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Reports Received. All amateurs, especially League members, are invited to report communications activities, training plans, code classes, theory-discussion groups, civilian-defense building or planning each mid-month (16th of the month for the last 30 days) direct to the SCM; the administrative official of A.R.R.L elected by members in each Section whose address is given below. Radio Club reports Emergency Coordinators' reports should be for reports Emergency Coordinators' reports. Emergency plans if generally desired by SCM's for inclusion in QST. A.R.R.L. Field Organization appointments, with the exception of the Emergency Coordinator and Emergency Corps posts, are suspended for the present and no new appointments or cancellations, with the exception named will be made. This is to permit full efforts of all in Emergency Corps plans.

### Midwest Division

<table>
<thead>
<tr>
<th>State</th>
<th>SCM Name</th>
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<tbody>
<tr>
<td>Illinois</td>
<td>Mrs. Carrie Jones</td>
<td>9207 Central Ave.</td>
</tr>
<tr>
<td>Indiana</td>
<td>Harry R. Miller</td>
<td>116 N. Longworth Ave.</td>
</tr>
<tr>
<td>Iowa</td>
<td>Harold C. Bird</td>
<td>205 Broad St.</td>
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<tr>
<td>Kansas</td>
<td>E. H. Gibbs</td>
<td>2702 S. 46 St.</td>
</tr>
<tr>
<td>Michigan</td>
<td>Alvin C. Kroese</td>
<td>9411 N. 10th Ave.</td>
</tr>
<tr>
<td>Missouri</td>
<td>Don Beaudine</td>
<td>630 First St.</td>
</tr>
<tr>
<td>North Dakota</td>
<td>E. C. McCall</td>
<td>Box 149</td>
</tr>
<tr>
<td>Ohio</td>
<td>Millard L. Snyder</td>
<td>608 N. Huron Ave.</td>
</tr>
<tr>
<td>South Dakota</td>
<td>W. J. Wilkinson, Jr.</td>
<td>Room 413, Jefferson Hotel</td>
</tr>
<tr>
<td>Western New York</td>
<td>Fred Cliecheste</td>
<td>270 E. 47 St.</td>
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### Atlantic Division

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<tr>
<td>Connecticut</td>
<td>Edmund R. Fraser</td>
<td>355 W. 34 St.</td>
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<tr>
<td>Delaware</td>
<td>E. L. Rainey</td>
<td>357 Van Winkle Ave.</td>
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<tr>
<td>District of Columbia</td>
<td>Jerry Mathis</td>
<td>6208 Muster St.</td>
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<tr>
<td>Maryland</td>
<td>Armond D. Brattland</td>
<td>9411 N. 10th Ave.</td>
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<tr>
<td>California</td>
<td>W. J. Mortman</td>
<td>P. O. Box 366</td>
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<tr>
<td>Idaho</td>
<td>L. B. Vannard</td>
<td>1114 S. 9th St.</td>
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<tr>
<td>Montana</td>
<td>Wm. C. Hauser</td>
<td>122 S. Park Ave.</td>
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<tr>
<td>Oregon</td>
<td>Clifton C. Gordon</td>
<td>214 East St.</td>
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<tr>
<td>Washington</td>
<td>Garold Bennett</td>
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### Southwestern Division

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<tr>
<td>Arizona</td>
<td>W. E. G. Borden, Jr.</td>
<td>1213 College St.</td>
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<tr>
<td>California</td>
<td>W. J. Mortman</td>
<td>1213 College St.</td>
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<tr>
<td>Colorado</td>
<td>James C. Driscoll</td>
<td>1213 College St.</td>
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<tr>
<td>Utah- Wyoming</td>
<td>Carl F. Holman</td>
<td>1213 College St.</td>
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### ROANOKE Division

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<tr>
<td>Virginia</td>
<td>J. W. Victor</td>
<td>P. O. Box 366</td>
</tr>
<tr>
<td>West Virginia</td>
<td>Thomas S. Jones</td>
<td>2918 Monroe Ave.</td>
</tr>
<tr>
<td>Washington</td>
<td>Anton J. Silva</td>
<td>111 South Quincy St.</td>
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### Rocky Mountain Division

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<td>Utah</td>
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<td>1213 College St.</td>
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<tr>
<td>Wyoming</td>
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### SOUTHEASTERN Division

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<td>James F. Thompson</td>
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<tr>
<td>Florida</td>
<td>Carl G. Schaal</td>
<td>1213 College St.</td>
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<td>Georgia</td>
<td>William U. Hanks</td>
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<tr>
<td>Kentucky</td>
<td>Everett Mayer</td>
<td>1213 College St.</td>
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<tr>
<td>Louisiana</td>
<td>Ralph S. Clink</td>
<td>1038 Milwaukee Ave.</td>
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<tr>
<td>Mississippi</td>
<td>John K. Oliver</td>
<td>1038 Milwaukee Ave.</td>
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<tr>
<td>North Carolina</td>
<td>George W. Smith</td>
<td>1038 Milwaukee Ave.</td>
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<td>Oklahoma</td>
<td>Russell W. Battera</td>
<td>1038 Milwaukee Ave.</td>
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<tr>
<td>Texas</td>
<td>Homer A. Blyde</td>
<td>1038 Milwaukee Ave.</td>
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<tr>
<td>Western Mexico</td>
<td>Dr. Hilton W. Gillett</td>
<td>1038 Milwaukee Ave.</td>
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### SOUTHWESTERN Division

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<td>Wyoming</td>
<td>W. E. G. Borden, Jr.</td>
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### WEST GULF Division

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<tbody>
<tr>
<td>Louisiana</td>
<td>Dr. Milton W. Gillett</td>
<td>1038 Milwaukee Ave.</td>
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<tr>
<td>Texas</td>
<td>Homer A. Blyde</td>
<td>1038 Milwaukee Ave.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>George W. Smith</td>
<td>1038 Milwaukee Ave.</td>
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### Maritime Division

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<tr>
<th>State</th>
<th>SCM Name</th>
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<tbody>
<tr>
<td>A. M. Crowell</td>
<td>Flying Officer Donald R.</td>
<td>69 Dubai St.</td>
</tr>
<tr>
<td>Ontario</td>
<td>Gann c/o Canadian Bank of</td>
<td>69 Dubai St.</td>
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### Quebec Division

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<tr>
<th>State</th>
<th>SCM Name</th>
<th>Address</th>
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<tbody>
<tr>
<td>Quebec</td>
<td>Lindsey G. Morris</td>
<td>Art, 6, 4101 Grouard Ave.</td>
</tr>
<tr>
<td>New Jersey</td>
<td>John K. Oliver</td>
<td>7174 Shirley Ave.</td>
</tr>
<tr>
<td>New York</td>
<td>Luis A. Cartwright</td>
<td>7174 Shirley Ave.</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Louis A. Cartwright</td>
<td>7174 Shirley Ave.</td>
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### VANALTA Division

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<th>State</th>
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<th>Address</th>
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<tbody>
<tr>
<td>Alberta</td>
<td>C. S. Jamieson</td>
<td>581 W. Riverside Drive</td>
</tr>
<tr>
<td>British Columbia</td>
<td>C. O. L. Sawyer</td>
<td>2634 West 31 Ave.</td>
</tr>
<tr>
<td>Montana</td>
<td>Arthur Cheeseworth</td>
<td>747 Milliman Ave.</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>A. W. Mortley</td>
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*Officials appointed to act until the membership of the Section choose permanent S.C.M.'s by nomination and election.*
The history of CENTRALAB can be read in its advertisements down through the years. New developments ... the result of research and pioneering ... keep Centralab constantly in the vanguard.

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The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial 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. Correspondence should be addressed to the Secretary.

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Acting Treasurer ................ DAVID H. HOUGHTON
West Hartford, Connecticut

General Counsel ................ PAUL M. SEGAL
1026 Woodward Building, Washington, D. C.

Address all general correspondence to the administrative headquarters at West Hartford, Connecticut.
"IT SEEMS TO US—"

THE TIME HAS COME!

This country has before it a task the difficulty of which must not be underestimated. All the energies and intelligence of the nation are necessary to its accomplishment.

There is an immense need for skilled radio personnel. Many thousands of us are already serving in the armed forces. Others of us are finding our places in technical positions directly connected with the war effort. Most of us who stay at home are offering our services in local auxiliary communications. All of us can do something. We know that the radio amateur will bring to these tasks the fidelity and competency which are traditional to him, and that he will again demonstrate that there are few jobs in radio that an amateur cannot do better than any one else.

The radio needs of the Services are particularly acute. The time has now come when every available radio amateur should place at the disposal of his country the skill and knowledge which he has acquired through the years of building and rebuilding transmitters and receivers, the days and nights of transmission and reception through interference and static. The trained ears, the clever hands, the keen minds — they are needed by the United States of America. If you can be spared from home you are wanted in the Army or the Navy, and you are urged to seek enlistment or a commission in the service of your choice.

A.R.P. COMMUNICATIONS

Just as we went to press last month the griefs associated with the “reactivating” of ham stations for civilian-protection purposes caused DCB and FCC to wash out all authorizations and prepare for a new start — as reported in this month’s “Happenings.”

As we close our pages for this issue the matter is still in process and no announcement is available. However, the new deal moves closer and this is our understanding of the status of things: DCB is understood to be receptive towards an officially-requested plan to employ amateur apparatus and amateur services in ARP secondary communications if the needs of national security are met. OCD is keen on such amateur collaboration, definitely wants it, and is preparing a detailed plan for DCB’s consideration. It is believed that such a plan will propose that the commanders of the local Citizens’ Defense Corps be responsible for the operation of the amateur stations and that such operation be confined, for the time being, to the ultrashighs. The expectation is that a proposal of this nature will receive DCB’s blessing and result in the issuance of detailed regulations by FCC to govern the new arrangement. It could also be expected that the issuing of new operator licenses would be resumed at the same time, not only to facilitate CDC communications but because the “ticket” is an attestation of operator proficiency which is recognized for enlistment in both Army and Navy. At the moment, we are QRX for Washington. When the announcement is made, ARRL Hq. will rush the particulars to directors and their alternates and assistants and to the SCMs and ECs and clubs. Keep in touch.

Meanwhile another angle of approach is developing. In some cities the responsibility for ARP communications rests with the police radio systems, which are expanding under “police experimental” licenses to carry their increased load — on u.h.f. Providence, R. I., has been the first city to embrace this solution and may be used as an example. Under an FCC “X” license, its police department has the use of four police frequencies in the 116–117 Mc. vicinity, one of them being 116, 150 kc., just outside our 2½-meter band and reachable by practically all amateur gear. Amateur stations are being bought by the city under a resale agreement and are being installed in control points, schools and other needed spots in the ARP plan. About fifty local amateurs are being sworn in as unpaid members of the police force, issued credentials, and assigned to posts of service. The whole thing is now part of the municipal police radio system.

We may remain confident that a place in civilian-protection work will soon be made for the u.h.f. stations and services of amateurs — quite possibly before this issue of QST reaches you.
CARRYING ON

This League intends to carry on throughout the war. We have much to do. Our headquarters establishment is groaning with overload in every department, almost every bit of it associated with the war effort. As you’ve seen in QST’s pages, we’ve been designing special apparatus for ARP communications, gear easily and inexpensively built for this particular purpose. We have before us a task of the first magnitude in arranging for the effective participation of amateurs and their apparatus in this civilian-protection work in every city in the land, and in planning the other communication needs that will inevitably arise. We are very busy finding skilled people for crying government and defense radio jobs. We’re finding hurry-up apparatus for the military services, writing training manuals, promoting wholesale code instruction, planning the organization of an amateur intercept corps.

The League must maintain the Washington liaison: to represent us through these changing times, to watch over our frequencies, to see that we get them back when the national job is done. In particular, we must keep ARRL going so that QST may continue to come to us each month with the news of each other, of the jobs to be done, of the new developments — now that we cannot chew about these things over the air.

Yes, we all need the League. And we at ARRL hq. will say quite frankly that the League needs the support of every amateur. It is necessary if this useful work is to be continued and the amateur position safeguarded for the return of peacetime operating. Wherever you go, wherever the war effort takes you, we ask you to maintain your membership in ARRL and your subscription to QST. It will keep you a part of things back home, help us pay the printer, and bring you each month the news of what is going on.

Which reminds that much is going to be going on. Amateurs are peculiar people, as has been sagely remarked under all sorts of circumstances. While we’ll be interested in reading of the radio gear of other services and in studying theory, we’re primarily communicating people. Talk all you want about how things work, what we really want is two-way communication with each other by means of key or mike. Radio may be temporarily out for most of us, but there are other ways. Radio amateurs are the heirs of the old backyard telegraph gang. We can go on to other methods during this war. Look at your own situation. Chances are you’ve got a buddy in the next block or two with whom you were wont to chew the fat for hours on end in bygone days. If radio be out, there are a myriad of other ways of doing it: buzzer lines, carrier current, induction, infra-red blinker, our old friend lambda-over-2-pi, modulated lightbeams, new things that only a fertile ham brain can concoct. So we’re starting something, fellows! See the announcement and dope elsewhere in this issue. It will help you to some ideas. We recommend that you get together with that buddy and see what you can cook up. You can lick that communications problem, have a whale of a lot of fun and education for yourselves. Then tell us how you do it, so that the rest of the gang may benefit from your experience. It’s like the old pioneering days all over again. If a few of us will put our minds at work on these alternative forms of communication, we have small doubt that in a few months thousands of us will again be enjoying local QSOs. QSA? QTC?

K. B. W.

OUR COVER

Our cover this issue shows W1LOP scanning the West Hartford skies from atop the ARRL Hq. building, endeavoring to locate a distant aircraft heard over the acoustic airplane detection system described on page 22. Inset is the microphone suspended in its wind- and weatherproof housing.

At the amateur quiz program broadcast from WICC as part of the Connecticut State Convention events in Bridgeport, W1KCS was asked, “What is the largest selling book in the world?” He promptly replied, “The ARRL Handbook!” Well, after all, it has been called the “Bible” of radio amateurs.

25TH ANNIVERSARY

When you have been a member of the League a few years, your membership card naturally gets a bit battle-scarred. Here’s one that shows 25 years of membership without a lapse — and if member McCuffage had maintained the same QTH we would have been able to sneak on a few more before the card had to be turned?
What Do We Do Next?

Wartime Offers Opportunities for New Ham Activities

BY GEORGE GRAMMER,* WIDF

Thanks to the Japs, we've all suddenly attained the status of "pre-war ham." Until the fuss is over and we get back once more to ordinary operating, we all want to continue with amateur activities of such nature as conditions will permit. The inescapable necessity for closing down on transmitting does not mean that there's now nothing for hams to do. Far from it! Those who have the opportunity and time to continue with amateur work can do so — the accent will have to be shifted, of course, but the pattern is familiar. Here are a few suggestions.

WHAT to do in wartime? Though the transmitter still stands beside the operating table, its perforce darkened filaments and silent transformers only emphasize the aching void in our ham lives — those roseate hours spent in pleasant communication and busy competition with fellow amateurs. Some day, we know, we'll be back at it again, and the memory of these dark days of close-down will dim. But in the meantime — what to do?

Let's first say that we'll do our part in national defense — and, conditions being as they are, many of us would have little time to spare for hamming even if we weren't restricted. Civilian defense communication should come first, of course, for those who won't be in the military services. But we'll probably have some hours now and then when the urge won't be downed, when some kind of ham radio has to be practiced even though the old set can't be fired up and a hopeful CQ broadcast to waiting ears. There's no cause for discouragement — barring actual radio transmitting, it looks as though we could find plenty to keep ourselves busy.

A lot of the gang have written to tell us they feel just that way about it. While some have curled up their toes, they're very few indeed compared to those who say, in essence, "Well, it's come. Let's make the most of this forced retirement to try some of the things we've always wanted to do but never had time — or necessity — for. We've been so busy on the air that we've let a lot of things slide. Now's the time to catch up."

They're right. Amateur radio has never been wholly a matter of two-way communication, although no one would dispute that communication has been the most important part of it. Odd as it may seem to many, there are plenty of hams who get their fun out of fussing around — experimenting, to be dignified — with equipment which seldom, if ever, is put on the air. Those fellows are curious to know about things — why they work, why they don't work, how they can be made to work better. Maybe everything they do merely duplicates something which has been done before — but there is no substitute for first-hand knowledge. The pursuit of such knowledge can be a lot of fun, whether or not an ulterior motive lurks in the background.

Now the fact is that we can do all those things we could do before except radiate signals. There are no restrictions on receiving, for instance, except the need to preserve secrecy of messages. Years ago there was an amateur cult which specialized on receiving — in the days when it was counted a real achievement to hear POZ or MUU, or to pick up 600-meter signals from far-distant ships or coastal stations. The super-DX of short waves changed the thrill of hearing foreign stations to a commonplace, but there is still a lot to be said for just plain listening when some attention is paid to the content of what's heard. How many present-day hams have ever listened from 600 meters up? How many know what goes on between the ham bands? And speaking of listening, there's a national defense angle too. There's an opportunity for us to help in spotting some of the phonys that are bound to be on the air in wartime, reporting signals which seem to be behaving suspiciously, getting directional "fixes" on them. Direction-finding is an art in itself, particularly over long distances, and one which could keep any amateur occupied for a long time; setting

* Technical Editor, QST.
up a good direction finder is far from being the easiest thing in the world. We'll have more on the subject in a future issue.

Too many of us think of a receiver as something that comes in an iron box — when the necessary number of dollars is available to lay on the counter. How many can honestly say they have any comprehensive knowledge of how the circuit is supposed to work? Some of the remarks we've heard on the air about receiver "faults" or performance (or lack of it) certainly have not reflected any great knowledge on the part of those making them. And since receivers are hard to get now, why not use this period to do two things — first, find out how and why the black box works; second, figure out how its faults can be overcome? Besides providing something interesting to do, it should pay dividends in stepped-up performance.

