frequencies with single control. Complete with tubes, less crystal. $120.00

**Millen 90810 HF Xmitter** for 10-6-2 meters. NEW. Uses 6AG7 xtal oscillator, 2E26 tripler, 829B final. May be driven by high frequency ECO. Less tubes, power supply and xtal but with complete set 10 meter coils. $69.75 Coils for 6 or 2 meters, grid and final tank, 2 required, each. $1.80

**Millen 90881 500-watt P.A.** Wired for use with 812 tubes but can be converted for JST’s, T55, HK154 etc. Less tubes. $89.50

Note: All prices are Net, F.O.B. N.Y.C. and are subject to change without notice.

Telephone: Longacre 3-1800

**HARVEY RADIO COMPANY INC.**

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It's a Guarantee

MILLEN H. F. XMTR 90810 $69.75

with set of 10-meter coils, less tubes, power supply and crystal.

This new 26-10-meter xmtr, featured in September QST, is available RIGHT NOW from the Radio Shack. You know Milen quality so you know this is a "fine business" rig.

Tube kit for 90810 ......... 3.10
Set of 6-meter coils ......... 3.50
Set of 2-meter coils ......... 3.60

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HT-9 TRANSMITTERS

Coils available for all bands
10 meters $16.50 40 meters $11.75
20 meters 15.50 80 meters 10.35
Time payments if desired — write for details. $70.00 Down

Price, complete with tubes, less coils and crystal.

HALLICRAFTERS

HT-9 TRANSMITTERS

Coils available for all bands
10 meters $16.50 40 meters $11.75
20 meters 15.50 80 meters 10.35
Time payments if desired — write for details. $70.00 Down

Price, complete with tubes, less coils and crystal.

POPULAR RECEIVERS

Now available on easy terms

Model Number

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S-40-A complete $89.50 $17.90

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RME-45 complete 198.70 39.74

RME-84 complete 98.70 19.74

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You'll be pleasantly surprised at this value . . . its counterpart has been sold by a well-known speed key manufacturer at more than double our bargain price. Made for the Signal Corps by Lionel Corp.: supplied complete with cord, spade plug, and switch. You've always wanted a "bug" . . . now you can have one.

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XMTRS

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RCVRS Great for standby on 40-80 meters; phone or CW; ample bandspread; complete with 6 tubes

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XMTRS - Furnished with 4 tubes, including 1629 magic eye, 1626, and 2-1025's; also calibrating crystal

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A real bargain — famous Collins quality in a transmitter covering 1500 KC to 18 MC — in A-1 used condition. — complete with tubes. Shipping weight, 90 pounds.

BC-221 AK FREQUENCY METER
Fundamental ranges are 125-250 and 2000-4000 kc. Complete with tubes, original crystal and calibration charts. Built-in modulation. Excellent condition. Order today!
The BC-221 makes an exceptionally fine VFO — W7NU tells how in March QST.

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Fifty-foot RG-8/U co-ax cable with PL-259 connectors $1.95
One hundred-foot RG-8/U cable comprising two 50-foot cables coupled with $3.90
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SUPER SPECIAL BRAND NEW 807's
Westinghouse JAN-inspected 80c each
THE BUY OF A LIFETIME

SHURE SW-109 HAND MIKE
Brand new single-button carbon mike with pre-tuned witch, cord and plug. A rare chance to get a fine hand mike under a dollar.

RADIO RECEIVER $4.95
BC-1206-A with tubes
This compact midget superhet is designed to fit a 3-inch metal hole for back-of-panel mounting. Originally used for receiving marker beacons and weather reports, in 200-400 KC band, you’ll find it a handy all ‘round receiver. Five tubes provide pre-selector, converter, oscillator, 175 KC IF, 2nd detector, and AF. Draws 900 mls at 28 v. d.c. Container in metal case; shielded battery lead passes through RF filter. Can’t be told from new.

HS-30 HEADPHONES only 79c

AAF XMTR BC-375-E
A special buy brings you this favorite at a greatly reduced price. Basic xmtr unit and tubes, plus one hand-calibrated tuning unit and detailed data on easy modification to 110-volt a-c operation. Made by G.E.; used but in good condition.

$17.50 NEW LOW PRICE

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HOT! 3C24 (HK 24G) HOT! 90c each ... 6 for $4.50

The RADIO SHACK Corp.
CABLE ADDRESS - RADIOSHACK
167 WASHINGTON ST., BOSTON, MASS., U.S.A.
ELINCOR
ALL ALUMINUM BEAMS

Model 200-EA
folded di-pole driven element. All aluminum construction.
Fed with low impedance coaxial cable. Amateur net price $8.40

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All of the above antennas are furnished complete with all aluminum supporting ladder, 2½” standoff insulators, hardware and instructions. Elements are ¾” aluminum tubing telescoping to ¾” adjustable over a range of several feet.

We also manufacture a complete line of FM, Television, Broadcast and shortwave antennas. Send for literature.

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Only

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LISTEN

$169.50

Listen to the amazing AM-FM-CW performance of Hallicrafters new MODEL SX-43 hallicrafters

50 Mc.
(Continued from page 67)

ton, and W4FJ and W4CYW, Richmond, Va., the last two being 300 miles distant. He heard W4KWY, Norfolk, Va., 370 miles.

The excitement attending the breaking of the record by W3EEK/1 and W3KUX, on the night of August 7th, is obscured by many contacts made in the East that night which would have been front-page news otherwise. It is believed that many things happened that night which have never been reported in correct detail. At 2:30 A.M. on the 8th, W2LTVQ worked a station signing W5TQA. This station was heard by others in New Jersey, Pennsylvania and Maryland, though no such call is listed in the Call Book, and no DX claim has been made by any W5. If anyone can furnish more information on this one, we'd be very glad to have it. W3KCA in Baltimore heard a W5, whose call was unintelligible because of fading, working W2LTVQ at this time. He reports that the signal was coming from about 25 degrees south of west, and the station gave his location as some place in Texas. The frequency was 145.5 Mc. W2LTVQ heard W8ICL, Columbus, Ohio, and a W4 in Raleigh, N. C., shortly after the mysterious W5 QSO.

Not all the good work has been done over favorable paths, though the DX reports are most frequently received from coastal or Great Lakes area stations. W3HWN, Mechanicsburg, Penn., has worked W3s RUE, OMY, KWD and KWIT, Pittsburgh, about 150 miles, over very mountainous country, and has heard several stations in Ohio, at distances around 300 miles. There is a tremendous new horizontal-vertical array about ready to go up at W3HWN, and the thing should really start happening across those Allegheny Mountains!

Stations along the Eastern Seaboard will be glad to know that there is appreciable activity on 144 Mc. in Nova Scotia. VE1QZ at Halifax reports that VE1s BC, QG, SF and QZ have crystal rigs, good receivers and beam antennas. They are on almost nightly, and are concentrating on attempted contacts with W5s at 10, 11 and 12 P.M. EDST, making five-minute transmissions on the hour, listening thereafter for calls from W-land.

W3KUX sends in an observation that will bear investigating. He says that while listening to W2 signals in the midst of a thunderstorm he found that there were sudden large increases in signal strength coincident with cloud-to-cloud lightning discharges. The signal bursts were not in evidence when the lightning flashed to earth, and not always on the "sheet-lightning" flashes. Has anyone else noticed this effect?

August saw the accomplishment on 144 Mc. of an aim that never was achieved on 56 or 50 Mc. — a message relay from the Middle West to the East Coast went all the way on 2 meters, without the aid of unusual propagation, other than the normal summertime conditions. Two messages, originated on August 1st by W3HAQ,
Low Prices
I guarantee to sell to you as cheap as you can buy anywhere.

Complete Stocks
Hallicrafters, National, Hammarlund, Collins, Millen, RME, Pierson, Temco, Meissner, Supreme Transmitters, Mock, Gordon, Amphenol-Mims, RCA, Vibroplex, Sonar, all other amateur receivers, transmitters, beams, parts, etc. If it is amateur or communications equipment—I can supply it.

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RECORDS

Two-Way Work

50 Mc.: W6AC/KH6—WK5KL
5550 Miles — August 25, 1947
144 Mc.: W3KUX—W3EKK/1
375 Miles — August 7, 1947
235 Mc.: W6OVK—WOAOW/6
186 Miles — March 2, 1947
320 Mc.: W6VIX/6—W6ZRN/6
32 Miles — July 7, 1947
1215 Mc.: W1BBM—W1ARO
3 Miles — April 7, 1947
2300 Mc.: W6IFE—W6IFE/6
24.6 Miles — May 24, 1947
3300 Mc.: W6IFE—W6IFE/6
20.2 Miles — June 5, 1947
5250 Mc.: W2LGF/2—W7FQF/2
31 Miles — December 2, 1945
10,000 Mc.: W4HPJ/3—W4IFE/3
7.65 Miles — July 11, 1946
21,000 Mc.: W1NVL/2—W9SAD/2
800 Feet — May 18, 1946

Davenport, and W9IFB, Solon, Iowa, were delivered to your conductor by a routing reported to be W0HAQ, WSCVQ, W6GJF, W8ML, W8WXY, W8OMY, W3NIX, W3HWN, W9AED, W1OSQ, W1HDQ. There were undoubtedly some other relay stations between the first two listed. It took two weeks on the way, but the important point is that the circuit was completed on 144 Mc.

Let’s try again, and speed it up — a good activity for the fall and winter period when conditions may not be providing DX thrills.

50-Mc. News

The news from Atlantic City, insofar as it concerns the v.h.f. bands, is mostly good. The inability to secure world-wide acceptance of 50-54 Mc. as an amateur band was a disappointment, but the establishment of it as amateur territory in all the Americas, Australia, New Zealand, Asia and South Africa, should extend our sphere of operations for the current sunspot peak. Particularly good news is the alignment of South Africa in the 50-Mc. column, as there are many enthusiastic v.h.f. men in ZS. Word has been received that, through the cooperation of their Postmaster General, the ZS boys will be able to operate on 50 Mc. this fall by special temporary authority to be issued upon application, despite the fact that the allocation resulting from the conference decision will not be effective for some time to come.

Though there is no provision for European amateurs in the region between 30 and 72 Mc., it is probable that operation in the 50-60 Mc. range will continue, for the present, contingent upon lack of television interference from amateurs using these frequencies. Thus, we may still look forward to a possible two-way v.h.f. QSO across the North Atlantic this fall, with our PAO friends on 50 Mc., and even the Gs on 58.5, if the m.u.f. goes as high as it appears now that it

(Continued on page 150)
HAMS

Amazing New PILOTUNER adds F-M to ANY Receiver!

Simple to connect, it brings you all the bene-
fits of FM reception formerly available only
for a very high price. Of course, it brings you
only low price that everybody can afford.

Features: 5 tubes plus selenium rectifier; 3-gang cond.; Built-in FM
wood cabinet 83"x16"x25 1/2". YOU can own it, for only...

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Same XMT & SAM, Antenna MORE POWER!

Measures stdg. wave ratio, RF power on coax transmission lines.
3 to 100 Mc; 10 to 500 watts.
MM2A 52-ohm comp. & indic. $37.45
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New low price for this perfectly coiled 200-ohm cable. HANDMIKE; Press-
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Gen'l purp. Pric... 110V
60 cy. Sec: 750VCT @ 160 Ma, 1450V @ 2
Ma, 63V @ 1 amp.
SMASHING LOW PRICE!
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Thord. All- PURPOSE
Filament Trans. 

Prt: 105 to 260V 60 cy.
Sec: 6V @ 20 amps.
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New York City Stores: 115-17 W. 45th St. & 212 Fulton St.
May. There has been a great increase in v.h.f. interest over there during the past summer, and it should not be difficult to promote 50-Mc. tests across the Atlantic this fall, with many of the countries of Europe.

August produced no great excitement in this country. There were fairly frequent openings, and many good skip contacts were made, in what used to be considered a dead month. The weather conditions that produced the phenomenal DX on 144 Mc. also provided plenty of good long-haul "ground-wave" contacts on 6, but generally speaking, the boys were laying low, waiting for the fall m.u.f. peaks. One flurry of excitement developed during a nice opening on August 9th, when the state of Vermont had its first resident activity on 50 Mc. W1MEP, of Glastenbury Mountain fame in prewar days on 5, got going on 6 from his home location in Bennington. Nestled deep in a valley, Chet has yet to hear a "local" signal, but he provided Vermont contacts for W9JMS, W4JBF and W8ZVY. He heard several Florida W4s the following day but was unable to make any contacts. Look for W1MEP on 50.8 Mc.

There was a bit of "double hop" on August 10th. W60VK worked W4WMI/4, Georgetown, Ky., and heard W4AVT, Raleigh, N. C. Jim makes an interesting observation regarding the appearance of double-hop signals. Similar to his prewar experiences in Arizona on 56 Mc., he notices that the single-hop stations become very loud for a short period, and then fade down after perhaps 20 to 30 minutes, when they take on a wavvy quality and the double-hop signals start to come in. From the Bay area, Jim hears Colorado and Utah in this way, followed by W9, W8 and W2. When these fade out, the single-hop signals come back strongly and stay in for an hour or more with good strength. A somewhat similar condition has been noticed in WI, and there is a saying here, "When you hear W9PK fade, look for W6s!" It's worked more than once!

Aurora contacts were common during August, accounting for a few more "new states." The fuzzy stuff was reported on August 11th, 13th, 15th and 16th by W9ALU. W9ZHL says that the signals heard on the 15th were the loudest ever heard by this medium. He worked W4JBF, Covington, Ky., his first aurora contact with a station farther south than Terre Haute. Aurora contacts were made on several dates in the East, but it was noticed that many chances were being missed because some fellows still do not make full use of their opportunities. It's a pretty good idea to turn the beam north and listen carefully with the b.f.o. at frequent intervals!

When you get up to 45 states, the rest come hard! Ask W9DWU, who has only two to go for a 50-Mc. WAS, or W4GJO and W0USI, who lack only three. W0USI needs Montana, South Carolina and Nebraska. He heard W7KKB and W7CJN (both in Montana) in QSO one night recently, but they were still at it when the band went dead! Bill is having good luck working

(Continued on page 132)
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BENDIX TRANSMITTER TAI2

CHECK THESE VALUES: Three 807 Tubes, four 12SK7, one 2-inch 5 amp. RF meter, four Separate Master oscillators. (These can be easily changed to cover 20-40-80 meters and by using crystal for the 10 meter band you will have a complete coverage transmitter.)

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These are brand new, complete with tubes — three 12BE5, 12SK7, 12A6, and 12AR. Designed for dynamotor operation, but easily converted to 110 or 12 volt operation. Two L.F., stages and gating condenser.

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<tr>
<th>Item</th>
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<tbody>
<tr>
<td>BC-455</td>
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<td>BC-456</td>
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<td>BC-457</td>
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<td>Hallcrafters SX4</td>
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<td>$87.90</td>
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</tbody>
</table>

### POPULAR GLOBE TROTTER XMITTER KITS

**Available for Immediate Delivery**

A 40 Watt input kit including all parts, power supplies, chassis, panel and cabinets. Write for brochure and price. Complete kit furnished.

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Price</th>
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<tbody>
<tr>
<td>Cat. No. 70-309 less tubes</td>
<td><strong>$69.95</strong></td>
</tr>
<tr>
<td>Cat. No. 70-312 same as above, wired</td>
<td><strong>$79.95</strong></td>
</tr>
<tr>
<td>1 set coils, meters, tubes, extra</td>
<td><strong>17.15</strong></td>
</tr>
</tbody>
</table>

### FOR ANYTHING IN RADIO — YOU’LL GET THE BEST DEAL FROM LEO, W2FGQ

**World Distributors**

**Laboratories INCORPORATED**

**COUNCIL BLUFFS, IOWA**

134
NEW 275 WATT XMITTER

FOR IMMEDIATE DELIVERY
AS LOW AS $70 DOWN

A versatile, advanced design transmitter kit that will give you efficient performance on 6, 10, 15, 20, 40, and 80 meter bands on phone & C.W. Available in complete kit form or in individual sections. There's nothing like it on the market for quality, features, and price.

(A) RF Exciter Section — Here is one of the most efficient exciter driver units available. Capable of 40 watts input on all bands including 6 meters, 6 meter output from 2126 tube obtained by using crystal frequencies from 8355 to 8600 Kc, 10 meter crystals do a F.B.I. job for the 10 and 20 meter bands. 7CS regenerative type crystal oscillator, with provisions for 10x1, driving the new 2126, giving high efficiency on all bands. Voltage regulation is provided for oscillator tubes and screen of 2126 offering high stability to both stages. Tube line-up: 7CS oscillator; 2126 buffer doubler; and two VR150 voltage regulators. Chassis size 7" x 12" x 3". Uses 8½ x 19" relay rack panel when used with Final RF section. Weight 10 lbs.

(B) Final RF Section — Another brand new feature never before used in transmitters is a front panel Coupl-Trol that controls the amount of coupling of the antenna to the final amplifier. The latest in easily to drive triodes, the V70D's are used in the final amplifier. Designed for the shortest RF leads and parts, and placed to eliminate the presence of parasites and self-oscillation. Tube line-up: two V70D's. Chassis size: 10" x 12" x 3". Utilizes 8½ x 19" relay rack panel when used with exciter section. Weight 16 lbs.

(C) Speech Amplifier and Modulator Section — The latest in circuit design and the use of zero bias on the four 6L6's gives more power than ever before with very low static plate current. The use of resistance coupling up to 686 driver gives excellent reproduction of audio frequencies, and, incorporation of a high quality audio transformer from the 686 to the 6L6's gives more efficiency and better matching between stages. Power consumption is cut down and heat dissipation is held to a minimum by this improved circuit design. Plate voltages are relay controlled for ease of operation. This new speech amplifier and modulator is capable of modulating inputs from 500 to 3500 watts. Tube line-up: 6SJ7; 685; 6L6; four 6L6's and 83 rectifiers. Load: 450 volts at 250 amps. Chassis size: 7" x 12" x 3". Utilizes 8½ x 19" relay rack panel. Net weight 48½ lbs.

(D) Dual Power Supply Section — Tube line-up: 573; two 866A's. Load: 600 volts at 300 amps, and 1150 volts at 300 amps. Chassis size: 12" x 17" x 3". Utilizes 8½ x 19" relay rack panel. Net weight 38 lbs.


BUY ON LEO'S EASY PAY PLAN

This new WRL 275 Watt Transmitter kit is available as a complete unit, or individual sections may be purchased separately as priced below.

WRL 250 Watt Kit
Complete with R.F., Speech Amplifier and Modulator, and Power Supply sections. $274.50 $299.50
RF Exciter section .......................... 43.42 50.56
Final RF section .......................... 87.97 61.65
Speech Amplifier and Modulator section ................. 91.81 98.95
Dual Power Supply section ......................... 81.30 88.44

Complete with tubes, meters, coil set, and cabinet $19.50

3 section cabinet for complete kit, or with antenna feed inductor installed, Size 16" x 16" high, 22" wide, 14½" deep Weight 38 lbs. $19.50

Tubes for Modulator $5.80
Tubes for RF Final. $3.90
Meter for Modulator $5.50
Meter for RF Final. $5.50
Tubes for RF Exciter $6.50
Cool set for RF Final. $4.00
Cool set for RF Exciter, per band .......................... 2.95
Tubes for Power Supply, per band .......................... 4.50

Complete with tubes, meters, coil set $374.45

KIT FORM        WIRED BY OUR
WRL 250 Watt Kit Complete .......................... $351.45
WRL 275 Watt Kit Complete .......................... $374.45

World Radio Laboratories
275 W+Wats Drive, Bluffs, Illinois.