We needn't stop there, however. New ideas are and will be coming along — for instance, panoramic reception, described in another article in this issue. If we could only have had one of those gadgets in the last DX contest! Imagine being able to keep continual tabs on four or five important multipliers, taking advantage of the many opportunities that are bound to be missed when only one station can be heard at a time!

For the u.h.f. men — and those who have any thoughts in that direction, too — this is a really good opportunity to get better receivers under way, and a chance to do some experimenting with f.m. reception. With f.m. broadcasters opening up all over the country there will be signals to practice on; signals which, incidentally, provide a means for checking the results of modifications made in r.f. stages, mixers, antenna coupling systems. The fact that the family can get a taste of high-quality broadcasting shouldn't hurt any in such a program. This in turn leads to such things as building high-fidelity amplifiers, improved reproducing systems, things most of us have promised ourselves we'd do some day — but somehow that day never seemed to come. Why not now?

And, speaking of receiving, how about extending it to recording? Probably no one needs to be told that home recording has been the most popular innovation in radio in years. We can go a bit further, tinker with the recording gear to make it suitable for recording high-speed stuff, possibly turn up something that will be useful to the authorities. Homemade tape recorders are something to think about, too.

Yes, there ought to be plenty to do in the receiving line. It's not impossible that some organized activities, linked up with national defense, are in the works.

Now, on another subject, maybe the rig could stand a little overhauling. Not rebuilding, perhaps; it would be just as well to wait a bit and see what developments come along in the interim while we're off the air. But certainly any equipment we have now should be usable after the war, and it's the exceptional transmitter that hasn't a few bugs that need to be eradicated, small operating conveniences that need to be added, minor changes in design or layout that ought to be made. There's no objection to carrying on such revamping and testing, so long as no signal is radiated. But don't take it for granted that a signal won't get out just because the antenna isn't connected as in days of yore. A tank coil can radiate, especially if it's operating without a load to absorb the power. An elementary precaution that should always be taken is to move the feeder connections as far as possible from the transmitter and to tune the whole antenna system to some frequency considerably removed from that on which the testing is done. With low-power stages this, plus loading, should prevent any radiation, but if there is any considerable voltage applied to the tube it will probably be necessary to shield the stage. A grounded shield made from ordinary window screening will not be hard to put together and ought to do the trick. Before going very far with any such testing, try it with low power and have some nearby ham friend listen to see if he can hear the carrier. Don't try keying or other direct communication via the transmitter! If it can't be heard with low power, run the power up to normal and try again. If the carrier can be heard at a greater distance than a couple of hundred yards it isn't safe to do any testing until suitable shielding has been installed. Such a range is about comparable to what the oscillator of a "modern" b.c. receiver gets under ordinary conditions.

Another field which most hams have neglected, and one in which most of us really need more practice, is that of measurements. Few of us have even elementary measuring equipment, aside per-
haps from a milliammeter or two for the transmitter. Now's a good time to work on that long-planned frequency meter, or on a standard of the 100-kc. oscillator-multivibrator type. Probably crystals will be out of the question, but there's nothing to prevent work on a self-excited oscillator to stabilize it to as near perfection as we can get. Most hams need a general purpose multi-range voltmeter-milliammeter and, granted that meters are among the items missing from most dealers' stocks nowadays, those that do have 1-mil meters (or meters having scales near that range) probably can find such other parts as will be needed. A simple resonance indicator ("wavemeter") is a mighty handy thing to have around the shack; building and calibrating one will provide several evenings' entertaining work. The 'phone man will find an a.f. signal generator (which may be nothing more than a one-tube audio oscillator) especially useful for checking up on speech equipment, especially if a calibrated attenuator is provided, along with a meter of some sort (such as a vacuum-tube voltmeter) for checking amplitude. The vacuum-tube voltmeter, incidentally, has lots of useful functions in an amateur station. And how many of us have oscilloscopes? And of those who do, how many are equipped with amplifiers and linear sweep circuits, without which one cannot begin to realize the possibilities of the 'scope as a measuring instrument? How many fellows have ever heard of a grid-dip meter, let alone own one? — yet it's capable of doing things that can't be handled by any other simple methods. How many own anything resembling a test oscillator, the basic necessity for keeping receivers in alignment? Most of these things can be built from junk-box parts, and once owned it will seem almost impossible to get along without them. There's a year's work at least in getting together a set of test instruments which represents only the minimum of what a reasonably well-equipped ham station ought to have in this day and age. The beauty of it is that most of them can be built from salvaged parts.

This is also a good time for a little serious study of the radio art. Even without any thought of radio as anything other than a hobby, a technically informed amateur is a better amateur. We expect to offer some practical helps in this respect from time to time in QST. A bit of code practice — simply a division of the total body of experience and other information which accumulates, re-

March 1942
Wired Wireless

Low-Frequency Communication Over Commercial Power Lines

BY BYRON GOODMAN,* WIJPE

As pointed out elsewhere in this issue, the curtailment of normal amateur radio communication need not throw all amateur communication into a state of suspended animation. For example, it is a well-known fact that so-called "carrier current" communication is used by both telephone and power companies for long-range work over their wires, and the thought that the 110-volt power lines might be utilized for amateur communication has no doubt occurred to many hams during the past several months. Let's look at the picture a little more closely.

Low-frequency radio waves do not radiate as easily as high-frequency ones because the radiation efficiency increases with the frequency. While it is true that they can be radiated, it is equally true that the radiators become large affairs, and any small antenna for such work is practically hopeless. This is a headache to the long-wave radio engineers but a boon to the telephone and power company men — and possibly to the amateur. By keeping the frequency low, the radio energy can be made to travel along wires with little or no radiation, depending mainly upon the balance of the two wires and their spacing. The r.f. follows along the line in much the same manner as the 60-cycle current except that it is much more susceptible to the by-passing effects of lines that connect to the main line. This is one factor that limits the range of 110-volt power-line communication because, while the power and telephone companies can put chokes in strategic points along the lines that are carrying carrier currents, the amateur must be content with the line as he finds it.

Another factor involved in the amateur use of low-frequency carrier current communication is the proper choice of frequency and power. The amateur might use a frequency around 40 or 50 kc. without any danger of radiation and consequent interference to radio services, but there would be the possibility of interference with established telephone and power company service, with its resultant ill will and possible legislation. The same holds true of frequencies up to about 160 kc., the upper limit of the frequencies used by the services mentioned. From 100 to 200 kc. there seem to be no "wired wireless" services, but the chances for radiation increase and there is the possibility of broadcast receiver interference in receivers using a 175-kc. i.f. By keeping the power down to a low value (less than 50 watts), there isn't much chance for any appreciable radiation and radio interference. In any event, the radiation can be checked roughly by listening at a distance on a long-wave receiver. There still remains the possibility of harmonic interference with local b.c. receivers, but a judicious selection of frequency which keeps the harmonics farther than 10 kc. away from the local b.c. stations will practically eliminate this problem.

The use of frequencies higher than 200 kc. is unwise because of the increased chances for radiation. We once had the idea of using the regular 80-meter transmitter on the power lines for local

A 25-watt transmitter for wired wireless. Since variable condensers large enough to give much frequency change are out of the question, a tapped coil is used for tuning.

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work without QRM, and tested it with a receiver about three miles away that was also coupled into the 110-volt line. The signal came in over the power lines all right — it was a fairly strong one, at that — but the signal that came in through the regular receiving antenna was not more than three S points weaker and represented a signal that would certainly be considered a violation of the law under the present FCC Order No. 87-A. Hence utilization of our amateur transmitters without modification is not a possibility convenient as it would be. So, rather than skate on thin ice, we propose that amateur wired wireless be conducted on frequencies between 160 and 200 kc., with powers not exceeding 50 watts. The frequencies should be selected with proper consideration of possible harmonic interference in the b.c. range and with the 175-kc. i.f. amplifiers that may be in some local receivers. After we find out what can be done in various localities and under a wide variety of circumstances, it may be possible for us to spread the limits a bit, but we should consider at all times the possibility of interference with other services and act to avoid it.

This is not a brand-new thing, but something that has been tried before and made to work by other amateurs. Mr. John E. Williams, W2BFD, has put a 175-kc. signal over the lines for distances up to five miles¹ without any detectable interference to other services, and with the equipment to be described in this article we got a good signal over a distance of two miles. There are so many possibilities for complicated routing (and by-passing!) that it is impossible to predict the range of any installation within 200%, and it makes a nice thing for amateurs to try for themselves. It might be expected that greater distances could be covered in rural areas than in thickly populated centers, but that remains to be seen. That is the attraction to wired wireless — like high-frequency DX its range is fairly unpredictable.

A Wired-Wireless Transmitter

Any problems connected with the design and construction of an oscillator for the 160-200-kc. range center around the tank circuit. Using an L-C ratio that will give a decent order of stability means using a tank capacity of at least 0.002 µfd., and the average ham no longer has variable condensers of that size kicking around the shack. A number of b.c. tuning condensers can be connected in parallel to get the necessary capacity, but we finally decided upon the use of mica condensers, and a check on their performance showed them to be entirely satisfactory for the work. Using mica condensers means changing frequency by changing the inductance unless a large variable shunting condenser (500 µfd. or more) is available. Tapping the coil is simpler than trying to build a variometer to cover the range, and we ended up with a transmitter that is fairly simple (and reminiscent of 12 or more years ago!). It is not exactly a thing of beauty, but the fact that it doesn’t cost very much to put together should compensate for its artistic shortcomings.

The circuit, shown in Fig. 1, is the conventional series-fed Hartley. The tank condenser, $C_1-C_2$, consists of two 0.006-µfd. mica condensers in series (to decrease the chances for breakdown), and the frequency and excitation are adjusted by the proper selection of taps on the coil. The “antenna” coupling is adjusted by the proper

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¹ Williams, “Wired Wireless for Remote Control,” QST, February, 1940.
A top view of the converter. Note the adjusting screw of the output tank condenser, C₃, just in front of the 6SA7.

selection of condensers in series with the coupling coil, L₂.

About the best source of cardboard tubing for the inductance is our old friend of early broadcast-receiver days, the Quaker Oats box. A look at the local grocery showed this to be the only cheap source of 3½-inch diameter cardboard tubing, and if the kitchen won’t furnish you with one, buying a box in the store won’t ruin your financial standing. After the contents have been removed and the box cut down to a length of about 4¾ inches, the box should be given a coat or two of shellac. We finished ours off with gray lacquer, but this isn’t necessary for the proper operation of the transmitter. The 80 turns of No. 18 enameled wire should be wound on as tightly as possible. The taps at every 5th turn are made by twisting a 1-inch loop of wire tightly for several turns at each tap so that it will not twist apart as the rest of the coil is wound. When the coil is finished, the loops can be scraped bare of insulation with a knife or fine sandpaper. As a final touch, spots of Duco cement can be used to secure the twisted portions.

The framework used to support the coil and other components was made of ¼-inch plywood except for two corner strips at the top of ½-inch square stock and the two bottom strips of 1-inch by 2-inch wood. The whole assembly is held together by brads and glue. The box was made just wide enough to allow the coil to be pushed in, and the spring of the sides is enough to hold the coil firmly in place. Our box measures 6½ inches high by 5½ inches long by 4½ inches deep.

The tube socket is set down in a hole in the center of the top of the framework. The tank condensers, C₁ and C₂, are fastened underneath by screws. The grid choke, RFC, is supported on a ½-inch pillar on the rear screw which holds the socket. The coupling condensers, C₆, C₇ and C₈, are supported on lugs under the heads of the screws used for coupling taps at the rear of the box. The flexible leads to the coil are fastened to the terminals of the tank condensers.

When the transmitter is completed, it can be hooked up to a power supply giving 350 or 400 volts at 100 ma. A meter and key should be put in the positive lead, as shown in Fig. 1. Some may object to the key in the positive lead, but it is convenient to have it there because as long as one’s hand is off the key there is no chance for shock when adjusting the coil taps. A certain amount of care must be exercised, of course, and we heartily recommend that all tuning adjustments be made with one hand in your pocket. The first tuning should be done without the oscillator coupled to the line. Set the clips so that there are 60 turns between grid and plate and attach the cathode tap 25 turns from the grid.
Fig. 2 — Wiring diagram of the low-frequency converter.

C1 — 100-µfd. variable (Hammarlund MC-100-S).
C2, C6 — 260-µfd. adjustable mica (Hammarlund CTS-160).
C3 — 20-µfd. variable (Hammarlund MC-20-S).
C4 — 350-µfd. adjustable mica (Hammarlund CTS-230).
C5 — 50-µfd. mica.
C10, Cu — 8-µfd. electrolytic, 450 volts.
R1 — 20,000 ohms, ½ watt.
R2 — 20,000 ohms, 1 watt.
S1 — D.p.s.t. toggle.
T1 — 240-0-240 a.c., 6.3- and 5-volt filament windings (Thordarson T-13RI9).
L — 8 henrys, 40 ma. (Thordarson T-13C26).
L1 — 175-kc. i.f. transformer replacement winding (Carron S735). Antenna winding is 11 turns No. 32 d.c. wound over L1.
L2 — 43 turns No. 32 d.c. closewound on 1-inch diam. form. Cathode tap at 5th turn from ground end.
L3 — 50 turns No. 32 d.c. closewound on 1-inch diam. form. Output coil is 14 turns No. 32 d.c. closewound ½ inch from L2.

A bottom view of the converter also gives an idea of the panel layout. The output tank coil, L2, can be seen in the center of the chassis; L3 is directly under the oscillator tuning dial, and the mixer grid coil, L1, can be seen at the right, next to the toggle switch. Padding condensers C4 and C5 are mounted on the left- and right-hand sides of the chassis, under their respective tuning condensers.

end. Press the key and read the plate current, and then try again with the cathode tap on either side of this position. The setting of the cathode tap which gives the lowest plate current reading is the one to use. With a 350-volt supply, the no-load plate current should run around 25 or 30 ma. Connect the output into the line and set the coupling clip so that it isn't shorting any condenser (loosest coupling). The plate current will increase to 30 or 40 ma., depending upon the frequency of the transmitter, and the note can be checked by listening to a harmonic with your communications receiver set to the lowest frequency range. The coupling can be increased until the note becomes too rough or yoopy, which indicates that the coupling is too tight or that the cathode tap needs adjusting. The same rules hold for adjusting a transmitter on 170 kc. as on the higher frequencies, and a little experimenting will bring back the old touch. With no loading at all, the signal from these low-frequency oscillators is truly beautiful — they should be coupled up to the point where the note starts to go sour, and that is the place to stop. The note will roughen up before it chirps — you can tolerate the roughness, but the chirp makes it difficult to copy. And be careful in making adjustments — you have deliberately hooked into the 110-volt line, and you can get a good shock from it!

The Wired-Wireless Receiver

The first thought in building a receiver for the wired-wireless frequency range might be to throw

(Continued on page 83)
Amateur radio communication has been marked by continual progress since its inception in the spark and coherer days. The technical advances have been many, but just as important are improvements in operating technique, which amateurs and professionals alike have developed. Under the heading of “operating technique” are such items as operating schedules, proper choice of frequency to do a certain job, and a considerable acquaintance with variations in the “wireless” part of the communications circuit.

But recently there has been added a powerful operating aid known as panoramic reception which gives the operator enhanced control over the uncertainties of transmission and reception.

Seeing the Radio Spectrum

In the same manner that the familiar light spectroscope makes visible the spectrum of light frequencies, the panoramic spectroscope makes visible the spectrum of radio frequencies. As a light spectroscope is attached to a telescope for pickup from distant sources, so the panoramic spectroscope is attached to a communications receiver for bringing in any desired band of frequencies. The radio spectrum is displayed on the screen of a cathode-ray tube, where each signal appears as a separate indication showing its frequency, strength, type of modulation, fading characteristics and frequency stability, as well as the nature of any interference.

Panoramic reception can be easily understood by reference to Fig. 1. Suppose we have an ordinary communication receiver and tune it through a band of 100 kilocycles, starting from any frequency desired. In normal times the starting frequency might have been 3900 kc., represented by zero in Fig. 1, in which case the whole 100 kc. covered would be the 3900- to 4000-kc. ‘phone band. If we should plot the strength of the signals as we pass them (by means of the “S” meter, for instance) against frequency the curve might resemble that shown. Each peak would represent a received station, the strength as we tuned through it being low at first, then rising to a maximum when the signal is on the resonance peak of the i.f. amplifier, then dropping off again on the other side. The width of the signal will depend upon its strength and the selectivity of the i.f. amplifier, and what we actually do is plot a series of i.f. resonance curves as we pass through the various signals. Peaks a and b are too close in frequency for complete separation; in other words, the signals are so close that the i.f. selectivity is not sufficient to make them appear as isolated peaks.

In the panoramic receiver a similar curve is traced by the oscilloscope spot each time the receiver is tuned through the band, and by repeating the tuning rapidly (25 times per second or more) the trace appears as a continuous line. The rectified output of the second detector, with suitable d.c. amplification, is applied to the vertical deflection plates of the cathode-ray tube, thereby using the c.r. tube as an indicator of instantaneous signal strength. The horizontal deflection is synchronized with the receiver tuning, one trace for each tuning cycle. The process is quite similar to the synchronization in an ordinary oscilloscope equipped with a linear sweep circuit. The rapid tuning of the receiver can be accomplished by either mechanical or electrical means, the latter being preferable for a number of reasons. A saw-tooth generator can supply both the oscilloscope sweep voltage and the control voltage for a reactance tube which does the
Panoramic reception is a comparatively new development which has not yet made its impress on amateur radio, but it promises to become one of our important operating tools when we’re back on the air again. For amateur work the adapter or “spectroscope” described here offers a practical way to get started in visual reception. This article tells what panoramic reception is and gives a brief description of the spectroscope; we expect to follow it up with “how to build it” material just as soon as possible. The spectroscope is a fascinating thing to operate, and its obvious advantages in communication are supplemented by a high order of usefulness in various measurements that need to be made around the ham station. Panoramic reception is the invention of Marcel Wallace, one-time owner of F3HM, and up until a few years ago an active amateur.

actual rapid tuning of the high-frequency oscillator in the receiver. A tuning rate of 25 times per second or more is necessary to eliminate flicker. It is advantageous to choose a tuning rate which can be synchronised with the supply frequency, which in most cases will be 60 cycles.

The selectivity of the receiver must be taken into account in determining the permissible width of the band to be scanned and the rate at which the tuning can be repeated. The higher the selectivity, the longer the time required for oscillations to build up to their maximum value, so the scanning rate must be slow enough so that the tuned circuits can follow instantaneous changes in signal strength accurately. Since by far the greater part of the receiver’s selectivity is in the i.f. system, only that part of the receiver need be considered in this connection. A practical formula based on experience, and applying to sets with i.f. transformers having Q’s in the vicinity of 100, gives for the minimum time in seconds:

$$T = \frac{4}{f^2} (F_{\text{max}} - F_{\text{min}})$$

where $T$ is the minimum time permissible in scanning the band once, $F_{\text{max}}$ is the highest frequency and $F_{\text{min}}$ is the lowest frequency of the r.f. band being scanned and $f$ is the desired visual selectivity of the receiver.

All frequencies are in cycles per second. For example, if the whole broadcast band (550-1550 kc.) is to be scanned and the desired selectivity of the receiver is 10 kc., the formula gives 1/25th second as the minimum time which should be consumed in tuning once across the band. If the reactance tube which does the tuning is driven by a saw-tooth oscillator having a wave-shape in which the “fly-back” time is negligible, this means that a tuning rate as high as 25 per second could be used. Lower rates, and therefore a longer period of time to go once across the band are necessary if greater visual selectivity is required. The “static” selectivity, or the selectivity as shown by the ordinary resonance curve, of the receiver should be twice the desired visual selectivity. In the example above, a receiver having a 5-kc. pass band would be necessary to secure 10-kc. visual selectivity.

Rather than a special receiver for panoramic reception, it is more practical for amateurs to use an adapter which provides panoramic reception in conjunction with an ordinary communications receiver. An adapter of this type, the “panoramic radio spectroscope,” does not interfere in the least with the normal functioning of the receiver. Neither is it necessary to modify the receiver in any way, since the adapter can be connected to it without doing anything more than

A simplified spectroscopy adapter set up with a communications receiver. This model uses a 2-inch cathode-ray tube, housed separately from the power supply and other circuits.
connecting a wire to the plate pin on the mixer tube.

**The Radio Spectroscope**

A communications receiver with such a panoramic "'scope" attached is shown in one of the photographs. A station to which the receiver is tuned would appear in the center of the cathode-ray screen, and also would be heard in the usual manner. Stations above this frequency would appear on the right half of the screen and stations below on the left half, spaced along a calibrated frequency scale. A close-up of the screen, on another model of the spectroscope, is shown in the first photograph.

The stronger the signal the higher its deflection, so that relative signal strengths may be read directly off the screen. If desired, an entire amateur band may be reproduced, but the mass of information is then enormous. It is more practical to operate with a fraction of this coverage. Usually a band including 50 kc. on each side of the receiver (center) frequency contains information of most interest to the operator.

If the operator tunes the receiver slowly, incoming signals move in a procession across the screen, each station in turn passing over the mid-frequency mark as the receiver tunes through it and it is heard. As the procession moves, stations pass off the screen at one side and other stations move in on the other side, so that a visual picture of the whole band is quickly presented. This complete visual picture stands out in full detail, and the panoramic 'scope shows the direction and amount of the drift. This makes possible the use of more selectivity in the receiver i.f. than would ordinarily be practical, or the use of more flexible transmitters, or both.

**Circuits and Methods**

The panoramic radio spectroscope utilizes an input cable which is run into the receiver cabinet. Connection is made to the receiver mixer or converter tube plate prong by means of a clip on the end of the cable. Detuning of the receiver i.f. is prevented by an isolating resistor at the clip. The i.f. signals are carried through the cable to the panoramic 'scope and are then amplified and passed through a second mixer where they are converted to a new (second i.f.) frequency, then through a sharply tuned second i.f. amplifier, a final detector, and an audio amplifier, to the vertical plates of the cathode-ray tube.

Signals in the plate of the receiver mixer include i.f. signals at (say) 455 kc., and also i.f. signals falling off in amplitude on each side of this frequency because of the selectivity of the r.f. circuits. A wide band of these frequencies is transmitted to the panoramic 'scope and amplified through a compensated band-pass stage so that a "flat-topped" band is delivered to the second converter. By this means the relationship between actual strength of the incoming signal and its deflection on the screen is maintained fairly constant over the whole band of frequencies scanned.

The second converter is "swept," that is, the frequency of its oscillator section is varied periodically through a range of frequencies by means of a reactance tube. A saw-tooth generator feeds the reactance tube and also feeds (through an amplifier) the horizontal plates of the cathode-ray tube. Thus at any instant the second mixer with its second i.f. selects a single frequency from the wide band of first i.f. signals, and delivers it to the cathode-ray screen as a vertical deflection. But the frequency selected is varied periodically (Continued on page 68)

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**Silent Keys**

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

- George Bambridge, ex-BAM, F3OTB, Papeete, Tahiti
- James Bolton, G4KT, Blackburn, England
- William Thomas Caswell, jr., W5BB, Austin, Texas
- Jack D. Giles, W5HLZ, Natchez, Miss.
- N. K. Godkeesen, OZ4G, Trustup, Denmark
- Charles Guth, W6NAL, Carmel, Calif.
- Ignacio Armond y de Leon, CO2AL, Havana, Cuba
- John E. Manion, W9YHD, Maysville, Ky.
- Ellsworth M. McCollum, W8VBR, Cozad-dale, Ohio
- Ricardo R. del Monte, CM2MZ, Havana, Cuba
- Chester J. Pokrzywa, W9I0I, Chicago, Ill.
- Fred B. Raymond, W5GYK, Philadelphia, Penna.
- Dr. Charles E. Sceleth, W9GV, Chicago, Ill.
- Worth S. Sorenson, W1JUK, Boston, Mass.
- Joseph Spoon, W2GWB, Catskill, N. Y.
- G. E. Turner, W5CAM, Kilgore, Texas
- Frank R. Winn, W6LFM, Niland, Calif.
HAPPENINGS OF THE MONTH

WILLIAM THOMAS CASWELL, JR., W5BB, acting director of the West Gulf Division, ARRL, died peacefully in his sleep at his home in Austin, Texas, at 1 o’clock in the morning of January 26th. He was 25.

In poor health since a childhood illness, Tom Caswell nevertheless gave liberally of his energy and time to amateur radio. He was first licensed in 1929 at the age of 12, and from that time on was almost continuously active on the air, working both ‘phone and c.w. on all bands. Few amateurs have ever exceeded the time and devotion he bestowed on the game.

Recent years brought increasing activity in the organizational sphere, and in March, 1940, he was elected alternate director of the West Gulf Division. When Director William A. Green, W5BKH, was called to active duty with the Navy in 1941, Tom took over the duties of the office. He represented the division at its 1941 meeting, and both in the annual meeting and in the discharge of the other varied directorship duties displayed exceptional faithfulness and sagacity. His loss in the councils of ARRL will be greatly felt.

During 1941 W5BB participated in the development of the Texas Defense Guard. Appointed a captain on the staff of the Adjutant General, he served as communications officer. As such he organized the TDG’s comprehensive amateur radio net which linked most of the state’s fifty battalion centers until the close down, acting also as NCS of the net. Under his leadership this net distinguished itself during last year’s Gulf Coast hurricane as well as in the faithful conduct of the routine twice-weekly on-the-air drills (at which attendance constantly exceeded 90%). Its performance has elicited the highest praise from the governor of Texas and other officials.

Prior to his service of state and nation, W5BB was president of the Austin Radio Club. He was the first W5 to receive a DX Century Club certificate; held three WAC certificates (c.w., ‘phone and 28 Mc.), as well as WAS, WBE and BERTA. He was an A-1 Op, RCC member and formerly held an ORS appointment. Before becoming alternate director he was a member of the ARRL Planning Committee.

Widely known in amateur circles both because of his thousands of contacts on the air and his extensive personal acquaintanceships, Tom Caswell was liked and respected by his comrades in amateur radio and ARRL. He was proud to be an amateur, and we are proud that he was one of us.

ENSIGN GREEN, W5BKH, although still director of the division, has been unable to act because his service duties have called him outside the division. He has therefore appointed former Director Wayland M. Groves, W5NW, as assistant director and asked him to assume the administration of the division pending the election of a new director. Because of his active-duty status he has felt it desirable that he resign effective with the election of a successor. Consequently, a special election has been ordered for both director and alternate in the West Gulf Division, the formal notice of which follows.

ELECTION NOTICE

To all members of the American Radio Relay League residing in the West Gulf Division:

You are hereby notified that, because of the resignation of Director William A. Green, W5BKH, account nonresidence in the division, and the death of Alternate Director W. T. Caswell, Jr., W5BB, acting director, a special election is about to be held in your division to elect both a member of the ARRL Board of Directors and an alternate thereto, for the remainder of the 1941–1942 term and for the following two-year term, 1943-1944. Your attention is invited to the provisions in the Constitution and By-Laws for the government of ARRL by a Board of Directors, defining their eligibility, and providing for the nomination and election of directors and their
request.

ou are particularly cautioned to observe that, in order to permit the selection of a new director in time to represent you at the annual meeting of the Board of Directors in May next, less time than is customary is being provided for each action in the process of choosing the new director and alternate. The time will be ample for the requirements of each step in the process, but your reasonably prompt action is required. Nominations will close April 6, 1942; ballots will be mailed from the headquarters office as soon thereafter as possible; voting will take place between about April 10th and noon EST of April 30, 1942. The result will be determined as quickly thereafter as possible; and the new director and alternate will take office immediately upon that determination. The ballots will list in one column the names of all eligible candidates nominated for the office of director by ARRL members residing in the West Gulf Division; and, in another column, all those similarly named for the office of alternate. Each member will indicate his choice for each office. If there be but one eligible nominee for an office, he will be declared elected without balloting.

Nomination is by petition. Nominating petitions are hereby solicited. Ten or more ARRL members of the West Gulf Division may join in nominating any eligible member of the League residing in that division as a candidate for director therefrom or as a candidate for alternate director therefrom. No person may simultaneously be a candidate for the offices of both director and alternate. Inasmuch as the by-laws were recently amended to transfer all the powers of the director to the alternate in the event of the director's death or inability to perform his duties, it is of great importance to name a candidate for alternate as it is for director. The following form for nomination is suggested:

Executive Committee

The American Radio Relay League
West Hartford, Conn.

We, the undersigned members of the ARRL residing in the West Gulf Division, hereby nominate . . . . . . . of . . . . . . . as a candidate for DIRECTOR; and we also nominate . . . . . . . . . . . . . of . . . . . . . as a candidate for ALTERNATE DIRECTOR; from this division for the remainder of the 1941-1942 term and for the 1943-1944 term.

(Signatures and addresses)

The signers must be League members in good standing. The nominee must have been both a member of the League and a licensed radio amateur operator for a continuous term of at least four years immediately preceding receipt by the Secretary of his petition of nomination, except that a lapse of not to exceed ninety days in the renewal of the operator's license and a lapse of not to exceed thirty days in the renewal of membership in the League, at any expiration of either during the four-year period, will not disqualify the candidate. He must be without commercial radio connections: he may not be commercially engaged in the manufacture, selling or renting of radio apparatus normally capable of being used in radio communication or experimentation, nor commercially engaged in the publication of radio literature intended, in whole or part, for consumption by licensed radio amateurs. Further details concerning eligibility are given in By-Law 12. His complete name and address should be stated. The same requirements obtain for alternate as for director. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon EST of the 6th day of April, 1942. There is no limit to the number of petitions that may be filed on behalf of a given candidate but no member shall append his signature to more than one petition for the office of director and one petition for the office of alternate. To be valid, a petition must have the signatures of at least ten members in good standing; that is to say, ten or more members must join in executing a single document; a candidate is not nominated by one petition bearing six signatures and another bearing four. Petitioners are urged to have an ample number of signatures, since nominators are frequently found not to be members in good standing. It is not necessary that a petition name candidates both for director and for alternate but members are urged to interest themselves equally in the two offices.

Classification of members into Full Members and Associates is still in process, occurring at time of renewal throughout coming months. Members possessing certificates of Full Membership, and members not yet classified and holding valid old-style membership certificates, may nominate candidates, or may stand as candidates if otherwise eligible. But members holding certificates of Associate Membership are not eligible to either function.

Members are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

January 27, 1942

K. B. Warner
Secretary

"ESMDT"

Throughout the radio industry there is a great shortage of men trained in the fundamentals of radio theory. In the military services the need is even greater. To meet this need, a vast training plan has been started all over the country in the form of special free radio courses. The work is part of the Engineering, Science & Management Defense Training program of the Office of Education
Sides, W4AUP. Some of the boys also attempted alternate director in the person of William P. operating and theory to the youth of America. the hard luck to have an inadequate number of to nominate Ernest L. Morgan, W4FDJ, but had ranks after this show is over!

SOUTHEASTERN ALTERNATE issue.
In addition to ESMDT, Boards of Education throughout the country have been requested by the Bunav of the Navy Department to establish radio courses in high schools to give training in engineering university. If you happen to be thoroughly grounded in theory yourself, you are badly needed as a (paid) instructor.

This is an immense project that will give solid radio knowledge to perhaps a quarter of a million people. We have seen an outline of the courses prepared in some states and they are splendid. If you are an average amateur your theory is shaky, and you can greatly profit by enrolling. (The usual entrance requirement is that applicant be a high-school graduate with some knowledge of algebra.) Your particular patriotic duty in this matter, however, is to spread the news of these courses and to get the right kind of people to enroll for them in sufficient quantities. Some of the classes have already started, others are coming along rapidly; since they will occur in several cities in every state, there should be one near you. You can get data from your newspaper office or broadcasting station, or from the nearest engineering university. If you happen to be thoroughly grounded in theory yourself, you are badly needed as a (paid) instructor.

Incidentally, NAB recommends that students in these courses study The Radio Amateur's Handbook. You'll be interested to know that ARRL has bought out a special defense edition of the Handbook with changes especially calculated to make it of maximum usefulness as a manual for defense training classes — as announced elsewhere in this issue.

In addition to ESMDT, Boards of Education in several cities in every state, there should be one near you. You can get data from your newspaper office or broadcasting station, or from the nearest engineering university. If you happen to be thoroughly grounded in theory yourself, you are badly needed as a (paid) instructor.

Maybe these programs won't swell the amateur ranks after this show is over!

SOUTHEASTERN ALTERNATE

The Southeastern Division has a new alternate director in the person of William P. Sides, W4AUP. Some of the boys also attempted to nominate Ernest L. Morgan, W4FDJ, but had the hard luck to have an inadequate number of signers who were League members, so that the petition was not a legal one. This left the field to Mr. Sides, who was therefore declared elected without membership balloting.

Mr. Sides is a division operator of the Alabama Power Company at Montgomery. He is an OPS and AEC, and although he was ANCS of the AARS 75 'phone net he also has a 25 w.p.m. code certificate and is the holder of two public service certificates.

TICKLER

We give you three memory-joggers:

If you are available for a job in defense radio, fill out immediately the registration form appearing on page 27 of December QST and file it with us.

If you are in the military service in communications work, please report the fact for the ARRL roster. See page 34, November QST.

Voting membership in the League is confined to licensed amateurs residing in ARRL divisions. To permit proper classification you, please show whether you have an amateur license (either station or operator) when joining the League or renewing membership.

ATTENTION, HAMS IN SERVICE

Apparatus is becoming difficult to procure. Much is needed in the colleges that are conducting defense courses. Many useful pieces of apparatus and parts could be obtained from idle amateur stations. If you care to dispose of your station, write, or have your folks at home write in your behalf, to the department of electrical engineering or science of the college or university nearest to your home, and offer it for sale.

ABOUT O.C.D. VOLUNTEER OFFICES

We have previously reported how the OCD organization provides for the maintenance of a local Volunteer Office in each city, where personnel is recruited and assigned to the ARP services. It was originally our understanding that arrangements would be made whereunder amateurs wishing to take part in the civilian-protection work would be enrolled through these Volunteer Offices. This would involve a formal amendment of the standing instructions, and it now seems that the question may be permanently stymied. It will not make any difference to our plans. The Volunteer Offices are concerned chiefly with the assignment of personnel to ARP tasks (and with the various women's auxiliaries), whereas we will serve as part of the control staff. We have discussed this matter with the OCD people at Washington and it now seems preferable to work on the following basis: The Commander of the Citizens' Defense Corps will appoint a communications officer with general re-

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(Continued on page 62)
An Acoustic System for Aircraft Detection

A New Job for the Speech Amplifier

BY DON H. MIX, WITS

This article tells how to set up a simple acoustic system for the detection of aircraft. Such a system is urgently needed by spotters in local units of the AWS. Because of priorities, the demand cannot be immediately filled by government agencies. Here's a chance for the ham to make a real contribution to national defense. It's a job right down his alley. Furthermore, there's plenty of fun connected with it. It's an interesting subject for the experimenter too, since there is surprisingly little available information on the subject. There are problems to be solved and there is plenty of room for development.

ALTHOUGH the picture of the future is not completely clear at the moment, it seems probable that the chief function of the amateur not directly involved in military service will be that of replacing vital local wire communications which may succumb in the event of attack by air, or possibly natural disaster. These are contingencies for which we have been training ourselves for many years.

* Assistant Technical Editor, QST.

There are, however, other ways which will undoubtedly appear from time to time as the war progresses in which we can contribute our skill and the use of our equipment. Some of these, we are confident, will be definitely out of the "watchful waiting" class; they will be interesting things to which we can immediately turn our itching hands without restriction.