Name .................. Call letters .....
Address .................. City .....
Zone .................. State

FREE
Send data on your Own Super"
J9AAO has the automatic keyer used to transmit from J9ACS. J9AAK is on the way back, we understand, and KH6DD is on duty at Quantico, Va., making ready to get going from his home in Alexandria for the fall DX season. KH6DW is back in Macon, Ga., where he gives the 6-meter gang a thrill by signing KH6DW/W4. W7ACS is now back in KH6, and off to a flying start in making 50-Mc. history from Honolulu this fall. Several stations may be expected to be active on Guam, Iwo, Okinawa and in Japan, to give him some opportunities.

**Helpful Hints Department**

Ever wish for an easy way to check for unbalance in a push-pull amplifier? One can insert separate meters in each side of the grid circuit, by modifying the amplifier to incorporate separate grid returns for each tube, but a better method is suggested by G6DH. Denis removes the plate clips from his 24Gs and inserts a low-range milliammeter from each plate to ground. With the grid drive on (but no plate voltage applied, of course) rectification takes place and sufficient current is obtained for a good reading on a 0-10 ma. meter.

**How About 235 and 420?**

There is no denying that 144 Mc. is now definitely committed to crystal control and superhet receivers, and no one who has had the experience of operating on the band by both the old and the new methods would ever wish to go back to modulated oscillators and superregenerative receivers. The amazing difference between the spring of 1946 (DX record 200 miles) and the fall of '47 (DX record 575 miles) is almost entirely a matter of the swing to modern techniques. Operation on 2 last year was a continuous pain in the ears, what with hashy transmitters, splatter, and receiver squeals. Today, with more stations on, the QRM is negligible. Operation is similar to lower frequencies, but minus the heterodynes.

All very nice, of course, and nobody wants it otherwise, but what of the fellow who likes it simple? The modulated oscillator and the superregen are OK until heavy activity develops — why not go to 235, or better still, 420, with them?

Interest in both bands is picking up, but more stations are needed before anything like regular activity can be said to exist in either. Most of the work is confined to crossband tests, but it need not be.

Up in Arlington, Mass., W1CTW has a crystal rig and a superhet on 235, but that doesn't need to scare the boys who want to use the simpler jobs. Cal has been heard briefly in W2 on 235, and his signal was readable over the 95-mile path to West Hartford, with only 12 watts output at his end, and a much simpler antenna system and receiver at W1HDQ than are used for 144 Mc.

W1OSQ, Milford, Conn., put a solid signal up to W1DAH, North Scituate, R.I., and W1CTW, on the eventful August 27th. Frank was using a string of doublers and tripplers to drive an 832-A, (Continued on page 158)
Here's How CREI Home Study Training Prepares You NOW for a BETTER Job and a SECURE Career in Radio-Electronics and Television

CREI Courses for Every Radioman Keep You Ahead of Competition — Earn You More!

Never before have so many men like you had the opportunity to step ahead into better-paying jobs and enjoy lasting success. Men with up-to-date technical training are needed in every branch of radio-electronics. That's because radio's manpower has not kept pace with radio's technical developments.

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An Accredited Technical Institute

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Branch Offices: New York (7); 170 Broadway • San Francisco (2); 760 Market St.
for resistance readings. Three gfre: models are available in this small performance. Self contained stand­

equipment field, D • Arson val move­

ard size batteries supply current

lient pocket size make these little instruments most useful and papu~

am.meter

range •witch.

The outstanding value in the test

Model 451A A.C-DC Volt-Ohmmeter with Output Ranll, Model 4,52A Hlll'h Sensitivity Volt-Ohmmeter

138

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Drake No; 600-10 Is Ideal for those

all important connections when rewiring your

ask your nearest supplier or

write for the name of the dis­

tributor nearest you ... and
give yourself the advantages of

these superior Irons.

DRAKE RADIO
SOLDERING IRONS

600-10—the Drake No. 600-10 is ideal for these

all important connections when rewiring your

rig. Get back on the air fast · Make good de­

pendable connections with this 100 watt ¾" tip.

400—the Drake No; 400 is the perfect iron for

work in small places. Only 9 inches long, it is

especially designed for light corners and del­
cate connections. 60 watt, ¾ tip.

Ask your nearest supplier or

write for the name of the dis­

tributor nearest you ... and
give yourself the advantages of

these superior irons.

Feather Light

MINIATURE

Test Meter

The outstanding value in the test

equipment field. DRAKE's new mini­

ometer. Zero adjustment, Rotary

range switch. 1000 Ohms per volt. 8

Volts DC: 0/5/10/15/20/50/500/1000

Mils DC: 0-1

Ohms full scale: 5000/50,000/500,000

Ohms center scale: 50/500/5000

Shipping weight 2 oz. Price only $19.00 net

Model 451A AC-DC Volt-Ohmmeter with Output Ranges

Volts DC: 0-10/50/100/500/1000

Volts AC: and Output: 0-10/50/100/200/500/1000

Ohms center scale: 7200 Price only $14.90

Model 452A High Sensitivity Volt-Ohmmeter

10,000 Ohms per Volt. Volt;

DC: 0-5/10/50/100/200/500

Ohms full scale: 700/2000/20000/200000/70000/100000

Ohms center scale: 30/300/3000/30000

Price $14.90

Ask your dealer or write direct for circular

America's Pioneer Maker of Pocket Test Equipment

CHICAGO INDUSTRIAL INSTRUMENT CO.

536 West Elm Street - Chicago 10, Illinois

running 60 watts (poor thing!) input as a straight

amplifier. It was a temporary lash-up, and only

a simple dipole antenna was used, but it shows

what can be done when conditions are right. The

distance between W1OSQ and W1CTW is about

130 miles. It is felt that, with a little concentrated

effort, these paths can be nearly as good on 235

as on 144 Mc.

W9OA, 235-Mc. record-holder, with W6OVK,
is now located in Baltimore. He is interested in

trying for a new 235-Mc. record along the Eastern

Seaboard. Anyone who would like to work with

Joe can reach him at 1435 Key Highway, Balti­

more 30, Maryland.

The 420-Mc. band is getting some attention

here and there. This looks like the ideal band for

the experimentally-inclined worker. It is high

enough in frequency so that care must be used

in designing equipment, yet it is not impossible

to build simple inexpensive gear that will work

satisfactorily. Antennas are down to intriguing

dimensions, yet conventional designs work — it

is not a wave-guide-and-parabola band. W2HNY,

Westfield, N. J., has gear for 420, and is

interested in lining up others for tests. He and

W2LYP and W2MLF will arrange to operate on

a regular schedule if other interested parties will

gather on a desirable night. The rig at

W2HNY has an 8012 oscillator, with a measured

output of about 6 watts. Antennas are hori­

zontal, but they will change to vertical if it will

help to get things started.

HAMPFEST CALENDAR

IOWA — A 10-meter mobile picnic will be held Sunday,

October 5th, at Devil's Backbone State Park, near Man­

chester, Iowa. All amateurs are invited. Bring a picnic

lunch and the family. A caravan will leave Cedar Rapids

at 10 A.M. Further particulars may be obtained from

Charles W. Boegel, jr., W8CVU, 149 First Avenue, East.

Cedar Rapids, Iowa.

NEW YORK — The Federation of Long Island Radio

Chiefs is sponsoring its Eleventh Annual Hamfest at New

Columbia Hall, 86-41 122nd Street, Richmond Hill, New

York, on Friday, October 17th, at 8 P.M. An excellent pro­
gram, including prizes and entertainment, has been ar­
ranged. Tickets are $1.25 in advance, and may be pur­
chased from Federation clubs or Louis H. Roth, W2DKH,

163-18 Jamaica Avenue, Jamaica, New York.

NEW YORK — Saturday, October 18th, is the date of the

Annual Hamfest of the Schenectady Amateur Radio

Association. The affair is being held at the Hotel Van Curfer.

There will be a demonstration of mobile television equiP­

ment, prizes, and technical lectures. Reservations may be

made through Dallas T. Hurd, W2PPU, chairman.

NEW YORK — Because of last year's heavy attendance

the Radio Association of Western New York has this year

secured the main ballroom of Buffalo's Hotel Statler for its

hamfest. The date is Saturday, October 19th, with regis­

tration starting at 2 P.M. Prizes, speakers, demonstrations

and an excellent dinner are programmed. Reservations and

further information can be secured from Ed Graf,

W2SVY, 61 King Street, Tonawanda, N. Y.

ONTARIO — The Kirkland Amateur Radio League is

staging a hamfest on Saturday, October 4th, at the Canadian


Prizes, games, banquet and dancing, plus a visit to the famed

gold mines, are the pleasures of the day. Registration is

$3.00 — $1.00 for XYLs. Reservations can be made through

Secretary Hal B. Grover, VE3BJE, 149 Pollock Ave.,

Kirkland Lake, Ontario, on or before September 27th.
ARRISON HAS IT! HARRISON HAS IT!

IF you like friendly helpful service, and want to enjoy that warm feeling of confidence that you are getting a square deal and your full money’s worth, every time—

THEN I’M YOUR MAN!!