One thought which has occurred to many hams is that idle or simply-built audio gear can be made to serve importantly in assisting the civilian aircraft spotter in his lonely vigil in all kinds of weather. Not only does inclement weather add to his physical trials, but it also decreases his efficiency as an observer. This applies particularly to the effects of cold weather which force the observer to keep his ears more or less under cover.

For some time before the development of the radio locator, the British had had considerable success in detecting the course of approaching aircraft by acoustic methods. A system of this type has also been used by the military services in this country. The device usually consists of a pattern of several large horns terminating in a single outlet for sound which is led directly to the observer's ears or, through audio amplifiers, to electrical indicators. The horns may be oriented to determine the direction of approach of aircraft. Several amateurs have recently written us regarding the possibility of home-brewing something along the same lines built around existing ham gear. It seems to us, however, that the immediate need can be filled as well, if not better, by a less-cumbersome arrangement consisting of simply a non-directional mike, high-gain amplifier and headphones or loudspeaker. Such an arrangement removes many of the headaches involved in directional systems. The problem of continual orientation of a directional system is further complicated by the necessity for eliminating noise contributed by microphone vibration. Tests with a simple horn of plywood for directivity also showed that this type of horn is entirely unsuitable because of the rumble introduced by the vibrating sides of the horn. This undoubtedly has something to do with the thick-walled horns shown in published photographs of directive systems in use.

It is apparent that the job of the spotter may be divided into two distinct stages. The first stage is that of detecting the presence of aircraft in the vicinity, while the second is that of determining the course of approach. It seems quite
obvious that a highly-directive system would be at a distinct disadvantage in the first stage; it would be similar to the case of searching for one or two signals over an otherwise unoccupied wide band of frequencies with the crystal filter cranked up for maximum selectivity. Although little information is available on the subject, it seems highly probable that directive systems must be equipped with non-directional auxiliaries to cover this first stage to facilitate rapid detection of the presence of aircraft after which the directive system is brought into use. It should be a relatively easy job to set up equipment which will permit the spotter to remain out of the weather until the approach of aircraft is detected after which he may go outside to make his usual observations.

While it is probable that the authorities plan eventually to provide some sort of gear for the spotters, it may be some time before the necessity for concentration of production along other lines will permit issue of such equipment to any but the most-important posts. In the meantime, individual amateurs and clubs are in a position to ease the job of the local spotters tremendously. In many cases, speediest relief can be supplied by the loan of existing idle speech equipment. In others, it may be more advisable to build up a simple unit available from spare parts, while under still other circumstances, it may be necessary only to act as constructor or adviser when components or complete equipment can be furnished by local authorities.

A high-gain amplifier with a power stage rated at 3 watts will give excellent loudspeaker performance. This means that the speech amplifier and driver stages of almost any medium-power modulator will fulfill the requirements. It is particularly important that the amplifier be free from hum, since the audio frequencies of importance are those of the lower part of the range. Microphones of the dynamic type are less susceptible to extremes in temperature. The carbon and crystal mikes in predominant use among amateurs may be used successfully with suitable precautions, however. The crystal type is unaffected by low temperatures, but must be protected against excessively high temperatures. Speakers of the permanent-magnet dynamic type will be most convenient to use in most locations.

If the speaker is equipped with the usual type of coupling transformer, it should be possible to arrive at a reasonably close match between driver output and speaker by simply connecting the

![Circuit Diagram](image-url)

**Fig. 1 — Circuit diagram of simple audio amplifier for aircraft detection.**

- C1 — 25-µfd., 25-volt electrolytic.
- C2 — 8-µfd., 450-volt electrolytic.
- C3 — 0.1-µfd. paper.
- C4 — 0.01-µfd. paper.
- C6 — 0.01-µfd. paper.
- C7 — 25-µfd., 50-volt electrolytic.
- C8, C9 — 16-µfd., 450-volt electrolytic.
- J — Open-circuit jack.
- L — Filter choke, 10 by., 65 ma.
- R1 — 5 meg., ½-watt.
- R2 — 1300 ohms, ½-watt.
- R3 — 1.5 meg., ½-watt.
- R4 — ¾ meg., ½-watt.
- R5 — 50,000 ohms, ½-watt.
- R6 — 1-meg. potentiometer.
- R7 — 2000 ohms, 1-watt.
- R8 — 0.1 meg., 1-watt.
- R9 — ¾ meg., ½-watt.
- R10 — 400 ohms, 1-watt.
- S — S.p.s.t. toggle switch.
- T — B.c. replacement transformer, 290 volts, r.m.s., 40 ma., each side of center; 5 volts, 3 amp.; 6.3 volts, 2 amp. (Thordarson 13R11).
primary winding of the speaker transformer to the output winding of the Class-B input transformer. By trial, it may be determined whether it is better to connect across the entire output winding of the Class-B transformer or across only half. By using the Class-B input transformer in this manner, it will avoid the necessity for passing the driver d.c. plate current, which may be excessive, through the primary winding of the speaker transformer. The audio output of the driver can be limited to that which the speaker will handle by adjustment of the gain control. If this arrangement is not used, it will be necessary to substitute a speaker transformer of suitable rating between the output of the driver stage and the speaker voice coil.

In some cases, it may be deemed more desirable to build up a simple amplifier for the purpose. The one shown in the accompanying photographs is designed to work with a crystal microphone. The circuit diagram is shown in Fig. 1. It consists of a 6J7 pentode high-gain stage followed by a conventional 6J5 resistance-coupled triode stage, ending up with a 6F6 in the power stage.

A small a.c. power supply delivering 250 volts is included. The output of the power stage will operate a speaker of decent size at good volume. A jack for headphones is provided in the output of the triode. A socket is also included to permit application of independent supply from batteries or vibrator pack in localities where a.c. supply is not available. A dummy plug with two pins shorted is inserted in the socket to complete the heater circuit when a.c. supply is obtainable. When using a storage battery for heater supply and "B" batteries for plate supply, most economical operation will, of course, be obtained by removing the power tube and using headphones. In this way, long battery life may be obtained.

The unit is constructed on a chassis 7 inches by 3 inches by 2 inches. The only precaution necessary is that of isolating the microphone input connection from components which might introduce feedback or hum. The standard Amphenol microphone cable connector is covered with a National microphone jack shield which also houses the input grid resistor, $R_1$. Shielded wire is used for the connection between the mike connector and the grid of the 6J7. The grid cap of the 6J7 is covered with a shielding cap. The gain-control potentiometer, $R_s$, is mounted at one end of the chassis between the 6J7 and 6J5 sockets, while the power switch, headphone jack and pin jacks for the speaker connection are mounted at the opposite end. External power connections for independent supply are made at the socket in the rear edge of the chassis. Other components are placed close to the points to which they connect.

The successful operation of such a unit will depend greatly upon the location of the installation. A noisy location makes it difficult to distinguish weak aircraft responses. The remarkable ability of the human ear to distinguish selected sounds amidst a confusion of sounds because of the directivity of the aural system is entirely lost when all sounds from a large area emanate from a single source, in this case, the loudspeaker. The only selective means left for the ear to work upon are the frequency and certain other characteristics of sounds of various types. Thus, a restriction is placed upon the usefulness of the ear in detecting the approach of aircraft which can be best compensated for only by a low noise level at the location of the microphone. Traffic noises are particularly bothersome, since the frequencies are in the range most useful in detecting aircraft. At the same time, however, an audio system can be made more sensitive than the unaided human ear, so that in quiet locations it should be possible to detect the presence of aircraft at greater distances with the amplifier.

In an otherwise quiet location, wind will be the source of greatest noise. Wind noise may be greatly reduced by the use of a silk screen and

(Continued on page 68)
SIGNAL CORPS COMMISSIONS

The Electronics Battalion takes only unmarried men without dependents. Many married applicants have been rejected. Here is big news for amateurs:

The Signal Corps wants several hundred communications officers for immediate duty, not in the EB, and will take men between the ages of 30 and 60 even if they are married or have dependents. In fact, applicants between 21 and 30 will be considered if it can be shown that their services in the Signal Corps would be of more value than in any other capacity. It is preferred that candidates have college training in electrical or radio engineering, but in some cases years of commercial experience will be accepted in lieu of a degree or college credits. We understand that the urgency is sufficiently great to have resulted in a very liberal policy concerning physical defects, with the result that almost any disability that will not interfere with an officer's functioning can be waived, except heart trouble.

This makes it possible for many skilled amateurs with families and good positions to rally around and yet be able to support their families in comparable manner. As with the electronics group, the ARRL prez is qualifying applicants. Write to George W. Bailey, National Research Council, 2101 Constitution Ave., Washington.

ENGINEERING STUDENTS AS OFFICERS

Good news for students of engineering and physics: You are encouraged to stay in college and complete your technical training, so that you may qualify as an officer.

The Chief Signal Officer is authorized to enlist junior and senior students of electrical engineering in the Signal Enlisted Reserve Corps. Students so enlisted will be deferred from active duty until the date for completion of their academic courses. Upon satisfactory completion of engineering training and the recommendation of the CSO, these students will be tendered commissions in the Army and discharged from their enlisted status.

If you’re an EE student, no need to go into the draft as a private and let your schooling be interrupted. Get deferment, finish it up, serve as a lieutenant. For more dope, see your dean.

S. C. PRODUCTION ENGINEERS

The pressure of work in the Coordination and Equipment Division of the Office of the Chief Signal Officer at Washington has reached the point where more trained engineers are desperately needed. An appeal is being made for several dozen trained engineers of industry experience to lend themselves to this work.

The C&E division deals with military communications equipment. Engineers engaged in this work study the military characteristics of comparable equipments, figure out how existing designs may be made to fill a new tactical need, analyze the tactical and technical requirements, the manufacturing practicability of a new design, the available production capacity in the country, etc. What are needed, therefore, are trained engineers with experience in industrial radio and, if possible, familiarity with Army radio equipment. In addition to radio, help is needed in the wire and sound fields. It is interesting work and rightfully important in getting our vast radio requirements into production.

Compensation commensurate with the positions can be arranged. In many cases this will be a Civil Service rating, which the Signal Corps will arrange for after correspondence with the applicant. Commissions up possibly as high as the rank of colonel are also available. Engineers patriotically willing to attach themselves to this work.

(Continued on page 78)
Radio and Atom Busting

A Glimpse at the Cyclotron

BY J. S. V. ALLEN,* WBUNS

Imagine the ecstacies of an amateur who had nursed a 200-watt transmitter up to 300 watts, and then suddenly had the opportunity of playing with an 80,000-watt rig that loafs along at 40 kilowatts input! Therein lies a story.

One of the more recent scientific developments employing radio frequency power is the cyclotron or “atom-smasher,” which threatens to revolutionize our lives some time in the future by unleashing almost limitless sources of atomic energy. A brief description of this scientific wonder and the part played by high-frequency radio may be of interest to the radio amateur. Also, some of the humorous and unusual experiences and observations of an enthusiastic ham may be interesting to others in the realm of hamdom.

The 100-ton cyclotron recently completed at the Ohio State University, at a cost of $60,000, is the product of over two years of unceasing toil by Dr. M. L. Pool and his associates. Eighty tons of iron went into the construction of the magnet core, which was wound with more than nine miles of 1/4-inch copper tubing. Through this tubing a current of 300 amperes may be passed, if at the same time water is circulated through the tubing for cooling purposes. Automatic switches have been installed to stop the current if the water should cease to flow, thus preventing the high current from burning up the large magnet coils. It requires several minutes for a 50-kw. motor-generator to build up a current of 300 amperes, and during this time the magnet creaks from magnetic forces being set up within the coils. If the circuit should accidentally be opened, the destructive forces would be considerable because of the enormous amount of energy stored within the large magnetic field (15,000 gauss over 1400 square inches). For this reason the magnet and the generator are permanently connected. If the motor of the M.-G. set is turned off, the energy flows from the magnet into the generator and reverses the set. Hence, the field in the generator is reduced first, and then the M.-G. set is shut down.

How the Cyclotron Works

The construction and operation of the cyclotron, briefly stated, are as follows: There is a large cylindrical vacuum chamber, 42 inches in diameter and 8 inches high, between the magnet poles. Within this chamber are two “dnees,” so-called because they are shaped like the letter D. These two copper dnees are electrodes supported within the chamber by insulators and connected to the radio frequency power oscillator.

![A cyclotron is a tremendous affair because it is necessary to build up terrific particle velocities to disintegrate atoms. This 42-inch (chamber diameter) cyclotron at the Ohio State University was constructed and is operated through the aid of Julius F. Stone, the Ohio State University Development Fund, and WPA aid.](image)

Near the center of the chamber is a tungsten filament, which must be heated by radio frequency current because the interaction between ordinary alternating or direct current and the 15,000-gauss magnetic field would bring destructive forces to bear upon the filament. Hence, an 806-833 “transmitter” (650 watts), operating on 200 kc., is used to light the filament with r.f. Above the filament is a plate, at 1000 volts positive potential to draw a beam of electrons from the filament. The beam passes vertically along the axis, ionizing the low-pressure hydrogen within the chamber. The protons, or ionized hydrogen nuclei, have a positive charge, and are pushed and pulled around and around between the two hollow dee-shaped electrodes 10.5 million times per second as the polarity of the dnees oscillates. When a state of resonance exists, the positive hydrogen ion arrives between the dnees in

* Bethany College, Bethany, W. Va.
time to be attracted by the negative charge on the one dee and repelled by the positive charge on the other dee.

But in moving, the proton must pass through the strong magnetic field which turns the ion in a semicircle. Each time the ion runs the gauntlet between the dees it receives an electrical kick in the pants, figuratively speaking, of about 40,000 volts. In this way the speed of the ion is increased to about 6000 miles per second before it crashes into the target at the outer edge of the chamber. With higher velocities a new difficulty is encountered — relativity. The ions become heavier because of their tremendous velocities, and hence cannot be accelerated as easily. The path of the ion from the center to the target is a series of about 125 semicircles with increasing radii, the increase taking place each time the ion is accelerated between the dees.

The R.F. Oscillator

The most interesting part of the cyclotron to the ham is the 80-kw. power oscillator used to drive the ions back and forth between the dees. This shielded radio transmitter employs a pair of 859 tubes. Don’t look in your Handbook for the characteristics of this tube for it exceeds the maximum amateur input by about 4000% (2000% in California)! Each tube is capable of handling more than 40 kw. at 10.5 megacycles, the frequency used. With an input of 50 kw. the plate dissipation is 20 kw., requiring a flow of from 8 to 15 gallons of water per minute. The filament current is 70 amperes and the voltage across the two units of the filament is 22. The tube is two feet in height — a real bottle!

With an input of 40 kw., perhaps 2 kw. reach the water-cooled target where the atoms are cracked, and is dissipated over an area approximately 0.05 square inch. Try that on your final amplifier tube! The target becomes white hot during some bombardments.

The power oscillator is housed in a large copper enclosure several feet from the cyclotron. The r.f. power is transferred to the chamber of the atom-smasher by means of a transmission line which includes a quarter-wavelength section. The shorting bar on this line is adjustable, permitting rough tuning. The fine tuning is accomplished by a man-sized variable condenser — a 13 square-foot vane hinged over the transmission line and adjusted by means of a motor. This whole Lecher system is made of 5-inch copper tubing and must be water-cooled for good stability. The voltage multiplication obtained by making the transmission line shorter than a quarter-wavelength is about 100. If one stands close to the transmission line his ears become uncomfortably warm from induced r.f.; there is some evidence that sinus trouble has been cured while working in the r.f. field of the transmission line.

The frequency of the power-oscillator must be maintained within a few kilocycles of the resonance frequency for a certain strength of magnetic field, otherwise the ions will fall out of step and will arrive at the gap between the dees at the wrong time to receive the greatest acceleration. The operator can control the frequency by varying the capacity through the tuning vane above the transmission line. Or an automatic gadget called a discriminator can be used.

This automaton consists of an electron-coupled oscillator, amplifying circuits and a bridge circuit. Its oscillator is tuned to a frequency 5000 kilocycles below the frequency of the

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While cyclotrons and many other devices utilizing the electronic art which has developed as a result of radio research are not, strictly speaking, “another part of the family,” some of them are not very distant cousins. This article is presented with the thought that the ordinary amateur is enough interested in general science to want to know what the more interesting developments are in allied fields. If the gang wants, we’ll try to have more articles of this nature from time to time.

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power oscillator, giving a heterodyne signal of 5000 kc., which is applied to a bridge circuit balanced at 5000 kc. Any variation in the frequency of the power oscillator resulting from load resistance changes caused by heating in the power circuits causes the heterodyne beat to change and the bridge to become unbalanced proportionately. The unbalanced voltage controls the motor which varies the position of the tuning vane, and the frequency of the large oscillator is thus restored to resonance.

Occasionally the power oscillator becomes unstable and a heavy r.f. arc jumps across the grid line used to tune the grid circuit. At these times the discriminator is thrown into a state of nervous disorder. Sometimes it will adjust the tuning capacity first in one direction, then in the other, very rapidly. But under normal conditions this gadget operates very well.

When the grid circuit breaks down with a thunderous arc, the discharge sometimes drills a very fine hole through the centers of the nine-inch insulators, or an insulator may be shattered by the arc. The operator is always alert for such emergencies, and quickly turns off the power to prevent more damage.

One rainy day the 100-kva., 20,000-volt, threephase power transformer arced with a great flash and noise. Later the same day the author was operating the cyclotron and worrying about another transformer flash-over when a 150-watt lamp over his head burned out with a bright flash. Nervous prostration set in, but not before he had turned off all the power in a split second!

Warning — Leave Watches Outside!

Many interesting things happen around a cyclotron which are not duplicated elsewhere. One source of several interesting tales is the strong magnetic field. If one approaches the large magnet with iron tools in his pockets he can feel them move in strange ways under the influence of the field. An eight-inch wrench which was passed carefully from one man to another was drawn with terrific force to the magnet, and it took two men to pull it off the magnet pole. An iron box was once carried too close to the cyclotron, with the result that the magnet had to be turned off before the box could be extricated.

Many people visit the cyclotron, and are warned before they enter the laboratory that their watches will be magnetized if carried near the magnet. In spite of this warning one lady carried her watch into the cyclotron room in her purse and later asked if it was not all right, since she had not removed it from her purse while near the large magnet! She did not realize that imitation leather is a very poor magnetic shield. A demagnetizing coil such as a jeweler uses is kept in an adjacent laboratory for such cases.

One day a visiting monkey from a near-by laboratory was scampering all over the cyclotron, with workmen in hot pursuit. An ether gun and other devices were used in trying to catch the unwelcome visitor but the cyclotron itself finally accomplished this feat. When the monkey tried to run through the belt of a small vacuum pump its foot was caught, and the belt held it until a keeper captured the monkey. But atom-smashing is not all monkey business, as the following paragraphs about the products of the cyclotron will demonstrate.

The material placed in the cyclotron is bombarded with protons, neutrons, deuterons, or alpha particles, with the result that minute quantities of the material are activated, after which they radiate much the same as radium does. In fact certain radioactive elements are used instead of radium in treating cancer, leukemia, and other diseases. These radioactive substances can be used as tracers within the human body, as shown by the experiment in which a person is fed some radioactive material which enters the blood and reaches the fingers within a very few minutes. The radioactivity can be detected in the finger tips by holding them near a Geiger-Muller counter which clicks each time a particle from an exploding atom pierces the counter tube. These radioactive substances have been called the greatest contribution to medical research since the discovery of the microscope.

Atomic power is perhaps a possibility in the not

(Continued on page 88)
A pair of modern code-practice oscillators. The one at the left gets its power from the 110-volt a.c. line, and the right-hand one uses batteries that are housed in the case. Both units are made of wood and painted with gray lacquer. The handle on the battery job is the final touch that makes it truly portable.

**For the Junior Constructor**

Code Practice Oscillators

Time was when a key and buzzer made up the usual practice set, but vacuum tube oscillators are vastly superior to anything but special high-pitched buzzers and are now universally used. The vacuum tube oscillators to be described differ from others only in their economy and convenience. Both use a minimum of parts — one needs only to be connected to a 110-volt a.c. source to be ready for operation (with slight modification it can be arranged for 6-volt d.c. use), and the other is entirely self-contained. Enough output can be obtained to operate several pairs of headphones or a small speaker.

The 110-Volt A.C. Oscillator

Code-practice oscillators have been built in the past which utilized only the voltage drop across the filament for the plate voltage, some have incorporated a small B battery for the plate supply, and still others have used the 117-volt cathode types to work directly from the power line. The oscillator shown in Fig. 1 uses a double-triode type of tube, with one triode section forming the oscillator portion and the other connected as a diode rectifier to furnish a small amount of plate voltage for the oscillator. By using the twin-triode tube in this arrangement, the oscillator is completely isolated from the power line, and there is no opportunity for a novice or careless person to get an electrical shock from the equipment. The voltage applied to the diode rectifier is obtained from the heater transformer, and thus there is no connection between any part of the unit and the 110-volt line.

As can be seen from Fig. 1 and the photographs, there are very few components in the unit and it is a simple matter to assemble them. Two jacks were used for connection to the key and headphones or speaker, but the ingenious constructor can easily replace these with cheaper substitutes if he desires. However, it is likely that one's headphones will normally be connected to a plug, and thus at least one jack is a good investment.

The oscillator chassis was built of pieces of ½-inch thick plywood and two strips of 1- by 2-inch pine. The top was cut to 4 by 5½ inches, but the construction and size can of course be modified to meet the requirements of the builder. The hole for the socket can be cut with an expanding bit or scroll saw, and the hole should be made large enough to pass the base of the tube.

---

Fig. 1 — Wiring diagram of the code-practice oscillator.
C1 — 250-µfd. mica.
J1, J2 — Small closed-circuit jacks.
R1 — 0.15 megohms, ½ watt.
T1 — 6.3-volt, 1-ampere transformer (Thordarson T-19F80).
T2 — Small audio transformer (Thordarson T-13A34).
A code-practice oscillator is a handy gadget to have around the shack at any time, and one becomes even more useful and appropriate under the present circumstances. Whether used to increase one's code speed beyond the pre-war rate or for code instruction of a group of potential operators, a key and an audio tone generator become a good investment at this or any other time.

(which is slightly larger than the diameter of some sockets). The wood was fastened together by nails and glue and then given a coat of shellac and a coat of gray lacquer.

There is no special care necessary in wiring the oscillator, except in the case of the 110-volt leads running to the heater transformer, T1. The connections from the line cord to the transformer primary should be soldered, well taped, and then forced between the transformer and the chassis. A staple can be used to secure the line cord to the chassis, as shown in the photograph. The grid connection that is brought out the top of the 6F8G is tied to the corresponding plate of that triode section. The key and phones can be plugged into either jack.

This inside view of the battery-powered oscillator shows the general placement of parts, and particularly the method of mounting the transformer shelf and recessed control panel.

Anyone who wishes to build a similar oscillator for 6 volts d.c. battery operation can do so by eliminating the filament transformer and substituting a 6J5 for the 6F8G. The circuit diagram is given in Fig. 2.

A Self-Contained Unit

Typical of the "personal portable" era, and every bit as convenient, is an alternate design shown in Fig. 3 and accompanying photographs. Battery-powered, self-contained, book size, this little unit will be found easy to carry over to a friend's house along with the Handbook for an evening's code practice; you will find it smaller than the Handbook, and not much thicker.

The circuit is the standard one using separate battery power for the plate circuit, since the filament voltage here would not successfully do the job. This unit employs a 1LE3, but of course any 1½-volt triode with low filament drain would serve the purpose. In fact, with the growing scarcity of tubes it may be necessary to dig into the "junk box" for an old type 30. Any 3:1 audio transformer will suffice, the smaller the better.

The box itself is made up of a rectangular frame of 1X2 white pine, with the top and bottom consisting each of a sheet of ¼-inch plywood. It measures 8X5½X2 inches outside, but here again the actual size will depend upon the parts available to the constructor. Long wood screws hold the frame; the rear side is fastened to the frame with small brads. The front panel, which must be removable to allow access to the batteries and tube, is held in place by small wood screws. The box can be dressed up a bit by rounding the corners and beveling the edges with a wood rasp (be extremely careful of the plywood!), a little sandpaper and a lot of elbow grease.

Battery life would be reduced considerably if the control switch were accidentally tripped to the "on" position and unknowingly left there a day or two. For that reason, the switch panel is recessed. This is done simply by cutting a small rectangular slot in one of the long frame members, of sufficient size to accommodate the switch and jacks, and fastening behind it a small piece of...
Presdwood or plywood, of slightly larger dimensions than the slot, on which the controls have been mounted. A bit of edge-rounding is in order here, too. Two closed-circuit jacks are connected in series in this unit also, allowing use of either or both at will.

Filament power is supplied by two small flashlight batteries (Burgess 432, or equivalent) for the plate circuit. A total plate voltage of 13½ V gives ample headphone volume with about 0.1 mA plate current, which allows maximum battery life. Although not visible in the photograph of the inside, the two "A" cells are behind one of the "B" batteries in the battery compartment. As can be seen from the inside view, the transformer is mounted on a small rectangular piece of Presdwood fitted into slots in the frame; this mounting serves also to hold the batteries in place. Homemade battery clips being a troublesome task, we soldered connections directly.

Since the pitch of either oscillator can be adjusted by changing the values of \( R_1 \) and \( C_1 \), it is not recommended that the connections to these two parts be made permanent before the oscillator is tested, particularly if a different type of transformer (\( T_2 \)) is used. If the pitch is not pleasing, the values of \( R_1 \) and \( C_1 \) can be changed until it is. If the circuit does not oscillate right off, reverse the grid and ground connections of \( T_2 \).

Take your choice. Build one of these gadgets, pull up a chair, and do some serious practicing. You can build up a lot of proficiency, particularly if you find another ham to work with you, criticize your sending, and give you receiving practice. Past \( QST \) articles form an excellent course in advanced study.

— B. G. & J. H.

October Battery Power Contest Scores

Low Frequency Stations

(Stations are listed in order of score. Figures following call indicate score, number of sections and contacts.)

<table>
<thead>
<tr>
<th>Station</th>
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<th>Sections</th>
<th>Contacts</th>
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<tr>
<td>W8RMH/8</td>
<td>6726</td>
<td>19-82</td>
<td>W8OVB/8</td>
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<td>W3BYF/3</td>
<td>6006</td>
<td>21-71</td>
<td>W9AGY</td>
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<td>4576</td>
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<td>W8GF/8</td>
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<td>W7RT</td>
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<td>1694</td>
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<td>8-17</td>
<td>W9TIO</td>
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<tr>
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<td>273</td>
<td>7-20</td>
<td>W9ARN</td>
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U.H.F. Stations

(All stations reporting used 112 Mc. Figures indicate score and number of stations worked.)

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<td>W6INN/6</td>
<td>223-52</td>
<td>W9JS/2</td>
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<tr>
<td>W9DZA/2</td>
<td>140-31</td>
<td>W1MKR/1</td>
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<tr>
<td>W1GBC/17</td>
<td>62-13</td>
<td>W8VUL/8</td>
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RADAR TRAINING

Amateurs are going in for the Navy's radiolocator training in a big way. Over two hundred have already appeared at the Noroton Naval Training Station, for example, to begin an eight months' course in the new technique. Here are some of the calls: Radiomen Delaney, 1FLR; Conte, 1GAO; Buchner, 1HWW; Hutchinson, 1AW; Hendler, 1BT; Wetlinsky, 1JPT; Pierce, 1LHH; Greene, 1MCN; Cavallini, 1RR; Philactos, 2AA-Y-IWH; Middleman, 2DZP; Meyer, 2GHK; Fergusson, ex-2GVW; Cleeland, 2HHP; Junior, 2HIPS; Cummings, 2KUF-9LEJ; Parnow, 2KAT; Daniels, 2ODA; Dickson, 3DSI; Cornwell, 3EFR; Kelley, 3FAI; Lorentson, 3GSD; Ford, 3HQL; Erdman, 3JBE; Robinson, 3JBG; Weitzel, 3JXV; Kelly, 4ATW; Tanner, 4BJG; Gammell, 4CFD; Baker, 4DKV; Smallen, 4DWR; Green, 4ELT; Azar, 4EU; Wyatt, 4EMC; Fowler, 4EYD; Newman, 4EYT; Windham, 4FAT; Smith, 4FDG; Rice, 4FG; Powell, 4FIY; Taylor, 4GGK; Ward, 4GAN; Henson, 4IER; Frederick, 4HTE; Selby, 4OS; Hawkins, 5BCK; Whitaker, 5HLT; Harbus, 4HRN; Cline, 5IDI; Horney, 5IDS; Reid, 5MU; Miles, 5JOS; Williams, 6NNW; Rex, 6QHW; Reynolds, 8EZR; Drenchko, ex-8FY; Henderson, 8GGB; Mace, 8MWZ; Rowe, 8REJ; Lotto, 8QKZ; Frederick, 8QLC; Olesfsky, 8RCL; Kemzura, 8RYY; Scott, 8STL; Dunkerton, 8QCK; Long, 8TWZ; Heitfield, 8VVP; Wilson, 8WSP; Crane, 9ARQ-5KFG; Soltow, 9BW; Fowley, 9CRY; Hill, 9JUL; Roberts, ex-9IGS; Fliegel, 9IVE; Lambrecht, 9JLM; Pulliam, 9LBQ; Smith, 9QUP; Hurt, 9RGI; Rowe, 9TNN; Damrow, 9SOZ; Bayer, ex-9SU; Lee, 9TVY; Osler, 9YDW; Neusbaum, 9YQS-3JWK; Brown, 9YQB; Johnson, 9ZSB; Tlapa, 6KUJX; Baird, 5GCU; Blossom, 5IMG; Canino, 8ERZ; Carter, 4JGP; Davies, 1AZG; Fisher, 3IFT; Geer, 1NCY; Gelardi, 1CCX; Heath, 3HID; Leahy, 8TKY; Levering, 1FDS; Martin, 3JUL; Miron, 1ARQ; Podroskey, 8NUS; Poindexter, 4FHS; Roberts, 5HRA; Ford, 9HGM; Hargis, 4FWS; Hurt, 9RGI; Leiphart, 8JFK; Munizza, 9SRZ; Schreiber, 1KKN; Ledbetter, 9WTT; Parker, 8KA; White, 9MMD; Smith, 5KAA; Killingsworth, 4EGI; Alexander, 4DPY; Bacon, 9VCJ; Ratcliff, 4CJE.

Lt. Comdr. Boyd Phelps, 9BP, has been transferred from Indianapolis to become executive officer at Noroton. Lt. LaVille, 9ELL, is now communications officer of the inshore patrol, Norfolk. Congratulations to Lt. (jg) Battey, 1UE, on the extra gold stripe, and the assignment to special recruiting duty among northeastern amateurs.

AIR CORPS

Major Bundy, 5GQK, has been appointed director of pilot training in the advanced school at Kelly Field, Texas. Lts. Miller, 4CWB, and Moyer, 3EWJ, recently acquired their wings. Lt. Ready, 5CTP, is at Randolph Field, and Lt. Brooks, 4EDJ, at Tuskegee, Ala. Pvt. Leonard, 5HDR, is in the 154th Obsn. Sqdn. at Elgin Field, Fla. Sgts. Anderson, 6GSP, and Stoddard,
Frank Miller, 4CW, now has his wings and commission as second lieutenant, USAC.

6SYN, who used to "scrap" over the air, now do so in the air with the 4th Obsn. Sqn., California State Guard. Gridley, 4GJO, is taking advanced radio training at Scott Field.

SIGNAL CORPS

Lt. Spillner, 2NY, is awaiting call to active duty. Lts. Hall, 3GOL, and Reynolds, 4BT, are new members of the electronics battalion. Gruble, 7RT, enlisted in the S.C. for Alaskan duty. Sgt. Rubin, 2LAD, is doing radio repair work in Iceland. Pvt. Samardza (operator license only), and Staff Sgt. Eanelli, 4HNP, are stationed at Ft. Jackson, S. C. We find Pvt. Burke, 8TYF, operating in the 37th Sig. Co., Camp Shelby; Franklin, 6JVG, with the 40th Sig. Co., Camp San Luis, Obispo, Calif.; Scanlan, 5JHZ, 3rd Comms. Sqn., Marshall Field, Kans. Major Elward, 3JJO, is with the 64th Sig. Bn., Ft. Meade, Md.

ARMY


NAVY

Ensign Hancock, 6ALK, is at the Los Angeles NTS. Rogatsky, 6LUJ, is assigned to the radio station at Chollas Heights, Cal. CRM Collins, 8QN, operates aboard the aircraft carrier Saratoga. RM2cs Lee, 6NON, and Lee, 6NON, are assigned to the D/F station at Imperial Beach, Cal. The Richmond brothers are doing their part: RM 7GKZ, operating on the Saratoga; 7AHF in Washington, and 7CRH operating for American Airlines in Memphis. And there are the Brogan brothers: 3ARM an op. and 6USG a machinist's mate in the Navy, and 3JEW going into the Army! Lt. Snyder, 80UT, is senior dental officer of the Griffin. Tomblin, 9UO, has enlisted in the Naval air service. RM3C Strauss, 2MFR, is stationed with the Coast Guard at San Juan, P. R. CRM Davis, K6UJO, repairs radio equipment on the Dobbin; Ganzman, 8OFW, is assigned to the Riget; and Welling, K6TRF, to the Argonne; all of the Pacific fleet. In the other ocean we find RM2C Swartz, 8BLL, on the Eberte; Schreiber, 2MGL, on the Woodcock; Lt. (jg) Von Dohlen, 4HC, on the Milwaukee; and CRM Tarditi, 2BPV, at the N.A.S. in Brooklyn. Officers taking physicist training at Noroton: Bullock, 6MGP; Dulewich, 9MYP; Edgerly, 1BOO; Homsher, 3AXR; Horrell, ex-9SVK; Schrader, 21NC. More "Radar" men are Blanchard, 9KJC; Miller, 6DED; Wharf, 9FHL; and O'Connor, 8VHU.

It is our unhappy duty to report the deaths, in line of duty, of Ensign Marvin Zimmerman, 9NZW, killed in a plane crash at Atlanta, Ga.; Radioman Sampson, 9WQD, on the Arizona; Lt. (jg) Bush, 4FB, of the Naval Research Lab., Washington; and J. Pokrzywa, 9IOU, USAC, killed in action in the Philippines. Lt. Wm. Clark, 6DHS, California State Guard, was killed upon the accidental discharge of a pistol he was examining.

RM1c Kellogg, 6MRE, who pounds brass on a Pacific patrol bomber, tells us of the following other Beverly Hills hams now in service: Lt. Winchell, 6NHK, chief weatherman at Randolph Field, Texas; Lt. Davis, 6NMA, in radio training at Scott Field; and RM2c Stynes, 6MFJ, of the Navy. Pvt. Fowler, 3GJZ, is now with the 16th Sig. Svc. Co. at Ft. Meade, Md. Capt. Creighton, 4HZK, teaches in the infantry school at Ft. Benning, Ga. Pvt. Sprague, 9UZW, enjoys his Marine Corps radio training at San Diego.

If you are an amateur in the services and not yet so registered with us, we'd like to add your name to our rapidly-growing list. Drop us a postcard, won't you, telling us your name and home call, your rank and radio duties, name and location of outfit to which assigned, and whether selectee, reservist or volunteer?
New Ideas on Semi-Automatic Keyers
A Symposium of Recent Designs for Automatic Dots and Dashes

As might be expected, W2ILE's article in the issue of QST for April, 1941, describing his electronic keyer has proved to be an inspiration to the inventive-minded of the ham fraternity. Ever since its appearance, we have been receiving a steady trickle of mail from both those who have developed improvements or simplifications of the original model of electronic key and those who have been working on the problem of semi-automatic keying from entirely different angles, some for many years. We believe the collection presented here will bring forth, for the first time, some new and novel approaches to the subject.