I offer you—

● COMPLETE STOCKS
  All the best makes of Receivers, Transmitters, Test Equipment, Parts, etc.—all latest models.

● LOWEST PRICES—always!

● GUARANTEE—free Service for 90 days

● TOP TRADE-IN ALLOWANCE
  at least 5% more

● FREE TRIAL
  If not satisfied with your new receiver, you may return it for full refund.

NEW ARRIVALS

MILLENT HF XMITTER

75 watts output on 11-10-6- and 2 meter bands X-Tal controlled. See Millen and Bliley ads in this issue—and then rush your order in to Harrison for quickest delivery! Model

90810, less tubes, coils, crystal, and power supply ................ $66.15

Coles, per band, set of tubes $20.04.

Millen 90811 Power Supply $64.90. Tubes $2.50

SILVER VOMAX

“Universal” Vacuum Tube Voltmeter. Readings up to 5,000 Volts, 25 D.B., 2,000 Megohms, 12 Amp. D.C. Complete, with RFC probe good up to 500 Mc. .......... $59.85

Altec-Lansing’s new WIDE RANGE AMPLIFIER

is perfect for FM and the new records. Response is within 1 DB from 20 to 10,000 cycles. Bass and low gain filter treble controls. Equalized phonograph input for G.R. Rhettenbacher and other high-fidelity units. Phonograph to Line input switch. 50 Watt output with only 2% total harmonics above 1000 Mc. $125

Stancor XMITTER KIT

ST-265-A. Up to 72 watts output on all bands, 10 to 20. Band switching of earlier stages. Complete kit including twin power supplies, with chasis and cabinet. less accessories... $92.80

Come in and see the new TEMCO GA

Series of “Unifized” Transmitters

QUICKER DELIVERY

I know how eagerly you look for its arrival!

HARRISON EASY PAY PLAN

Easiest terms in the country! Tell me what you want, terms desired, and enclose only $5

AND there’s plenty more good reasons for doing business with me. Let’s get together—I promise you’ll be well satisfied. Drop in, or write to me—NOW!

TNX ES 73

Bill Harrison
W2AVA

Here’s a ROTATOR for your BEAM!

* Runs on 24 to 33 volts AC or DC
* Reversible—only three wires required
* Approximately 36 RPM
* 7056 to 1 Gear Reduction
  (No free swing)
* Powerful motor, rugged precision gear train, and sturdy thrust bearing—will support and turn any ham beam.

Weatherproof housing

Used on aircraft to control pitch of propeller, these dependable motors are easily converted into an FB beam rotator! Used, but in perfect tested working condition, with conversion data $12.95

(Optionally-converted—motor housing freed, brake and brake release solenoid removed, terminal jummed, control leads pulled, and limit stop stops removed........ $3.80 extra)

Phone and Mail Orders add $1.25 for packing

TRANSFORMER. To run motor, etc. Deliveries: 27 V at 4.3 A, 3 V at 3.4 A, 6.4 V at 3 A, and 7.5 V at 3.5 A.

Primary 115 V 60 cycle. New ........... $4.48

OVERLOAD RELAYS

5 KW AC PLANT

with Electrical Reset. Protect your tubes, etc. by using this relay to shut down power supply when plate current exceeds safe value. Sensitive, compact, rugged. Pulls out on 15 MA or more. For high currents use adjustable shunt resistor. Has easily rewind coil form with a 110 spool of No. 38 Enamel. For spring adjustment of 150 to 600 MA. Reset coil 115 volt, 60 cycle. Navy inspected, brand new. Worth many times my low HSS price........ $545

HARRISON HAS IT!
TRYLON ROTARY BEAM ANTENNA SUPPORT

for 4-element 20-meter array

Quick, easy to install on any tower. Stainless steel, spot-welded construction. 19" 2" long, yet weighs only 30 lbs. Adaptable to either manual or motor drive. Ball bearing design provides full 360° traverse. Support can be tilted in either direction for easy accessibility. Has ample safety margin to withstand severe wind and icing conditions. Write for descriptive circular.

TRYLON TOWER AND ANTENNA DIVISION
Wind Turbine Co., West Chester, Pa.

How’s DX?

(Continued from page 61)

PK1TC (ex-PK2TC), S/M Ted Thyssen, 18 Sqdn., N.E.I. Air Force, Batavia, N.E.I.
PK2ML, Max R. Rommel, Corp. Tel. 18,352, e/o O.A.Z., Semarang, Java.
PK3OK, 5 Slamet St., Surabaya, Java, N.E.I.
PK5PC, Box 78, Macasar, Celebes
ST2FT, P.O. Box 253, Khartoum, Anglo-Egyptian Sudan
VR2AR, RN2AF, Lautbala Bay, Fiji Islands
V87DR, 205 Squadron, RAF, Ceylon
VU2BX, James Bullick, Rungamuttee Tea Estate, Mal. P.O., Dooars, N. Bengal, India.
VU2DE, W. M. Hamilton, Post Box 6, Cochin, South India.
ZA1RP, Post Box 49, Tirana, Albania.
ZC6SV, Box 30, Haifa, Palestine.
ZD1WB, Gilliam Bonage, e/o Post Office, Freetown, Sierra Leone, W.A.
ZD4AL, West Africa Signal Regiment, Accra, Gold Coast, W.A.

Tidbits:

An up-to-date listing of postwar DXCC standings will be found in the Operating News department of this issue. . . . . . . . HZ2TG will QSL via W5ZRA for all contacts between April 23, 1947, through June 24, 1947. . . . . . If you are looking for Sardinia, a contact with H1AHP or H14HL will do the trick. . . . For confirmations for contacts with XU1YK, send your cards to E. S. Maloney, 6600 Pinney Branch Road, N.W., Washington 12, D. C. . . . Ex-WGYUV is now with the American Arabian Oil Co., Dhahran, Arabia, so if you suddenly hear a new HZ don’t be surprised. . . . . . HS1LN, HS1DI, HS1CF and HS1MR are all the same station, and the gang there request that their cards be held until one is received from them, as they are operating slightly off-side. . . . KP4KD, in answer to our query, says one can make the DXCC without having worked Asia. His all-time total minus Asians is 111. . . . VS1BX, now back in England, says all stations QSOed from Singapore not having received his card may obtain one by writing to Victor H. Thorne, 79 Blinco Grove, Cambridge, England. . . . . . W1AZW informs us that ET1JF is not where one might think he is; however, he is good DX for a lot of us. . . . . We have never seen a so-called antenna farm, but here is a quote from W4BPD: “I have a 150-acre farm now and have already put up the following antennas: 10 different rhombics, each 5½ waves per leg, one long horizontal, 16½ waves per leg, one 10-element 20-meter Sterba, one NW-by-SE half-wave, one 10-meter vertical extended-Zepp, one 20-meter vertical extended-Zepp, and I intend to put up some more just as soon as I find my weak points on the globe. The place is fairly well covered up now with antennas, but there are a few clear spaces left for some more rhombics, Sterbas, . . . (Continued on page 148)
THERE'S A DIFFERENCE, in YOUR favor when you specify the new, improved RCA Power Tubes. They account for but a small fraction of the cost of your rig, yet their efficiency and stamina determine your operating results! NEW TUBES ARE YOUR BEST BUY!

Newly developed materials and manufacturing technique contribute greatly to RCA's success in making fine vacuum tubes.

The Terminal Radio Corporation is proud, as one of RCA's tube distributors, to offer these improved RCA tubes for amateur radio and commercial applications.

Each and every NEW RCA tube is accompanied with the full written warranty of the Radio Corporation of America guaranteeing its faithful high performance.

Check These ADVANTAGES!
You get them ONLY when you buy NEW tubes (now in stock at TERMINAL).

- Latest design improvements
- Newest post-war materials
- Highly uniform characteristics
- Increased power ratings for many types
- Manufacturer's liberal warranty
- Confidence in Quality — No uncertainty about this!

### NEW, IMPROVED RCA POWER TUBES — IN STOCK

<table>
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<tr>
<th>TRIODES</th>
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We are also distributors for AMPEREK, EIMAC, GENERAL ELECTRIC, H-K GAMMATRONS, HYTRON, RAULAND VISITRONS, RAYTHEON, SYLVANIA, TAYLOR and UNITED tubes. WRITE TO US FOR COMPLETE PRICE LISTS AND NEW OPERATING DATA, FREE ON REQUEST.

Ask us for Newest Listing of RCA Radiotron Receiving Tubes — We Have Them! WE PAY FOR SHIPPING AND INSURANCE on all tube orders over $5.00 when accompanied with remittance in full.

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Transformers and Rectifiers of All Types
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Audio Amplifier Kits and other
Electronic Devices to serve the
Discriminating Amateur.

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:

<table>
<thead>
<tr>
<th></th>
<th>Power Output (kw.)</th>
<th>Audio Freq. (cycles)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.5</td>
<td>1.0</td>
<td>440</td>
</tr>
<tr>
<td>5.0</td>
<td>10.0</td>
<td>440 and 4000</td>
</tr>
<tr>
<td>10.0</td>
<td>continuously</td>
<td>440 and 4000</td>
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<td>15.0</td>
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<tr>
<td>20.0</td>
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<td>30.0</td>
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<td>440</td>
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<td>35.0</td>
<td>continuously</td>
<td>440</td>
</tr>
</tbody>
</table>

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 First All-European DX Contest is scheduled from Friday, November 28th, 1801 GCT, until Sunday, November 30th, 2359 GCT. Only c.w.-c.w. QSOs will count on this weekend. The second period will be from Friday, December 12th, 1801 GCT, until Sunday, December 14th, 2359 GCT, only 'phone-'phone QSOs counting. Full details will be given in November QST.
De Mambro
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—and—
Those "Hard to Get" Items
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729 Main Street

Manchester, N. H.
1268 Elm Street
Hints & Kinks
(Continued from page 68)

that an arc-over has taken place. Should there be a permanent short-circuit, the relay will oscillate with a buzzing sound that will be a sure tip-off to the operator to pull switches before the power transformer burns out.