A Mechanical Semi-Automatic Key for Both Dots and Dashes

BY R. S. NASLUND, W9ISA*

Many efforts have been made to reduce the labor of manual telegraphy. In addition to the conventional type of "bug" key found in nearly every station, are the motor-driven cam key,1 electronic models of both the feedback- and relaxation-oscillator types 2 and perhaps others which form both dots and dashes. The mechanical-vibrator key to be described is, however, singularly unique in that it requires no electrical power for operation.

The theory behind the practical development of this key was evolved back in 1938. At A in Fig. 1 is shown a representation of dots typical of those obtained with a correctly-adjusted "bug" of the usual type with a vibrating dot contact. Without serious thought on the matter, it might be assumed that the making of dashes by a similar mechanism would be a simple matter of simply slowing down the vibrations. The results, however, as shown at B are far from correct. While the length of the contact has been increased, the length of the space between dashes has also been increased to equal the length of the dash. Correct formation of Morse characters requires that the dash be three times as long as the dot, while the space between dashes should be equal to the length of one dot.

This difficulty is overcome in this design by the use of two correlated vibrating members. One of these produces dots in the usual manner, while the other, by itself, produces dashes of length equal to twice that of a dot, with long spaces, as shown in Fig. 1B. To produce correct dashes and spaces, both vibrating members are actuated simultaneously when the control paddle is swung to the dash side. The result is that a dot is added to the short dash, which brings the total dash length to equal that of three dots, and which also shortens the space between dashes to equal that of one dot, as pictured in Fig. 1C.

The mechanical principles, by which this theory is put into practice, are shown in the sketch of Fig. 2. The dash and dot vibrators are free to move independently on separate bearings. When the control paddle is swung to the left for dashes, both vibrators are set in motion simultaneously when the control paddle is swung to the dash side. The result is a dot is added to the short dash, which brings the total dash length to equal that of three dots, and which also shortens the space between dashes to equal that of one dot, as pictured in Fig. 1C.

The mechanical principles, by which this theory is put into practice, are shown in the sketch of Fig. 2. The dash and dot vibrators are free to move independently on separate bearings. When the control paddle is swung to the left for dashes, both vibrators are set in motion simultaneously when the control paddle is swung to the right, the "reversing lever" is pivoted around to strike the dot vibrator only, thus keeping the dot vibrator moving to the same side for both dots and dashes.

An experimental model of the key is shown in the photograph. It was built by the author mostly from junk-box material. The bearings for the various pivots and the adjusting screws are mounted in a housing bent up from sheet metal at one end of the base. The fixed lower bearings are small depressions drilled in the tempered bottom plate of the housing. Flat strip material is used for the vibrating rods. The square weights for adjusting the speed of vibration are slotted to

*Lake Bronson, Minn.

1 "New Keying Device," p. 122, QST, April, 1939.
Fig. 1 - A: Characters formed by the dot vibrator. B: Characters formed by the dash vibrator. C: Proper dash characters formed by combination of both vibrators.

slide along the vibrating strips. It is important that the contact springs be as flexible as possible so as to prevent damping from this source, although the material should be stiff enough to hold adjustment. The dash vibrator is approximately 7 inches long and the dot vibrator approximately 4 inches long but, of course, the proper length to be used for any given speed will depend upon other factors as well, such as the stiffness of the vibrator spring used and the weight of the rod and adjustable weight.

The model described can be adjusted for speeds from 20 w.p.m. to 40 w.p.m. The dash vibrator is adjusted to give one dash per second for each five words per minute. For 25 w.p.m., it should be adjusted to give 5 dashes per second. The dot vibrator should be adjusted for twice the frequency of the dashes or two dots per second for each five words per minute. This will mean 10 dots per second for 25 w.p.m. Notches for each 5 w.p.m. may be filed in the rods and the sliding weights fitted with springs to snap into the notches. It is then a simple matter to change speed by simply sliding the weights to the desired notches. No other adjustments should be required.

This key, in its present form, requires somewhat more operating pressure than a conventional "bug" because of the extra weight which must be moved. This is at least partially offset by the fact that less effort is required in making dashes. In performance, this key is somewhat similar to other devices for automatic dots and dashes in that the development by the operator of a proper rhythm is required to produce readable code. In other words, it places the operator under a certain degree of compulsion to develop correct habits of character formation. While it may be a little hard for those who have already developed an individual swing to adapt themselves to a key of this type, once the old habits have been broken, the formation of characters approaching machine perfection will not be difficult.

A Motor-Driven Semi-Automatic Key

The accompanying photograph shows a motor-driven keying device called the "Equable Key" developed and produced commercially by W. R. Starkins* of Rochester, N. Y. This key produces both automatic dots and dashes.

The shaft of the small motor is connected to a speed-reduction gear box. On the reduced-speed shaft of the gear box is mounted a friction disc which drives a shaft carrying the keying wheels. The keying wheels are somewhat similar to those in the old Omnigraph code-practice machines. One wheel has projections in its periphery corresponding to dots, while those in the other wheel correspond to dashes. Both wheels are friction mounted on the shaft; under relatively-light pressure, they will turn with the shaft, but under heavier pressure, they will not turn with the shaft. The character projections on the wheels make contact with stationary brushes at the rear by which the keyed circuit is opened and closed.

The controls, which correspond to the paddle on the usual type of semi-automatic key is a double-lever affair. Each of these levers actuates a ratchet which serves to prevent the disc turning whenever pressure on the control lever is released. One section of the double control lever controls dots, while the other controls dashes. Speed is controlled by changing the speed of rotation of the shaft carrying the character discs by means of the variable-ratio friction drive.

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* 212 River Street
A motor-driven key making both automatic dots and dashes. The knob at the left controls the speed.

speed may be adjusted over an exceptionally-wide range (5 to 45 w.p.m. or better) by the simple twist of a speed-control knob which changes the ratio of the friction drive.

As in the case of other devices for both automatic dots and dashes, proper operation of the motor-driven key requires that the average "bug" operator give up some of his bad habits. An individual "swing" simply can't be imposed upon a key of this type. This is particularly true of the habit of exaggerating the length of dashes in respect to the length of dots. With this key, a dash can be neither cut short nor lengthened for the speed for which it is set. An undertimed pressure on the dash lever will do no harm, since the dash will automatically complete itself, once it has been started. However, if the dash lever is held over too long, another dash will be transmitted in its entirety. The same applies to dots, of course, although most operators will have less trouble with dot timing than with dash timing. The operator does, of course, have latitude in forming the spacing when alternating between dots and dashes and between letters and words, but the enforced rhythm required to execute the correct number of dots and dashes will tend automatically to develop correct spacing habits.

It is the belief of the designer that greater speed and less fatigue result from an arrangement of control in which the forefinger or middle finger controls the dots and the thumb controls the dashes. This is opposite to the action of the usual form of "bug" and the reason given is that it is possible to move the finger four to five times faster than the thumb. However, the Equable key may be obtained with dot controls for either thumb or finger as desired.

The unit is very quiet in operation, since all vibration has been cushioned. It weighs approximately 10 pounds, so that it will not slide over the operating table while in use.

**Improved Switching Arrangement for Simplified Electronic Key**

**BY H. B. SAVAGE, W4GRB**

It may be remembered that the original article on the electronic key by W2ILE, which appeared in the issue of QST for April, 1940, was followed by another by W1DF in the May issue which described a simplified model in which two of the three relays required in the original model were eliminated by the use of a special homemade multicontact key which served to perform the functions of the two relays eliminated.

It was noted, after careful study of the circuit diagram in the May issue that the keying arrangement could be somewhat simplified by eliminating the provision for making dashes manually, since this feature was not considered to be of importance to anyone except "visiting firemen" who might not be familiar with the operation of the electronic key. The revised circuit diagram is shown in Fig. 3. However, the main purpose of this article is to describe the construction of a key which requires no "hard to get" parts and which "feels" like a "bug" in operation.

The two levers, with their bearings, are constructed as described in Grammer's article. Instead of the Yaxley switch parts, which work much too stiffly in this application, the contact

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*P. O. Box 365, Coconut Grove Station, Miami, Fla.*
arms were obtained from a defunct vibrator unit of an automobile-radio power supply. The vibrating element has a large double contact of tungsten which was cut out and trimmed into shape, as shown in one of the sketches of Fig. 4, with tin shears. Two of these double contacts are necessary in addition to a single-contact which is also usually found as a part of the vibrator unit.

These contact arms are fastened to pieces of ¼-inch bakelite approximately ¾-inch square with machine screws as shown in Fig. 4. The bakelite pieces containing the contact arms are then fastened to the operating levers.

The construction of the mounting for the stationary contacts is also shown in Fig. 4. A piece of bakelite 2½ by 1¼ inches is used to space the bars holding the contacts. Two of these bars are cut from ¼-inch square brass rod, while the third is cut from bakelite or other insulating material. The central bar holding two of the stationary contacts may be grounded and is, therefore, used as a support for the assembly. The other brass bar must be insulated and, consequently, it is cut shorter than the other. While the bakelite bar is also shown shorter than the central bar in the sketch, it may be made the same length to provide additional support for the assembly.

Undoubtedly silver for the stationary contacts would be best, but ordinary brass screws have proved to be entirely satisfactory.

Across the rear of the bakelite top plate are a series of machine-screw terminals which are connected to the movable contacts with flexible leads. A view of the assembly is shown in the accompanying photograph.

It is hoped that this description will enable some amateurs who have shied away from attempting to build a key around the jack-type switching unit to build a unit with confidence that the results will be something which closely approaches the usual bug in handling and which does not feel like a wrestling match with a clock spring.

Close-up view of the construction of the key used by W4GRB in connection with his electronic keyer.
Another New Mechanical Key

Operating on lines somewhat similar to those described by W9ISA is the “Valiant” key which Melvin E. Hanson,* W6MFY, has placed in limited commercial production. The dot vibrator, the dash vibrator and the control paddle are mounted in separate bearings with the bearing for the control paddle between the other two. Moving the paddle to the right actuates the dot vibrator, while the dash vibrator is set in motion by moving the control paddle to the left.

Both vibrators are quite similar in construction to the dot vibrators of the usual form of semi-automatic keys. While the total length of each vibrator is the same, the steel reed of the dash vibrator is about twice as long as that of the dot vibrator to slow down the rate of vibration. The moving dash contact is mounted on a much longer spring of greater flexibility than that of the dot contact. This permits the dash contacts, with proper adjustment of the stationary contact, to remain closed over three quarters of the vibration cycle and open over one quarter of the cycle, thereby providing correct proportioning of dash and space lengths.

The key is well-built mechanically, with heavy chrome-plated machined parts and base. The length and position of the bakelite control paddle may be adjusted to suit the individual operator.

The “Valiant” key exhibits characteristics common to all types of keys which form both dots and dashes automatically. Its satisfactory operation requires the development of timing habits of greater accuracy than the minimum necessary for producing readable (but not necessarily correct) characters with the ordinary bug. Anyone who has become accustomed to an electronic key should have no difficulty in turning out excellent code with this key. It is capable of speeds well in excess of 60 words per minute.

* 831 Main St., Huntington Beach, Calif.
1941 NAVY DAY MESSAGE

It is my pleasure to transmit a message of greeting to the radio operators of the United States and its naval possessions in celebration of Navy Day. This message has particular significance at this time because we face a major national emergency. Not since the First World War has so much attention been focused upon radio communication and the Communicator Naval Reserve and commercial operators are already serving the Navy and many of these were once amateur radio operators. During peacetime the amateur radio operators have been busily engaged in preparing themselves to serve during an emergency. We now face such an emergency. The importance of our Naval Communication Service and the increasing demands thereon created by the growing size of our fleet is of particular interest to those skilled in the art of communication by radio. I sincerely believe that from among them will continue to step forward the additional radiomen the Navy will require to satisfy the ever-increasing need for communication personnel in the expanding Naval Communication Service.

The Secretary of the Navy.

(First line of the message transmitted from NAA.)

Honor Roll

Letter Winners


Making Use of Induction

Induction Transmission for Short Distance Communication

BY VERNON CHAMBERS,* W1JEQ

This novel communications system and its simple gear will provide communication up to distances of 285 feet at the frequencies suggested. And incidentally, the operator doesn’t have to build a receiver — and he doesn’t need a license!

The communication system to be described employs an old idea dressed up to give it ham appeal. The apparatus and its operation are closely related to other systems commonly known as wireless-record players, wireless inter-office communication installations, mystery control and similar devices. All of these methods of transmission may be used without licensing by the FCC, providing that the signal does not exceed a strength of 15 microvolts per meter at a distance equal to the wavelength divided by 2π. The distance over which this type of device may be used is, therefore, directly proportional to wavelength, and when used in the 550-600 kc. portion of the broadcast band, it is possible to communicate between points separated by as much as 285 feet. This is, indeed, a short haul compared to normal radio communication in the ham bands, but it is not so short as to make it unusable for many purposes. For instance, it is sufficient to provide contact between defense offices or stations located within large buildings, or for giving code practice to the next door neighbor, or conversing with a near-by friend without depending upon the regular telephone.

The induction transmitter does not cost as much as the average low-power transmitter. It is simple in design and construction. Both modulated c.w. and voice transmission are available (a valuable asset so far as code practice is concerned). Receiver construction or purchase is not required because the unit operates on frequencies covered by the standard broadcast set.

Circuit Details

The r.f. section of the induction transmitter is nothing more than an ordinary electron-coupled oscillator. The basic circuit is described in the Radio Amateur’s Handbook. However, in this case we used a pentagrid converter tube rather than one of the screen-grid types because it is convenient to have a separate grid to which modulation can be applied. The regular oscillator circuit for the 6SA7 is used, with the source of modulation connected to the No. 3 grid. The plate circuit of the oscillator is untuned, and the grid circuit has a fairly low LC ratio for the benefit of stability. The high order of tuned-circuit capacity is obtained by connecting the mica condensers C2 and C3 in parallel with the variable condenser, C1. This combination has a tuning range of approximately 50 kilocycles with the coils specified. Feed-back is obtained by tapping the 6SA7 cathode on the grid coil, L1. Cathode bias, not ordinarily used with this type of circuit, is employed in order that the operating characteristics of the tube may be set for proper modulated operation; the modulation percentage is low and the output distorted unless the bias is provided.

The audio oscillator-modulator will not be treated in detail because it is identical to the front end of the unit recently described in QST.1 We need only say that the audio-oscillator section is used to modulate the e.c.o. for code communication (the e.c.o. output must be modulated because it is expected that the receiving equipment will

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*Technical Information Service, ARRL.

not be equipped with a beat oscillator), and that the other half of the circuit is employed as a standard one-tube modulator.

**Construction**

The parts are mounted on a metal chassis measuring 2 by 7 by 7 inches. The photographs of the transmitter show how the components are mounted on the base, and in attempting to duplicate the layout it is only necessary that the constructor follow the general plan. In other words, a low-frequency gadget of this type does not require the extreme care given to the arrangement and wiring of a high-frequency circuit. Of course, you can encounter hum in the audio circuit just as you can with any speech-amplifier or modulator, but aside from this difficulty, little trouble should be expected. Hum can be eliminated if the fields of the microphone and power transformers are not allowed to interact. Such magnetic coupling can be prevented by providing sufficient spacing between the two transformers and by selection of the mounting positions. Although the microphone transformer must be wired into the circuit before the unit can be tested, it is not necessary that it be bolted in place immediately. Therefore, the position of $T_1$ may be varied as the testing proceeds and, as a result, the position which eliminates hum may be selected.

Feedback for the audio oscillator is secured through $C_7$. The circuit will not oscillate unless the connection is made at the correct end of the transformer primary winding; the correct end is to be found experimentally. If the oscillator does not function when the cathode circuit is closed by the key, try reversing the primary leads.

Leads for the microphone battery and the a.c. line cord are brought into the chassis through a hole drilled in the rear wall. The switch $S_1$ is in series with the line cord and is used to turn the transmitter on and off. Switch $S_2$ opens or closes the microphone circuit and the d.c. lead to r.f. and audio circuits. This switch is opened during the stand-by or receiving periods. The microphone plug should be removed from $J_1$ when the modulator is not used.

The tuned-circuit coil, $L_1$, is wound on a plug-in form for convenience and also to permit use of longer wavelengths for greater range should suitable receiving equipment be available. A new coil can be used for the operating frequency without necessitating any other changes in the unit.

**Testing and Operation**

The on-off switch should be snapped on after the coil and tubes have been plugged in their respective sockets. A broadcast receiver should then be set to the low-frequency end of the dial and a key should be plugged in $J_2$. The send-receive switch is now closed and, while keying the tone oscillator, the modulated signal is tuned in on the receiver. If the signal falls on a broadcast station carrier, it is advisable to tune the transmitter to a new frequency so that the e.c.o. signal will not heterodyne with the b.c. station signal.

The modulator may now be tried, this test being made either with the key open or removed from $J_2$. During these tests it is necessary to adjust $R_4$ for the desirable degree of modulation or for the modulation tone which appeals to the operator.

The distance over which this method of transmission may be legally used can be determined by

$$D \ (\text{meters}) = \frac{157,000}{f \ (\text{kc.})}$$

As we have said before, it is essential that the signal strength be not more than 15 microvolts per meter at this distance. A means of accurately measuring the signal strength is not available to the average person and, as a result, we must depend upon our own judgment to prevent infrac-
Fig. 1 — Wiring diagram of the induction transmitter.