The condenser shown in the diagram will absorb brief surges that do not result in an arc, and the variable resistor $R_1$ is used to set the point at which the relay will operate. A setting that causes it to operate at any overload 50 ma. in excess of the normal current drain will be satisfactory in most cases.

— Eldon L. Kanago, W0UIC

GETTING THE MOST OUT OF YOUR MOBILE POWER SUPPLY

Fig. 4 shows a method of getting the most out of a mobile power supply with the least battery drain. A 250-volt vibrator supply is used to power the oscillator and the speech amplifier, and a 500-volt dynamotor (not shown in the drawing) supplies the r.f. amplifier and the modulator. The novelty of the circuit is that the positive terminal

(Continued on page 149)
Millen High Frequency Transmitter

75 watts output, using 829 B tube in final. For 10-11, 6, and 2 meter bands.

No. 90810 $69.75

Abbott BM-2 5 Element 2-Meter Beam Antenna
Fed with 300 ohm twin lead. Weighs only 3 lbs. All aluminum construction. Special 8.82

A RESCO SCOOP ON ANTENNA SECTIONS

39" long by 3/4" diameter. Constructed of spring tempered light steel tubing, rust-proofed. Each section screws into another with tapered section, to make electrical contact. Assemble as many as you wish. Each section 15c.

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Modulation Meter 34.75 Net

IN 24 CRYSTAL DIODES
Germanium in 24 crystal diodes by Sylvania . . . $1.60

COILS FOR HALLICRAFTER HT-9 TRANSMITTER
Complete Set for 10 meters 16.50 Net
Complete Set for 20 meters 15.50 Net
Complete Set for 40 meters 11.75 Net
Complete Set for 80 meters 10.85 Net

POWER RELAY
One of best on surplus market. Made by Leach, D.P.S.T. (makes 2 contacts) 115 V AC coil, 60 cycles. Rated current handling cap. 30 amps. 4.95

U.S. ARMY HEADSET HS-30-R
Lightweight, complete with extra pair rubber ear inserts, clip to take off ears and adjustment instructions. Standard low impedance (500 ohms) . . . . 95c

Coupling transformer with cord and plug to convert headset to standard high impedance (400 ohms) . . . . . 25c

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1126 BANK ST., CINCINNATI 14, OHIO
of the vibrator output is grounded instead of the negative. In this way, the low-voltage supply may be used as a source of bias voltage as well as a supply for the oscillator and speech amplifier.

The advantages of the system are numerous. The bias voltage does not subtract from the supply voltage, as it would in cases where the bias is obtained from a tapped grounded bleeder. The oscillator plate condenser may be grounded without requiring parallel feed, since the positive is grounded. Fixed bias may be used, without requiring batteries, eliminating the need for cathode bias. This results in a saving in the power usually lost in the cathode resistor, and permits the final amplifier to operate at the full supply voltage.

—Zoltan T. Bogar, W3GJM

**Delta & West Gulf Divisions in Joint Convention**

Over 500 amateurs from the ARRL Delta and West Gulf Divisions met in a two-day convention at the Grim Hotel, Texarkana, U. S. A., on August 17-18th. A well-rounded program was presented, arranged under the joint sponsorship of the East Texas and Texarkana Radio Clubs.

- The convention was welcomed by the mayors of both Texarkana, Texas and Texarkana, Arkansas. "Eonco" N. C. "S. R. T." Settle, W6DAS, launched the Saturday morning program, which included a get-acquainted session under the guidance of "Mr. X," prize awarding, and a meeting of ARRL appointees. The latter group heard a talk on emergency matters by FCC Regional Manager Joe McKinney.

Highlighting the convention was the Saturday afternoon session. A beam-tuning procedure was demonstrated by Texarkana club members, led by W5KKM, Cmdr. R. V. Robinson, ex-W51KN, spoke on the Naval Reserve. Major H. E. Eversole, W6JDA, spoke for the Army, and W. C. Stickler, W3KOP, of the FCC Washington office, discussed licensing procedures and arranged for license examinations. Bill Anthony, W5ZS, presented pointers for the v.h.f. men, while Direction Wayland Groves discussed late developments at the Atlantic City conferences, reading a telegram from ARRL President George Bailey, W2KH, whose convention in person. Dick Smith, W1FTX, of Headquarters, demonstrated a new premodulation speech-clipping amplifier.

A movie showing the war record of the 8th Air Force was presented by the Shreveport Radio Club. A brief comedy session, "For Men Only," starring W5GJU, was followed by a code-copying contest under the supervision of RM Joe Bush, WSGDU. First prize was copped by WSNW.

A dance at an under-the-stars nightspot was followed by a midnight intermission. Mysteriously, the Saturday night session continued for the balance of the evening.

Sunday morning's sessions, ably handled by Russ Curry, W5DJC, included the awarding of numerous additional prizes. The two Divisions held separate banquets and business meetings Sunday afternoon, Houston and New Orleans being selected as sites for the 1948 conventions.

Equipment displays, QSL card distribution by QSL Manager Ray, and the full-time operation of stations W6TEX and W6USN/6 (Navy mobile) rounded out this most successful convention.

Thanks are due members of the convention committee, Chairman W5AQF, W5EGY, W5KKM, W5CEO, W5JY, W5GJU, W6DAS, W5CEC, W5ZUJ, W5HFD, and their families, for a job well done. — R. M. S.
A STORY FROM THE TROPICS

Box 201
Montserrat
Br. West Indies
12th Mech, 1947

Dear Sirs:

This is the story of a Turner Model VT-73 Crystal Microphone, Serial 1558. I bought this microphone in 1942 used. I cannot say when it first saw service.

I used it for about 2 years under extremely rugged conditions and then stored it for 18 months in an unused building. When I next saw the mike it was extremely wet, covered with sand, and had a fungus "beard" growing on it. (The mike was dropped on a sandy beach when it was shipped back to me). I dismantled the unit, found considerable sand and corrosion inside. The unit was cleaned and dried and has been giving excellent service in a police radio installation since.

I would like to express my sincere appreciation and have no hesitation in recommending Turner Crystal Mikes for real hard, rugged service in the tropics.

Very truly yours,

FRANK S. DELISLE
VP2MY

THE TURNER COMPANY
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W8ENH $2.70
Postpaid

Made of sturdy, light weight cast aluminum with letters and borders raised and satin finished against a baked crackle enamel background. Black is standard—red, gray or blue 50c extra. Size 3¼" x 3¼" with large 1½" letters.

For YOUR CAR - Type A-18
Cast with brackets for auto mounting and two 6-32 x 3/8" threaded studs for panel mounting.

For PANEL MOUNTING - Type A-19
Same as above, but without auto brackets. Equipped with studs for panel mounting.

LAPEL BUTTONS

W9HKZ Actual Size $1.10
Postpaid

Type A-26 - These attractive metal lapel buttons furnished with screw type backing for lapel. The raised lettering is sharp, clear and highly polished against a black enamel background. Other colors for 50c additional per order.

TERMS - Orders under S5.00, cash with order; orders over S5.00 require 20% deposit. Balance C. O. D.

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Correspondence

(Continued from page 94)

CLEANING-UP

10014 N. 30th, Quincy, Ill.

Editor, QST:

For some time I have been seeing comment in QST in regard to power bands. It seems to me if we can clean up our present bands it would be a big improvement. FCC has a ruling in regard to key-down operation in all bands 14 Mc. and below; yet any time of the day or night you can hear any number of heavy-fisted dopes tuning up with a foot on the key. I wonder if these guys ever heard of antenna dummies to be used for making adjustments on transmitters?

Also, how come so many commercial stations are operating in the ham bands? Did you ever listen to 20 meters after midnight? It sounds like the commercials are lined up shoulder-to-shoulder.

I recommend we clean up our present bands before we ask for more.

— H. L.oe, W0WTV

[Editor's Note: During the war and its aftermath, a great many "commercial" and government stations made use of the amateur bands, under special wartime powers. Amateur who still intercept such stations are asked to log the consistent offenders and report calls, times and frequencies to ARRL.]

OPERATING PRACTICES

Lake Charles, La.

Editor, QST:

At the present time hams using high-power rigs are involving serious regulations. There is no justification for a power input of over 150 watts on forty c.w. Especially is this true in the daytime when ninety per cent of the contacts are made within a range of 200 miles. I don't know how any ham can justify the use of more power than that mentioned except for emergency operation. I am not in favor of restricting power to less than a kw. by regulation but unless all hams realize soon the extent of our own excesses this will be the inevitable result. If you want to hear some fine examples of the use of excess power just tune your receiver to the 75-meter 'phone band. It will not be necessary to tune any of the half or whole kilowatts on the nose because the noise, in too many cases, spreads all over the face.

— M. J. Dugan, W2JFR

Editor, QST:

In recent months the League has been conducting an extensive campaign to clean up amateur signals. Great headway has been made, but it is evident that some people will never conform. I am speaking of those c.w. men, mostly "old-timers," who insist on having "adequately-filtered direct-current plate power supply." How, then, can these few have their apparently deliberate T6 notes?

— Herbert J. Shear, jr., W0WTQ

3.5-MC. HORIZONTALS

191 Myrtle Ave., Elmhurst, Illinois

Editor, QST:

In reference to the excellent article on eighty-meter antennas, in the August issue, I have been my experience that the sky-wave path between any two points provides from 3 to 10 times as much signal strength as does the ground wave, particularly at night. As a result, I find that almost any horizontal antenna will produce better results than any vertical within reach of the average amateur.

As a prewar member of the AARS, I was particularly interested in developing an antenna that would provide consistent signals up to a 500-mile range, using low-power transmitters. Both horizontal wires, and antennas radiating primarily vertically-polarized waves, were tried; as a result, I found the horizontal to be far more effective and consistent. While the vertical produced good signals over short ranges during the daylight hours, effective communication beyond 100 miles was not usually possible after sunset.

(Continued on page 150)
Uses

ROTATING MAST

allowing great vertical strength. Rotator and you stay on ground!

$194

as shown. Includes the two beams, beam clamps, 18-ft. mast, two bearings. Use your own motor or ours.

U.H.F. RESONATOR CO.  “TEN-OVER-20”

Power gain of 11.5 over a folded doublet on ten meters, 9.5 on 20 meters. No reaction between beams! Buy one now, add other later as you wish. Beams and combinations from $35 up to $400.

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CONVERTER
2, 6, 10, 11 meters
SUPERIOR in all ways—Band switching, Voltage regulator, AC Power Supply.

Enjoy IMAGE-FREE Reception. Price $66.60—$16.60 with order, balance C.O.D.

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ARCS; 3 to 6 MC Receiver $3.95
Hard Aluminum Tubing ½” to 2”.

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MODULATION & DRIVER TRANSFORMERS

These transformers are suitable for use with type 811, 809, TZ40, TZ20, etc. to modulate either triode or beam tube RF amplifiers. Two secondaries are provided. Impedance ratio primary to secondary number one, 2 to 1. Primary to secondary number two, 16 to 1. Will modulate up to 300 watts input. Modulation transformer, driver transformer, circuit diagrams and other information all for .......... $6.90

These effects are attributable to favorable angle of radiation rather than to polarization of the waves.

Thus it would seem that the average amateur interested in getting the most contacts on the 80-meter band would be advised to erect a horizontal antenna. As discussed, the height above ground is relatively inconsequential inasmuch as under normal nighttime conditions any radiation striking the layer at these frequencies will be returned and the sky wave will "illuminate" a large area. This, while true of the 80-meter band, is of course not necessarily true for higher-frequency operation where the higher radiation angles may well be useless for communication.

— C. F. Rockey, jr., W9SCH

PUBLIC RELATIONS

Sackville, N. B., Canada

Editor, QST:

Have just received August QST, and as I always first read the editorial section I thought I would immediately drop you a line on the contents of this one. I believe that if more amateurs would pay a little more attention to the vital matter of better public relations, our cause would be indeed furthered. As you know only too well, the average Mr. Public knows only one thing about that amateur that lives next to him: he is that fellow who listens to his radio programs.

I feel quite sure that if every amateur would seriously read, digest, and then finally act in accordance with the principles outlined in your editorial, the amateur fraternity would on the whole be better understood by the aforementioned Mr. Public.

— Ronald J. Heiser, VE1K3

RE QST

75 Harcourt Ave., Bergenfield, N. J.

Editor, QST:

Let me congratulate you on the appearance and mechanical correctness of your publication. It's a nice job and certainly must involve plenty of double-checking. I can appreciate what it takes since I'm managing editor of an industrial trade paper.

Let's have more down-to-earth articles on how to build noncomplex equipment. Not everyone has the time or patience to construct superfancy receivers let alone transmitters. A couple of articles recently are right along this line; for example the small transmitter by one of your staff...

The trend these days is toward more and more specialization, but I wonder just where a person could draw the line between the type of articles suitable for Electronics and that for your own publication. You certainly want to include all useful information on the subject of amateur radio, and yet a few of the articles sound distinctly "high-brow." Please understand that these rather disjointed remarks are not intended as carping criticism to pick fault with your paper. I enjoy reading it each month from the sidelines, so to speak, since I haven't the time or ambition to become a ham. You're doing a good job — keep it up!

— J. W. Moss

18 Spring St., Williamstown, Mass.

Editor, QST:

A lot of fellows want simpler articles in QST. Listen — if a fellow has sufficient interest in radio to study it for its own sake then I should think he'd want to learn all he can about it and be proud of the fact that he's intelligent enough to understand such a technical subject as radio. He should further be proud of the fact that his favorite ham mag. QST, should continuously demonstrate that mere amateurs, not professional radio engineers, have so great a knowledge of (Continued on page 188)
These little B & W Miniductors are just what the doctor ordered for all sorts of high-frequency inductance uses in modern rigs. “Air-Wound” construction assures real efficiency because there’s an absolute minimum of insulating material in the electrical field. Miniductors come in standard diameters of ½”, ⅜”, ⅜”, and 1” and can easily be cut down to any desired number of turns. Each diameter comes in 4 different winding pitches. Write for the complete B & W Air Inductor Catalog.

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Powerful gear train and motor housed in rugged aluminum pedestal. Speed 2 r.p.m. Instantaneous reversing. Automatic lock-in prevents drift in strong winds.
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Be a "key" man. Learn how to send and receive messages in code by telegraph and radio. Commerce needs thousands of men. Expansion of air commerce and freight after war should create an even bigger pent-up demand for operators. The famed Candler System, maker of world's champions, teaches you the "knack" of sound sense and sound consciousness that is the secret of speedy sending and receiving. Good pay, adventure. Learn at home quickly.

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$169.50

Listen to the amazing AM-FM-CW performance of Hallicrafters new MODEL SX-43

THE "IRRITATING CQ"

In reference to W1LVN's letter complaining about the "wolf-calls" QO from W5KMD, it's the sign of the times. Of course, I realize that a full, red-blooded ham never listens to frequencies below 3.5 Mc. If he did, however, tune his receiver to the never-never band between 550 and 1600 kc., he would be assailed with an obnoxious, offensive device known as the singing commercial.

Now let us be realistic. Sponsors would never shell out (Continued on page 164)
Corulite Elements for Light-Weight Arrays

Unusual Strength — Telescoping For Adjustment — Easy To Handle

Designed to meet the need for light-weight but sturdy elements for use in horizontal arrays and similar applications, Premax Corulite Elements are unusually light in weight and their special corrugated or reeded design provides exceptional strength and rigidity so essential in horizontal arrays. Available in 5' to 17' extended lengths or in special 10 and 20 meter kits. Fully telescoping and adjustable over 5' length.

See your radio jobber. If he cannot supply you, write direct.

Premax Products

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4812 Highland Ave. Niagara Falls, N. Y.
<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
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<tbody>
<tr>
<td>Johnson 50ED45, dual 50 mmf 4500 v. spacing</td>
<td>$2.50</td>
</tr>
<tr>
<td>Cardwell NP55ND, dual 35 mmf .084 spacing</td>
<td>2.50</td>
</tr>
<tr>
<td>TS-9 Kellog French Handset</td>
<td>2.95</td>
</tr>
<tr>
<td>T-178 Push-To-Talk Mike</td>
<td>1.50</td>
</tr>
<tr>
<td>C-D 2 Mfd 1500 v. oil-filled</td>
<td>1.40</td>
</tr>
<tr>
<td>Westinghouse 0-5 RF Ammeter</td>
<td>2.50</td>
</tr>
<tr>
<td>RCA UX Sockets (for 866, etc.)</td>
<td>.25</td>
</tr>
<tr>
<td>HK-24G $1.20, 811 $1.90, 913</td>
<td>3.00</td>
</tr>
<tr>
<td>813 $4.75, VR-105 VR-150</td>
<td>.75</td>
</tr>
</tbody>
</table>

Write for latest bulletin, send 20% with COD orders

73, JULE BURNETT W8WHE

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good American cabbage if the returns were poor. Psychologically, the singing commercial pays off because people remember an irritating stimulus a lot longer than a soothing one. So let's give W5KMD credit for using the latest technique of having people remember his call letters, the irritating CQ.

— A. A. Goldberg, WEHKU

SIGNAL STRENGTH
P.O. Box 5080, Univ. of Md., College Pk., Md.

Editor, QST:

Do you know of anyone who would like a nice new S-meter?

Serious, I think that the best way to clear up this reporting situation is for you to continue publishing such articles on using the meter readings as an indication of signal strength. Having recently read my ticket, I can say from experience that the new amateur makes the errors that the old-timer does, usually because he follows the practices of the amateurs already on the air...

— Sol Leise, W6JY

CALL CHANGES
68 Ieberson, Hamilton, N.Y.

Editor, QST:

We Who think that we were unfortunate in call area changes, causing some of us to lose our calls, must admit that we are still pretty lucky. A Colombian friend just wrote me that he had received his annual call sign change!

— H. S. Bradley, WBQHH, ex-W3TJW

QSLs
Julian, N. C.

Editor, QST:

Just a few words in support of W8XNK. I had hoped for quite a while to get a W.A.S. I have given up in disgust. To get a W.A.S you would have to work all states five or six times. It is so easy to fill out a QSL and it only costs one cent.

I was very much amused a few nights ago when I tuned across ten meters. One amateur was telling another what he thought of a fellow in a foreign country that had owed him a card for three or four months. He was in one of the states that I wanted. I looked in the log and there was his call.

I looked in my cardbook and you can guess the rest.

His card was not there.

— Eus. Thacker, W4IOH

EX-POW
159/6 Seymour Road, Shanghai, China

Editor, QST:

XU8RB is still alive and kicking after surviving a Japanese political prisoner-of-war camp from November, 1942, to August, 1945, arriving back here in Shanghai in October of that year. I would like to hear from the gang whom I worked on the 20-meter band in 1938-1939...