- C1 - 140-µfd. tuning condenser (National EX-140).
- C2 - 500-µfd. midget mica.
- C3 - 250-µfd. midget mica.
- C4 - 100-µfd. midget mica.
- C5 - See text.
- C6, C7, C8 - 0.01-µfd. paper.
- C9 - 0.002-µfd. mica.
- C10 - 10-µfd. electrolytic, 50 volts.
- Cu - 8-µfd. electrolytic, 450 volts.
- R1 - 0.1 megohm, ½ watt.
- R2 - 20,000 ohms, 1 watt.
- R3 - 250 ohms, ½ watt.
- R4 - 0.5-megohm volume control.
- R5 - 0.5 megohm, ½ watt.
- R6 - 0.5-0.002 megohm, 1 watt.
- R7 - 50,000 ohms, 1 watt.
- R8 - 0.25 megohm, ½ watt.
- R9 - 50,000 ohms, 2 watts.
- J1, J2 - Open-circuit jack.
- S1 - S.p.s.t. toggle.
- S2 - D.p.s.t. toggle.
- T1 - Single-button microphone transformer (Stancor A-4706 or equivalent).
- T2 - 325 volts each side center tap, 40 ma.; 5 volts, 3 amp.; 6.3 volts, 2 amp. (Stancor P-6010 or equivalent).
- L1 - 65 turns No. 24 d.c. close wound, 1½-inch diam. Tap 15 turns from grounded end.
- L2 - 10 henrys, 40 ma. (Thordarson T-13C27 or equivalent).

The antenna should always be left off when it is not essential to satisfactory communication; a few feet of wire should be sufficient in any case.

The operator must remember that his transmitter is radiating in or near the broadcast band and that its fundamental and harmonic frequencies can cause interference with broadcast program reception. Therefore, it is an excellent idea to learn the listening habits of your neighbors in order that you won't break up one of their favorite programs. And remember that it is possible to select an operating frequency that will cause the fundamental and harmonic frequencies to fall at points where broadcast carriers do not appear.

The Delaware Valley Radio Assn. held its 5th Annual Outing and Hamfest at the Trenton Fair Grounds on August 10, 1941 with a record attendance of 575. W2MLW rounded up eight popular YL ops there for this group photo. Left to right: "Frances" W2MWW, "Dottie" W2MIY, "Shirley" W2MLI, "Pauline" W3HVO, "Jean" W3INL, "Norma" W1MUW, "Millie" W5IIT, "Mary" W2JLL.
Making model airplanes? Collecting stamps? Going in for photography? Hi! The fellow who bought commercially-built gear solely for the purpose of rag-chewing may find very little of interest left in amateur radio but the u.h.f. enthusiast is, at heart, an experimenter, and as such he is making the best of what is left of his hobby while we QRX for Washington developments.

Intensive plans for civilian defense are being worked out in almost every city and town in the country, and in many places arrangements are so advanced that groups await only the word from Washington to have the situation completely in hand. As the responsibility for the establishment of an emergency communications system, even though it be u.h.f. in nature, now rests with all of amateur radio, news of our progress now appears elsewhere in QST.

But what of the time when all plans are made, and all emergency stations are ready to go when and where needed? Will some of us who do not go into the country's armed forces; some of us will not be working long hours in defense industries; some of us may not be required to spend too much time in civilian defense work. What, then, can we find in our hobby to keep interest alive? Friendly contacts on the ultra-highs have been a large part of the fun we have derived from our work, of course, but still a considerable amount of satisfaction has also come from making gear which works satisfactorily; and more from everlastingly tinkering to squeeze just a little more performance out of it. That angle remains with us — we may not be able to measure the extent of our improvements by the better reports we get from stations worked, and certainly we are not going to be able to "make a chest" at the Radio Club when we give out with the choice details of the DX worked with that new rotary; but we can put almost any amount of time to good use in giving our receivers a going over.

In the rush to get more watts into the antenna the receiver angle has been sorely neglected in recent years. We have frequently been content with a fancy and reliable piece of commercial equipment when we might have made ourselves something considerably better had we taken the time and trouble to build something especially designed for the job at hand. We have a strong suspicion that once the current unpleasantness is over we are going to see some real advances in u.h.f. technique, simply because, as a result of our enforced "time-out", we have spent some time making improvements in our receivers.

WLFF, Newport, R. I., suggests that now, if ever, is the time for us to get going on f.m. We have had the excuse, for our backwardness in adopting this new technique, that the receiver was too complicated for us. Fred points out that if the f.m. receiver is considered from the standpoint of its various units (r.f., i.f., limiter, discriminator, and audio) it is nothing to scare anyone who has had any experience in construction or servicing of receivers. The f.m. receiver has the very definite advantage of being useful at the moment, too. It can be built up for the f.m. broadcast band and be changed over to 112, 56, or 28 Mc. with a minimum of trouble. F.m. is "here." It is certain to play a greatly-increased part in amateur and commercial radio after the war, and right now is not a bit too soon to begin getting ready for it. It would do all of us no harm to dig out that January, 1940, QST right now and bone up on f.m. fundamentals laid down in QST's first feature article on the subject as applied to amateur communication. Other very useful material appears in QST for February, April, June, September, and December, 1940, and March, 1941.

If you think you are in a bad way, not being able to put that rig on the air, consider the case of W1MEP. Chet accepted an assignment to make weather observations and tend a battery of

This neat bit of tower construction supports the extended double-Zepp of W2FHJ, Little Neck, Long Island. Viola Kapp, operator, is one of the few YLs on Five.

March 1942
The 4-element W6QLZ array of W9LLM, Downers Grove, Ill., is 65 feet above ground. It was to have gone up another 20 feet on December 7th!

weather instruments on the top of Glastenbury Mountain, Vt., for just one reason — to permit continuation of his u.h.f. activities. At the end of his season's work as Vermont Fire Warden in 1940, Chet returned to his home in Bennington to find himself lost without his daily contacts on Five. So when the chance to spend the winter of 1941-2 on the summit came along, Chet welcomed it — and now he spends his spare time listening to the broadcast band and watching the snow pile up and his antennas blow down! Broadcast reception is good, though, and well it might be, for Chet has a receiving antenna that is something of a record — seven miles of telephone line!

The vast number of stations operating on 2½ along the Atlantic Seaboard in New England, New York, and New Jersey makes it a foregone conclusion that this primary target area will be well supplied with emergency communication when the need arises, but it may be something of a surprise to some to learn that Tampa, Florida, had eight stations lined up for 112-Mc. emergency duty at the time of the close-down. W4BYR reports that plans are going right ahead, and though they are not giving out details for publication, it appears that the Tampa area will be well provided for when the time comes that they are permitted to put their plans into execution.

W6ANN, San Pedro, Cal., is strong for the 112-Mc. superhet with superregen i.f. system. Bill completed such a receiver just a few days prior to Dec. 7th and was able to hear the fellows in San Diego (100 miles) under ordinary conditions. On one occasion a fellow operating a transceiver in the projection booth of a San Diego theater, with no outside antenna, was heard clearly by W6ANN!

And W6OVK has found a unique use for his modified S.I.G. recently described in QST. The Arizona State Police use a frequency of 116,150 (transceivers, note!) for communication with patrol cars. One of their commercially-built superhet s broke down recently and Jim installed his receiver while the ailing unit was being repaired. They report that Jim's receiver performs as well as the commercial jobs.

The W6QLZ-W6OVK combination is now interested in light-beam communication. Having been successful in establishing consistent communication over 107 miles of mountains on both 2½ and 5, Jim and Clyde are now wondering what sort of gear would be best for making the hop with a sealed-beam headlight!

W7CIL, Salem, Ore., reports that signals on Five follow the seasonal changes noted by the Arizona boys. In contrast to observations in other sections of the country, these fellows say that atmospheric bending is more pronounced in winter than in summer. W7's FFE and FDJ at Houlton, Ore. (70 miles), were down an average of 12 db. in June and July, as compared with the January-May level. "Bake" is getting set for f.m. by adding an adapter to his HQ-120. A converter for 2½, 5, and the f.m. band will then work into the HQ-120 or into a 20-Mc. superregen. The f.m. band is going to be watched for signs of sporadic-E DX. Like many another skip-DX enthusiast, Bake will undoubtedly go in for a bit of hair-tearing and nail-biting when the DX starts rolling in on that 42-50 Mc. range!

W7RT, Seattle, Wash., reports that 112-Mc. activity received a setback last summer when most of the gang sold their portable gear to soldiers on maneuvers. John enlisted in the Army December 27th and is now with the Alaska Communication System, Signal Corps.

Sometime ago we mentioned, as a likely prospect for the advancement of our 56-Mc. relay plans, WSKHG of Kane, Pa. He didn't make the grade in time to help out in the Ninth U.H.F. Roundup, but is now all set to go on Five, having received a new DM-36 on December 8th! In a high-altitude location less than 30 miles from the New York state border, WSKHG should help to make things interesting for W8RTW, Elmira, WSPK, East Bloomfield, and other Western New Yorkers — when we get back to such things as the promotion of relays. He has been working on locals, WSNM and WSRBRJ, and had tests lined up with W8RUE at Pittsburgh.

W9LLM, Downers Grove, Ill., was about to raise his 4-element W6QLZ array another 20 feet, to a height of 85 feet above ground. A block and tackle was mounted at the top of the mast —

(Continued on page 80)
**THE EXPERIMENTER’S SECTION**

As announced elsewhere in this issue, the Experimenter's Section is returning to the pages of QST. Since this department last appeared in its original form about 12 years ago (before many of our present readers could pronounce the word) a review of the aims and functioning of the Section is in order.

The amateur fraternity has always included a good number of experimentally-inclined persons — those whose calls may not be so familiar on the air as in print in the “by-lines” of contributed QST articles. This group must, by now, have been greatly augmented by those who have had experimental inclinations, but whose first love may have been the luring of DX contacts, the prompt handling of traffic or, perhaps, ragchewing, all now in abeyance. Many of these have already written, asking, “What interesting problems are there for us to work on? What information relating to my chosen subject is available? If collaboration is desirable in the solution of a problem along specific lines, where may stand the best chance of finding it?” To answer these and similar questions is the main purpose of the Experimenter’s Section.

To start the ball rolling, we are listing a group of numbered projects. Most of these, it happens, relate to communication systems which may be made to serve as a substitute for the duration of the emergency. This angle should prove to be of more than casual interest to those who are looking for something to do with idle gear. Many of the projects have little previous history; we shall have to start from scratch. This means that almost any results will prove to be of interest. Some of the projects may not bear fruit, but we shall have the satisfaction of knowing that their potential usefulness has been disproved.

The second function of the Section is that of organizing the work of the individuals. This includes the establishing of bureaus or centers to which progress reports can be made and through which information between individuals working on the same project may be exchanged. The organization will involve the appointment of a leader for each project. The leader will be some­ which information between individuals working on the same project may be exchanged. The or­ ganization

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Everyone who is interested in working on any of the listed projects is urged to enroll with the leader of the particular project on which he plans to work. Through QST or the group leader, he will be able to contact others working on the same project for collaboration, or exchange of notes. The leaders are particularly desirous of hearing from those who, at any previous time, have worked along any of the lines suggested.

The projects thus far suggested are listed below. Whenever a sufficiently large number of individuals express interest in other projects, they will be added to the list.

Project A — Temporary group leader — Byron Goodman, W1JPE, ARRL Headquarters, West Hartford, Conn.

Communication by means of a carrier-current system.

In this system, wire circuits are used as non-radiating transmission lines from transmitter to receiver. An article on carrier-current systems appears in this issue. While telephone and power companies have used such systems successfully for years over special wire circuits, very little has been done to investigate the possibilities offered by ordinary house-lighting circuits.

Project B — Group leader — R. B. Bourne, W1ANA, 27 Sulgrave Road, West Hartford, Conn.

Communication by means of light beams.

This category might include sunlight reflection (the heliograph) as well as artificial light-beam communication at night. Although some direct-ray work has been done, the possibility of communication among amateurs of a group by means of indirect rays from reflectors at high, centrally-located points may be visualized. Voice modulation of light-beam transmitters is another distinct possibility.

Project C — Temporary group leader — George Grammer, W1DF, ARRL Headquarters, West Hartford, Conn.

Communication by means of audio-frequency induction fields.

Here is a practically brand-new field. As an encouragement, it may be said that distances up to a half-mile or more have been reported by this means. The essentials of such a system consist of an audio oscillator feeding an inductance of large physical dimensions at the transmitting end and an audio amplifier and similar inductance at the receiving end. The coils may consist of several turns of wire around a group of trees, for in-

(Continued on page 88)
A SIMPLE COLLAPSIBLE ROTARY ANTENNA FOR 2½-METER MOBILE WORK

The sketches of Fig. 1 show the construction of a simple four-element beam antenna which I have found very satisfactory for 2½-meter mobile use. The antenna system consists of a vertical half-wave antenna fed by a short twisted-pair line and a "J" matching section, two directors and a reflector.

The frame is made of ½-inch, by 1½-inch furring-strip material. The "mast" is a "closet pole" 1½ inch in diameter. A hinge near the middle of the frame permits the structure to be folded for carrying in the trunk or back seat of a car.

For elements, ½-inch copper tubing is the most efficient, although aluminum is more convenient for portable work because of its light weight. The elements may be snapped into place in heavy-duty fuse clips mounted on the frame with stand-off insulators, as shown at B and C.

The four-element collapsible rotary in action.

Fig. 1 — W1LFI's collapsible 2½-meter 4-element beam for mobile work. The frame is hinged, while the elements are held in position by fuse clips to make assembling and disassembling an easy job. B and C show the details of element mounting.

The antenna element is 48 inches long, while the reflector is 51 inches long and the two directors each 45 inches long. A spacing of 12½ inches is used between all elements except the antenna and reflector which are spaced 25 inches.

The "J" matching section is 24 inches long and the match is adjusted by moving the low-impedance line, fitted with clips, along the section.

The "mast" may be set in a fitting near the front door of the car so that the antenna may be rotated by hand. The installation is shown in the photograph.

The outfit sure did work wonders for me last summer and it's simple enough so that no one should have any trouble making one up.

John Klar, W1LFI.

WINDING SMALL SELF-SUPPORTING COILS

After playing around with h.f. receivers and transmitters for some years, I have found that the easiest, simplest and most-efficient way...
of constructing chokes and coils is to wind them on a thin glass tubing. The outside should be coated lightly with Amphenol cement (or collodion will do in a pinch). Then, when the cement is dry, clamp the coil in a vise and slowly tighten the jaws until the glass breaks. Shaking out the glass completes the job.

Grid-leak glass can be used for r.f. chokes and tubes and vials of various sizes for larger coils. I have never yet injured the insulation on the wire in this manner, but would suggest that if the vise has grooved jaws, you put a piece of smooth aluminum on each side of the coil. I have used this same method to wind coils of heavy wire on cellophane.

Percy E. Buechtel, W8JTI.

SIMPLE LOUDSPEAKER-BUZZER COMBINATION FOR CODE-CLASS INSTRUCTION

When first invited to give Morse instruction to the local A.T.C. Squadron, the writer decided to use an audio oscillator in conjunction with a stage of l.f. amplification and a loud speaker. However, he soon found that the necessary apparatus, together with batteries, was rather cumbersome, consequently other methods had to be considered. The only buzzer on hand—

Fig. 2—Circuit diagram of G5VT's simple arrangement of buzzer and loudspeaker for code-class instruction. R is a variable resistance of 250 ohms.

which gave a really clear note was a tiny model, but this did not give sufficient volume for a large classroom. This drawback was, however, overcome by connecting a loudspeaker (minus transformer) across the buzzer winding, with the result that a strong signal of almost c.w. quality was obtained.

The arrangement at present, shown in Fig. 2, comprises a 3-inch moving-coil speaker wired in series with a 250-ohm variable resistance, which acts as a volume control.

The midget speaker makes for portability, although any low-resistance unit can be used. To avoid slight key thumps, the volume control should not be set at maximum.

The whole of the equipment, which comprises a 3-volt dry battery, volume control, loudspeaker, key and incidentally a signalling lamp, is housed in a box of less than gas-mask container size and is provided with a carrying strap.

Circular holes, covered with gauze, have been cut out in front of the speaker diaphragm and lamp bulb. — A. E. J. Cooper, G5VT. From T & R Bulletin.

Note.—This arrangement has been found to work very well working directly into the tube-to-voice-coil transformer, provided the volume-control resistance is omitted. — Ed.

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RE—THE SINGLE-WIRE CONNECTION FOR TRANSFORMERLESS POWER UNITS

I am a licensed electrician and, although I can readily see the idea behind the arrangement, I do not believe that the one-wire circuit you recommend in most small transformerless units, such as the code-practice oscillator (QST, January 1941), the frequency standard in the September issue and in numerous other places in recent articles is in accordance with the National Electrical Code used by the electrical inspection departments of most cities. I am sure it would not be accepted in this city (Richmond, Va.). I do not have a copy of the code at hand, but I know it expressly forbids the flow of any current over ground, except when performing its normal function—that of carrying off high currents under short-circuit conditions, etc.

The changing of convenience outlets to polarized type is not expensive and the use of a neon bulb to indicate polarity is even cheaper. One lead from the lamp should be held in the hand while the other lead is touched to one side of the line. Or the lamp could be connected between the chassis and one side of the line so as to burn when the plug is in wrong—this with chassis grounded through lamp. Possibly there are other ways too, but I prefer the insulated circuit throughout, using a common grounding point, insulated from the chassis.

Since high-resistance joints in pipes are not usually indicated by a small lamp normally used as a test light, it is assumed that the additional current used in this type of installation would eventually pay the small cost of polarity identification in circuits used for metal-cabinet equipment.

—Chas. H. Imel.

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HOMEMADE NEUTRALIZING CONDENSER

In building my new rig, I needed neutralizing condensers for my 809 buffer and HF100 final. Not wanting to wait too long for delivery, I made a dive into the junk box and came up with enough odds and ends to make a pair of very acceptable substitutes for the commercial product.

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A sketch of one of the condensers is shown in Fig. 3. It is patterned after the well-known coaxial cylinder type. The cylinders are cut from de-funct electrolytic condensers. The inner one is one inch in diameter and was taken from a 4-µfd. condenser, while the outer one, taken from an 8-µfd. unit is 1¾ inches in diameter. For a maximum capacity of 10 µfd., the cylinders should be approximately 2 inches long. For the same diameters, other maximum capacities will be proportional to the length of the cylinders.