— R. J. Broodley, XU8RB

APPECIATION
1203 N. Walnut St., Brady, Texas

Editor, QST:

While I am not yet a ham, I have hopes, and I want to express my appreciation of some of the ham spirit I have personally enjoyed. Two different hams, whom I wrote relative to surplus receivers, not only took time to answer me, but wrote long letters on the fine points of the equipment to help me out, even though they didn't know me from Adam. And I know how much time it takes to write a letter that long, too, so I know that they did me a real service....

— Cecil R. Nola

SWITCH TO SAFETY!
Introducing...

A COMPLETE LINE OF

New Crystal Units

Designed for stability, dependability, and economy by

CLARK CRYSTAL COMPANY
MARLBORO, MASS., U. S. A.

Successor to Precision Crystal Division, Harvey-Wells Electronics, Inc.

Line includes both plated and pressure mounted types—hermetically sealed in metal, glass or phenolic holders—temperature controlled ovens—dual frequency and multiple crystal units—any frequency 50 kc to 54 mc.

- All types are acid etched to prevent aging
- All types have low temperature coefficients
- All types are guaranteed unconditionally

- All frequencies are calibrated within .01%
- Exact frequencies at no extra cost
- Postpaid anywhere in the Americas

SPECIAL INTRODUCTORY OFFER—ending October 31, 1947

3 80 or 40 meter crystals (pressure mounted—½" pin spacing) $2.90
3 20 meter crystals (harmonic-pressure mounted—¼" pin spacing) $3.95

GREENLEE CHASSIS PUNCH

A "must" for punching fast, round, smooth holes. Screw action. DOES NOT WARP THE METAL. Order several sizes. All come complete with punch, supporting die, and cap screw.

<table>
<thead>
<tr>
<th>Size</th>
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POWER SUPPLY KIT
FOR THE BC-221

Delivers 135 V DC plus 63 V AC. Complete set of brand new parts to assemble the kit, including Staneor filament transformer and special schematic featuring prevention of AC line to ground short circuit.

They contain Everything! Only Sun Radio Has 'Em!

$595

SPEEDWAY ELECTRIC ¼" DRILLS

Lightweight and compact electric hand drill. 3 jaw type. Makes straight drilling easy and accurate. Built in cooling fan. Shockproof body. Only $1.80

$525

SUN RADIO & ELECTRONICS CO., INC.
122-124 DUANE ST.
NEW YORK 7, N. Y.
BARCLAY 7-1340

ORDER NOW!

Kit #1—500 or 700 Volts DC @ 300 ma...
Kit #2—1000 or 1250 Volts DC @ 300 ma...
Kit #3—1500, 1750 or 2000 Volts DC @ 300 ma...

Complete wiring diagram with every kit

$59.50

POWERFUL SAVINGS with Buck's
POWER SUPPLY KITS

FROM 500 TO 2000 VOLTS

Everything you need to build your own power supply. All parts are brand new: condensers, tubes, sockets, bleeders, Kenyon transformers, Miller caps and H.V. connectors and special, heavy-duty chassis with bottom plates. All systems have 4 mfd. filtered choke input.

ORDER NOW!

Kit #1—500 or 700 Volts DC @ 300 ma...
Kit #2—1000 or 1250 Volts DC @ 300 ma...
Kit #3—1500, 1750 or 2000 Volts DC @ 300 ma...

$89.50

$189.50

$189.50
HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in this country.

(2) No display of any character will be accepted, nor can any display of typographical arrangement, such as all or part casts setting, nor will any display of prose which would be impossible to reproduce in Typesetting stand out from the others.

(3) Closing date is 40 day before date of publication in which advertisement will be allowed.

(4) A special rate of 5¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature. Before an advertisement is accepted, the publisher reserves the right to reject the advertisement or to decrease the space allowed.

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

(6) A special rate of 5¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature. Before an advertisement is accepted, the publisher reserves the right to reject the advertisement or to decrease the space allowed.

(7) Exceptions to this publication rate of 40¢ per word for display ads will be made only on account of the very nature and is placed and signed by a member of the American Radio Relay League. Samples, 2138 So. 16th Ave., Denver, Colo. Write for specials. World Radio Labs., Council Bluffs, Iowa.

(8) No advertiser may use more than 15 words in any one issue.

(9) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in this country.

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(14) A special rate of 5¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature. Before an advertisement is accepted, the publisher reserves the right to reject the advertisement or to decrease the space allowed.

(15) Exceptions to this publication rate of 40¢ per word for display ads will be made only on account of the very nature and is placed and signed by a member of the American Radio Relay League. Samples, 2138 So. 16th Ave., Denver, Colo. Write for specials. World Radio Labs., Council Bluffs, Iowa.

(16) No advertiser may use more than 15 words in any one issue.

Having made no investigation of the advertisers in the classified columns, the publishers are unable to guarantee the 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 photo-electric crystals. Diamond Drill Carbon Co., 715 Vine St., Kansas City.

QS in colors. Stamps for samples. Glenn Griffith, F3SWF, 1042 Pine St., St., Mark's Church, Mankato, Minn.

DEKA-XTL, new compact 10-crystal unit for standard 3-prong socket. Looks and operates like a dial-knob. Just plug it in and turn.

METER repair, Braden Engineering, 3217 Kenmore, Dayton, O.

COMPETITIVE prices for radio and television equipment and supplies. 80 total sockets. 80

PAN-Ocel-O-Recr, Govt. surplus. Performs work of four units; Panoramic adapter; oscilloscope; synchromesh; rev. 3rd cone, 31 tubes ranging from a low step 3-80-300 to a high step 3-100-300. Will sell on $4-00 deposit for vertical and horizontal plates. 110-volt 60 cycle operation. Price: $100. H. G. Tuckahoe, 5, N. Y. Phone Tuckahoe 5-645.


TRADE: Pair Gigantic Handle-Talkers, per conus for VFO, preferably Bud. Also have Xetron Radio Generator, Models 8A10 and 8A11 listed for $195.00, New, unused, for $125.00. Also XG4A or other amateur gear. W3J, M. York, WICO, Houiston, Tex.

FOR SALE: transmitter $900, receiver $700, will pay any reasonable offer. All letters sent. W. Lee Breed, W0WRK, Grundy Center, Iowa.

FOR SALE: transmitter 300-watt cw, Millen exciter driving pair 12M in triode filter power supply, four meters and tube rack. Reason: drifted. Parts alone cost $250. Used six months. First money order gets it. W. E. McKinley, Hubbard, Iowa, WOPK.

WILL pay seven dollars for a BC173E dynamotor. Write H. T. M., Muskegon, Michigan, Michigan.

FOR SALE: all or none: BC160-xtr, new, $3.85; Direct-0-Beam rotating device, Premax three-element beam, 200-0.00 coaxial cable, antenna tuning and power supplies, items ranging in value from $2.00 to $25.00. Will sell any part for cash or contract discount or agency commission will be considered only.

AUTO TRANSFORMERS: limited quantity. Control low-line voltages to decrease plate supply to 121-volt, 60 cycle, continuous. Output variable in 2 volt steps from 20-80V. Price: $5.00 each based on 350 volts kp. Includes line terminal, 1/4" x 1/4" KP rig completing, James A. Lee, 501 Hickory St., Abilene, Texas.

TRANSFORMERS: filament 110 volts primary secondary 6.3 volts at 10 amp, 6.4 volts at 7 amperes, 2500 volts insulation, plated and hermetically sealed, complete only. Price: $5.50 x 5/4 x 3/4 Price: $2.95. E. J. Voigt, 3133 1142 S. 16th Ave., Denver, Colo.


WANTED: Motorola FM-103D or FMTSOD, mobile xtr. Sell: new $65. $55 with some parts. Used six months. First money order gets it.. W9FCL, Grundy Center, Iowa.

14546 Marlowe, Detroit 27, Mich.

Sells BC-3422, AC converted, $90, HO-192-X with spkr, $150 both in very good condition. Wohler, WCO-15.

WDLX ex-WDLX ex-WX4N, 301 Jefferson St., Valdosta, Ga.

FOR SALE: NC-44 with speaker. $45, EX-D4AXB, T. W. MacCleave, 1434 Main St., Detroit 27, Mich.


Belden BC-221 frequency meter, crystal, calibration tubes, tubes, complete like new, $35. BC-221 used, $37.50. Prewar HAWK, $100. W5NL, 226 N. Main St., Dubuque, Iowa.

SELL Carrell BC-221 frequency meter, crystal, calibration tubes, tubes, complete like new, $35. Belden BC-221 used, $37.50. Prewar HAWK, $100. W5NL, 226 N. Main St., Dubuque, Iowa.

SWAP: 1 yr. old. Needs speaker cone FJ otherwise, for BC-348 even so. Box 275, Hawkinson, Ia.


WDLX ex-WDLX ex-WX4N, 301 Jefferson St., Valdosta, Ga.

FOR SALE: NC-44 with speaker. $45, EX-D4AXB, T. W. MacCleave, 1434 Main St., Detroit 27, Mich.


Belden BC-221 frequency meter, crystal, calibration tubes, tubes, complete like new, $35. BC-221 used, $37.50. Prewar HAWK, $100. W5NL, 226 N. Main St., Dubuque, Iowa.


FOR SALE: Two tone/cw xms complete, Stancor 20P, 16/1670 20-watts, $45, Composite 30 watts 6V6/6F6, 80-10, 165, WIBB.

SELL: Two tone xms in Par-Metal gray cabinet. H. Ecke, 60 W 114 St, New York, N.Y.

SLL Hallicrafters S-20R rf; slightly used, $35. J. R. Burkhardt, 20 Poinsettia Ave., Los Angeles, Calif.

COLOR TONE QSLs! New, modernistic designs in distinctive colors. Dealers on different subjects in your area with special ColorTone QSLs, send you the finest ColorTone Press, Tunap, Miss.

QSLS. SWLS. New designs. Write Dossett, W8VBR, 595 Burling Ave., New York, N.Y.


SSELL: RME-55 cvr, comp. Kept in excellent condition. Best highest $150 or near. 100 ‘no reserve.’ Dealer Stanley J. Missakian, WINE, 18 Clark St, New Britain, Conn.

MEISSNER signal booster, Model No. 9-1068. New tubes, Excellent condition. Best offer accepted. W8CNU, P.O. Box 224, Cedar Rapids, Iowa.

NEW: One new HT-9 xmr, comp. with 10-meter coils and stxal, also mike; $350. SHORT S12B rig, with power supply, $150. USED HT-9 cvr, spkr, power supply. First $500 check takes both. J. H. Stephens, Jr, W7WQJ, P.O. Box 126, Port Clinton, Ohio.


HIGHEST Bidder Takes All or Individually. Mims 20-meter Beam, BULLETIN of interesting items for hams, experiments. Write At­

FOR SALE: Pre-war HRO recently realigned and reserved at Nationalfactory, four coil sets, no spkr or pwr supp. Good cond. $130. Harry Kalish, W2LRP, 898 Cauldwell Ave., Port Clinton, Ohio.


FOR SALE: One 250-watt xmr, final 813, modulators 811A; entire xmr 254 in, panel space. 1.1 S5-watt modulator with pwr supply, $600. Last offer $550. HRO power supply can be used on all 1x74 in chassis. Write or call W. L. Brown, 1719 Springfield Ave., Columbus, Ohio.

FOR SALE: HT-9, comp. with coils and stxal 10, 20, 40, 80, $225; Million exciter and high duty pwr supply, 700V; 300 MA coils, 20, 20, 2 mos; $200: Million detector model 824. 15 sample reproductions in booklet, 12¢. Stamps okay.

FOR SALE: Hi-Fi receiver, all-band 100-watt ECO control, complete with matching speaker. Wide ranges on all four bands. Write for photos. $15. W7KCH, Dayton, Wash.

FOR SALE - WANTED: New English THEMES CHANGING! Fines commercial aircraft for the Police, Marine, Geophysical and other services. Commercial re­
garding: many commercial and do-It-yourself users, too! New, high­
to-24 me power supplies - Steel Rack - 300 Watts.


FOR SALE: One 250-watt xmr, final 813, modulators 811A; entire xmr 254 in, panel space. 1.1 S5-watt modulator with pwr supply, $600. Last offer $550. HRO power supply can be used on all 1x74 in chassis. Write or call W. L. Brown, 1719 Springfield Ave., Columbus, Ohio.

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FOR SALE: Hi-Fi receiver, all-band 100-watt ECO control, complete with matching speaker. Wide ranges on all four bands. Write for photos. $15. W7KCH, Dayton, Wash.


90810 HIGH FREQUENCY TRANSMITTER

The No. 90810 crystal control transmitter provides 75 watt output (higher output may be obtained by the use of forced cooling) on the 10-11, 6 and 2 meter amateur bands. Provisions are made for quick band shift by means of the new 48000 series high frequency plug-in coils.

Crystal and circuit development on “third overtone frequency output crystals” has made possible this highly efficient unit, providing high output and crystal control with a minimum of tubes.

The No. 90810 consists of a Bliley CCO-2A crystal oscillator unit, using a 6AC7 crystal oscillator, a 2EZ5 tripler and an 829B power amplifier stage. For 10 meter operation, a conventional crystal is used, the crystal unit driving the 2EZ5 direct. For 6 meter operation, an overtone crystal is used in the crystal stage and drives the 829 directly as a power amplifier. For 2 meter operation, the overtone crystal is likewise used, but the output from the crystal unit is fed through the 2EZ6 tripler.

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Because of its advanced preselector design and use of 6BA6 miniature tubes, the new DB22A Preselector has an average overall gain of 30 DB, throughout the tuning range of .54 to 44 MC. Image ratio, too, is phenomenal—better than 50 DB with a communications receiver having a single stage of RF. The DB22A also provides tremendous increase in both gain and selectivity when used with a good communications receiver.

The DB22A is entirely self contained, entirely in a class by itself. Connect it to your receiver just like a good antenna — no extra wiring — no plug-in coils are required.

AVAILABLE IN TWO SIZES
The DB22A is available in two size cabinets: one to match the height of the RME 45, designated as "Standard" and the other to match the RME 84, designated as type "S".

PRECISION BUILT INTO
RME 84 RECEIVER
The new RME 84 is a precision instrument — no low priced, "average" components are used anywhere in its construction. Tuning range covers frequencies from .55 to 44 Mc. A planetary drive mechanism, spring loaded to eliminate backlash, makes operating a pleasure. Portability, too, is built into the RME 84. Provision is made for connection to 110 AC, batteries or RME VP-2 vibrapack. Other features include high sensitivity, new series noise limiter and provision for "S" meter.
The handsome new Collins-designed dial, which will be standard, now, on the 70E-8 v.f.o., is easier to read, and gives you greater mechanical band spread and direct reading in kilocycles.

Each band on the slide-rule has its own vernier scale below. On the 40-meter band, for example, one revolution of the dial changes the frequency 100 kilocycles. Each vernier division is one kilocycle. Direct reading is accomplished instantly by adding the reading of the vernier to that of the slide-rule.

An added feature is the method of zeroing the vernier hair-line, which has a screw-driver controlled adjustment on the panel to provide for exact calibration.

Note: Those who have bought the Collins 70E-8 v.f.o. with the fan-type dial may return it for replacement, free of charge, with this new slide-rule dial. Send it prepaid, well packed, tagged inside and out with your name and address, to “Customers’ Returned Goods,” Collins Radio Company, Cedar Rapids, Iowa. At the same time, write our Amateur Sales Department at Cedar Rapids, notifying us as to date of shipment.
Captain Bjorn Arnold Rorholt, 
c/o Norwegian Embassy 
Los Angeles, Calif.

Dear OM,

I have the answers to the questions regarding the radio equipment on the Kon-Tiki; I will first put the question as sent to them and then their reply.

1 - Q, Have you tried generator GN58 for receiver? 
A, No.

2 - Q, How many batteries did you take? 
A, All 41 six volts and 30 forty-five volts.

3 - Q, Is there any difference in output between generator and battery operation? 
A, Not tried yet.

4 - Q, Are you using 6995 KC crystal from the ten meter rig? 
A, Yes, but ten meter rig in use too.

5 - Q, Have you removed last audio valve in 173 Receiver? 
A, Tried, but receiver then too weak.

6 - Q, What kind of antenna do you normally use? 
A, L antenna

7 - Q, Have you tried balloon or kite supported antennas? 
A, Both tried.

8 - Q, Have you tried voice modulation since shortly after leaving Peru? 
A, Yes, results not good.

9 - Q, Do you use morse two transmitter? 
A, Yes, and then very good.

10 - Q, How does the NC-173 stand up under conditions on board? 
A, Excellent.

11 - Q, How many hours can you operate the transmitter on one set of batteries? 
A, High tension batteries very long life but long articles kill our heater batteries.

In case you did not hear me yesterday their heater batteries are used but Raaby tells me that they make 1½ volt units from their 45 volt batteries and then use four of these for six volts and but get about four days service from each. They have about five sets left so are O.K. for sometime yet.

"Pen" sends his vy 73 to you as do I and I hope to work you again soon. I am anxious to meet the boys but I am also going to miss these daily contacts with the raft.

I hope Knut, and Torstein keep up their radio and get on the air when they get back to Norway for I would enjoy very much keeping up our friendship thru amateur radio.

Again VY73 to you pronto and hope to cul.

Very Sincerely,

HAL-W6FVM

NC-173

Frequency coverage from 540 KC to 31 mc plus the 48-56 mc range. Calibrated amateur band spread on 6, 10-11, 20, 40 and 80 meter bands.

Amateur Net...NC-173 (with speaker) $189.50

The press of the entire country has carried stories concerning the day-to-day activities of the 6 young Norwegian scientists, members of the Kon-Tiki Expedition, who set out on a raft to drift more than 5000 miles across the Pacific Ocean.

Very little mention has been made, however, of the battery-powered transmitter and model NC-173 receiver which allowed the Expedition to dispatch over 500 messages and 30,000 words.

These figures furnish one more proof that a National receiver in the hands of a good operator makes an unbeatable combination.

National Company, Inc.
Dept. No. 8
Malden, Mass.
U. S. A.
YOUR CHOICE OF RCA BEAM TUBES FOR TRANSMITTER SERVICE

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NOTE: Class C telegraphy (ICAS) ratings are shown except for 832-A which are CCS.

The Fountainhead of Modern Tube Development is RCA

With power gains ranging up to 100 to 1 or more, it's incredible...almost, how little grid excitation you need to drive an RCA beam power tube to full plate input. Receiving tubes do it easily.

What are the transmitter design benefits? Plenty. RCA beam tubes make it practical to use fewer stages...fewer components...fewer tuning controls...smaller, less expensive drivers. They provide true circuit stability for frequency-shifting. They need no neutralizing in well designed circuits. And a beam tube transmitter takes less power.

Pioneered by RCA engineers...and continually improved, it is natural that beam tubes are our speciality: For more information, ask your distributor for a copy of "RCA Headliners for Hams" or write RCA, Commercial Engineering, Section M54J, Harrison, New Jersey.

In tubes for amateur transmitters it's power-gain that counts...

...and RCA beam tubes have plenty of it

TUBE DEPARTMENT
RADIO CORPORATION OF AMERICA
HARRISON, N. J.