Care should be taken to drill the hole for the adjusting screw for the movable cylinder at the exact center and to mount the stationary cylinder centrally in respect to the movable cylinder. The air gap should be sufficient to prevent breakdown when used in a plate-modulated amplifier operating at plate voltages up to 1500.

Pieces of metal strip are used to mount each cylinder. The upper strip is tapped to fit the long machine screw used for adjusting the capacity. The two metal portions are insulated by a strip of insulating material, such as polystyrene.

—Samuel A. Balaban, W2KVA/W8VTC.

**TUBELESS R.F. STAGE FOR B.C. MIDGETS**

Fig. 4 shows a simple, but very effective, gadget for anyone in the services who may be in some rather distant spot and who wants to boost the gain of his midget b.c. receiver. We have an ordinary a-c-d-c t.r.f. four-tube midget here and, while the stations rolled in strongly enough during the night, there just wasn’t enough hop during the day to cover the 600 miles between New York and Bermuda. We were going to add another r.f. stage, but the simple tuner shown raised the gain so strikingly that this was unnecessary. Most cheap midgets have simple capacitive or inductive coupling, so tuning of the antenna circuit adds almost as much gain as would an entire r.f. stage. A fixed condenser and variable coil is used rather than variable condenser alone, since this gives a much wider range of compensation for different lengths of antenna than could be obtained by variable condenser alone. The gadget can be built quite compactly on a small strip of bakelite, using a piece of spring brass for the sliding coil contact. It is a good idea to mount the tuner right on the receiver, since in actual practice it is necessary to adjust the coil for every station for maximum gain. Addition of the unit here enabled us to bring up to comfortable volume half a dozen stations which were formerly entirely inaudible.

—Jack Najork, RM2C, USNR, W2HNH.

**Strays**

"In a recent conference of college professors called together to provide plans for courses on u.h.f., the question of terminology came up, now that the ultra-ultrahigh frequencies are being used. It was decided to use the term UHFI ("ultrahigh frequency indeed") for these super-short waves." — January Electronics

No, no! We admit this system has some merits, since one could go on and say UHFI-AH (u.h.f. and how!), etc. But it is at best a system with limited imagination. We'll need more than one additional classification. We suggest the following division: 30-300 Mc., ultrahigh frequencies; 300-1000 Mc., superfrequencies; 1000 and up, colossal-frequencies. This system has the advantage that should further subdivision be necessary, "super-colossal-frequencies" are still available.

**P. O. W.**

It is reported that G2XQ is being held as a prisoner of war.

He may be addressed as follows:
Sgm. F. E. Marshall, B.P.O.W., 19304, Stalag, XXB, Germany.
"KEEP THE HOME FIRES BURNING"
Box 336, Peach Creek, W. Va.

Editor, QST:

Please accept this letter as a note of appreciation for the dear old ARRL from the very heart of the West Virginia mountains. I am thankful that there exists a League for the radio-minded hill-billies like myself.

Like many other hams, I suppose, my head is full of questions about the future of amateur radio and the ARRL. How long will it be? What will become of the League? What are the other boys going to do? Can we tear down our rigs? Will we get 2½ meters? Will the other boys forget the ARRL and what it means to them? Can the ARRL survive without calling for financial help? Will memberships decrease, or increase?

These questions and many others go through my head every day. I’d like to know the answers. So would lots of others, but here’s one thing sure: The American Radio Relay League must not fail. Now is the time for all amateurs, whether members or not, to come to the aid of the League, whether the League needs it or not. Now is the time for memberships in the League to go to a record high! And if the League should need more money in 1942 to carry on its work, now is the time to start assessments of all amateurs in the United States. I’m sure that here in the West Virginia mountains I could find at least one dollar, and if every ham in the country would do that much, certainly the League could go on . . .

I’ll never forget Sunday, December 7th. I was trying to get my little 20-watt rig on the air. The 100-meter band was full, as usual. Then the ARRL station began to pull the boys off, one at a time, two at a time. It was most disheartening to listen to, but I followed W1AW until almost 3 a.m. sliding up and down the band to catch the "CQ" calls as they came in. No one could help but marvel at the efficiency and precision of the whole set-up. It’s hard for me to understand just how the situation was handled so nicely. I tuned from 10 meters to 160 meters and it seemed though they all went off automatically — every one of the thousands of hams doing his part!

. . . I have the greatest admiration for the American Radio Relay League, and I still contend, it must not go down, or, rather, it must not be let down. — W. W. Adams, W8VQV

Phi Mu Delta House, University of Maine

Editor, QST:

I wish to express my appreciation for the help that I have received from the League since my membership began about six years ago. Since that time my most valuable technical periodical has been QST, from all points of view. And this is saying a lot, because over the greater part of this time I have had access to all types and "sizes" of technical magazines at the University Library. . . .

You shall have my hearty support in the future as in the past. — Robert E. Kelley, W1IEB Ensign, USNR

1819 Beverley Rd., Brooklyn, N. Y.

Editor, QST:

I just took my exam for amateur Class B, and I desire to compliment the ARRL very, very highly indeed for the comprehensiveness and accuracy in setting up the 80-odd questions for study for this license. . . .

It is now not too difficult to understand the high esteem in which the ARRL is held, nor why every single one of the eight young men who appeared for the exam this Tuesday morning carried the same ARRL pamphlet I did. (Last ambiguity appear here, accidentally, I hasten to add that the pamphlets were left outside the exam room, but what I do not want is any impression made that such unanimity existed in the choice of study material.)

With the kindest thanks — and greetings from an expectant newcomer to the ranks. — Erman Burger, W1KZ

Scott Field, Ill.

Editor, QST:

I’ve been intending to report for some time. I still maintain the habit of digesting QST from cover to cover every month. . . . I will graduate from the Air Corps Technical School and get back to my own squadron very soon.

Keep the home fires burning at W1AW and keep the good old League functioning while we take off to blast those insolent fools to hell!


COPYING ON THE MILL

1771 E. 24th St., Cleveland, Ohio

Editor, QST:

I read with considerable interest your items about copying on the mill. I am engaged right now in trying to make the change-over from stick copying to the typewriter. It is no cinch, but I may be able to help other hams by making a few suggestions:

1. Right off the bat, memorize the keyboard of the typewriter, so you have an accurate idea of where each one is located.

2. Get a touch typewriting book from any of the typewriter companies or from the public library. Then make a job of learning to operate by touch. You haven’t learned it until you can sit down and write with your eyes closed at, at least, twenty words a minute. You can see that this lies an important part of the job. You don’t have to give any attention to locating keys.

3. When this is done — and not until it is done — you are ready to start copying. Try first on call letters. Then, after this, the messages from W1AW. Then all it takes is practice. But I have found that it saves time to think of code sounds in terms of finger positions. . . .

— Chas. H. Seaver

NOW IS THE TIME TO QSL

103 Lakehurst Road, Toms River, N. J.

Editor, QST:

In my recent copies of QST there have been requests of amateurs to QSL and send their cards out for every new contact made on the air.

Now that our amateur activities are temporarily halted I feel sure that every ham could find time to sit down and answer those cards which are unanswered.

I, like every ham old or new, think a great deal of QSL’s, and I feel sure, fellows, that now is the time to send out those long overdue cards . . . — Walter Voelker, W2OCP

(Continued on page 84)
Build Stamina. The war requires cheerful acceptance of sacrifice. That takes stamina. The test for the amateur started early with restrictions on foreign communications, extending now to the cessation of all but defense requirements. A good many people who have just talked of sacrifice and payment for the war effort are now to feel the impact. While many are stimulated by war excitement, the real test is in the months ahead. This war is a long pull effort to which each must contribute. How can we take it? Luxuries must go, and conveniences formerly thought to be necessities. We expect reverses until increased production gives us the offensive. Each of us must help the nation to be strong by conservation in the use of articles as well as by finding ways to contribute of our equipment or personal effort. Energy and enthusiasm must be husbanded to meet each day of challenge and adversity with the proper stamina. On all fronts it is a war of nerves. Burdens, tasks, and even boredom will test stamina often. Our spirit as amateurs should set the example for others. Great changes in the civilian life of the nation must be met with cheer and patience. New values in human relationships and friendship will reward us as we learn to help our fellow travellers on life’s highway. We must retain our faith in the future, and all of us amateurs must do our full part in the all-out national effort.

Stamina and application will win the war on the home front as well as elsewhere. The danger around us is very real. It must be faced by common sense and assumption of a personal part in the war effort that each must find for himself, especially if one is not accepted for a place in the services. Production and civilian defense call for all we can do! Every day in this office we see civilian calls from companies with defense responsibility for lists of amateurs who have specialist qualifications, or gear that is needed in the defense effort. Each day there are civilian calls from companies with defense jobs for lists of amateurs who have specialist qualifications or gear suitable to the defense effort. Each day the government wants personnel or equipment for particular situations. With pride that ARRL can help, our records and knowledge assist in digging up the best answer to all such numerous requests. In the field amateurs may think there is un-called for slowness in government action elaborating ways in which our services count, approving OCD plans for supplementary radio defense services, establishing new controls and safeguards. But amateurs of stamina understand that time in study may be in the interest of national security. Above all we must guard against over optimism such as undermines stamina and is replaced with panicky fear when dispelled by realities. Strength and sacrifice must replace softness and smug words. France trusted a Maginot Line of forts instead of maintaining an impregnable nation built on the confidence of each Frenchman in his own strength and ability. The Line crumbled. Disillusionment and panic followed. To be self-reliant let us amateurs build our personal qualifications, knowledge and strength by continued study and self-training. By making ourselves part of the war effort in the services, in production, or in civilian defense we shall acquire understanding and mental stamina that will make us shock-proof and capable of contributing our full share to the national effort.

Field Organization. The assaying of all amateur facilities in each community continues under the direction of SCMs and Emergency Coordinators. With the exception of the Emergency Corps all other appointments are suspended, as explained in this column last month. SCMs make no additions whatever to mailing lists of appointees in suspended classifications. But more Emergency Coordinators are wanted, and will be appointed. From time to time there will be bulletins as explicit possibilities in civilian defense develop and training programs in the national interest are launched.

Any amateur not registered in the ARRL Emergency Corps should ask blanks from ARRL at once, enclosing a stamped envelope for same. Emergency Coordinators may soon be required to make selections from their registrations to cover a fixed plan of municipal defense stations for their city or town. Scores of cities only await new word from the DCB to call on their ECs for such help. In Providence, R. I., amateurs registered in the AEC will become part of the police-defense set up . . . see story in this issue. Be ready for more such work, or a broader scale civilian defense plan now expected, by registering now!

Report General News to SCMs. All amateurs are requested to report each mid-month to SCMs (address page 4) any of the things they are doing. Clubs have been asked to report their...
training plans — code classes — theory-discussion groups — civilian defense building programs, via SCMs. A postal will give the SCM the first results of “wired wireless” attempts with your ham pal. Word from Emergency Coordinators to SCMs will be used as a basis for concise reports on each community-defense development. How many 2½-meter rigs can be located in your town? Reports via the SCM will keep us amateurs together. See that your SCM has something from you by March 18th!

Amateur Radio's Future. Every so often someone asks, “What of the future?” In a time when the nations of the world are locked in an all-out struggle no predictions can be made. Some general observations are possible. Taking care of each day as it comes along is the best way to take care of any future. ARRL is keeping open for business, and for representation of the amateur. Placing first things first, full support of every citizen and individual amateur to the war effort is the first necessity. The quicker the winning of the war and the shorter the duration, the better amateur radio may fare. The threat to amateur radio is not potentially so much different than the threat to many other accustomed patterns of our living. Much will depend on the continued support of the individual amateur for his ARRL throughout the emergency. Continued strength for amateur radio requires maintained support by every amateur licensee, continued interest of the individual amateur, continued life on the part of club and training groups, and the League's continued contact with government officials through every stage of our national future. The record of the amateur is a growing one of real service to the nation in the hour when it called for specialists and more specialists in radio technique. ARRL is compiling the best record possible and aiding in the victory effort through every means possible. Individual service on the home front and in the services is the thing for every amateur, not forgetting to keep up full support of ARRL through actual membership therein. ARRL is doing its best for you. Your support will keep it strong.

A strong ARRL is the best insurance for Amateur Radio.

— F. E. H.

Consistency: “Ever since I can recall (which admittedly is not real dyed-in-the-wool ‘old time’ but is far from being ‘young squirt’ — 1921) W3BWT has appeared consistently in the ‘roll of honor’ BPL — not always on top of the heap but always well up in the list. Has always been my contention that this great hobby of ours should justify itself by the service rendered. For nearly twenty years this particular station has been justifying itself by the continuous appearance in the Brass Pounders’ roster. Some of us will not be inclined to give that much credit — but there is no denying the spirit of service that stood back of that enviable record.” — W6GBZ.

WBUUW tells us of another all-ham family: W5HEFS, father; W5ZI, mother; W6FYZ, son. He has worked each of the family under their respective calls.

Remember Pearl Harbor!

BY LAWRENCE R. MITCHELL, W1HIL

ARTICLE CONTEST

The article by Mr. Lawrence R. Mitchell, W1HIL, wins the CD article contest price for this month. For the purpose of general discussion let us divide amateurs into two groups. First, let us take the amateurs who are in a position to serve in the armed forces of our country. Are you in a position to serve in the radio section of the Army, Navy, the Marine Corps, the Coast Guard, or any other branch of the Military Services? If you can qualify, don’t wait to be drafted. Enlist today! Radio men are needed in great numbers and need no fear that they will be doing other than radio work under present wartime conditions. Go to the nearest recruiting office to-day and get the story on radio men in the armed forces. Review the many opportunities present in QST’s U.S.A. Calling department in recent months. Then act. Radio is one of the most important branches of the Military Services. Every amateur who is in a position to do so should serve his country in the Army or Navy, where his skill and training are badly needed and can be of great service.

Look through the past issues of QST and see the many jobs open in the radio field for the properly qualified. Consider for example the call of the Navy for men to operate the new radio locator equipment. Get the dope on this and other opportunities, you hams who are in a position to take advantage of them. Help your country, and at the same time help yourself to some knowledge of the very latest in the field of radio.

Now let us examine the second group of amateurs, no doubt larger in numbers than the first: those amateurs who are not in a position to serve in the armed forces. Right away I can hear many of you saying: "What can any of us do?" For most of us, radio has been a hobby. We are not in a

*4 Sidney, Wakefield, Mass.
position to give radio our full time and we may be too old or have dependents or any one of many other reasons why we cannot give full time to the job at hand. Yet we too should serve.

How can we best serve? Well, forget for that moment we are not licensed to operate our rigs, and take stock of ourselves and our equipment. Are we signed up with the ARRL Emergency Corps so that those in charge know what we have and where we can be reached if needed? Sign up, get your assignments. If your Emergency Corps material is, get in touch with your SCM. Sign up whether you belong to ARRL or not. If you have no equipment, don’t forget a pool of operators will be needed in any activity of this kind. Find out the local plan for the use of hams in an emergency and if you have been busy, get busy and find out why not, and do something about it. If you are in a position to do so, join your State Guard as well, as they are in need of radio operators.

Remember Pearl Harbor — lack of planning, lack of cooperation, lack of most everything that makes for success when taken by surprise. Every one of us not in a position to serve in the armed forces should see what we can do to be of service at home even though amateurs are now off the air. Look into your qualifications and see what kind of a place you can hold down in the radio field. Possibly you can take the place of someone who can serve in the armed forces. Start training yourself for that!

Keep your present radio equipment in operating condition. In the event of a real emergency and loss of the regular channels of communication no one knows when he might be needed to furnish communication on any band even though at the moment we are off the air. ARRL has suggested that every amateur build 2½-meter equipment for possible emergency use. Have you done that? Do your part. Amateurs going into the army who have 2½-meter equipment should leave it with another ham or the Defense Council. In case of civilian emergency, or leave it with the proper officials in your town. Even though you live in the wide open spaces where there are no other hams, build up some 2½-meter equipment, and you may be needed when the equipment becomes of great value, and you should be prepared. Any simple 2½-meter outfit which will work on 110 a.c. and/or 6 volts d.c. may be of great value and may enable you to save many lives. Every radio magazine has presented articles on simple 2½-meter rigs which any ham can build. The DCH-approved plans to permit supplementary radio facilities in civilian defense are likely to be announced by late February.

Be prepared! Even though you may never be called upon to use your equipment, the training is being given that anything can happen. Don’t wait, take stock of yourself and your equipment. Sign up with the ARRL Emergency Corps and build up that 2½-meter equipment. REMEMBER PEARL HARBOR!

Conn. Amateurs Stage Mock Disaster

Just twenty-four hours before the electrifying news of December 7th, amateur radio came successfully to the aid of relief at a simulated “disaster” in New Canaan, Conn. As an emergency tryout of home defense, the New Canaan Defense Council and the local branch of the American Red Cross, staged a theoretical detonation of a truck-load of dynamite in a large educational institution, some three miles west of the town. The scene of the mock disaster was one of “widespread destruction.”

It was the earnest work of Cedric Root, W1BCG, president of the Connecticut Brass pounders Association, which brought recognition of amateur radio before the New Canaan Defense Council and final incorporation of its facilities in the home defense plans. As a result fully equipped ultra-short wave communication was rushed into action within three minutes after the emergency alarm was sounded at 2:30 P.M. Two self-powered Abbott DK-3 transceivers were successfully employed to establish contact between the scene of destruction and the defense headquarters located in the New Canaan Town Hall. W1GWD, operating the field station, was forced to move his transmitter to several locations, representing the centers of activity at the scene, yet constant communication was held with W1JEC working the control transmitter atop the roof of the Town Hall.

The Red Cross and the Defense Council have been officially quoted as “highly pleased with this demonstration.” The unfortunate passing of Mr. Root’s mother prevented his active participation in this defense test.

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Providence Adopts New Plan for Civilian Defense Radio

Fifty Amateur Operators To Be Sworn into Police Department

While the office of Civilian Defense will be momentarily expecting Defense Communications Board action on broad plans for setting up supplementary facilities for radio communication after air attack about the time this issue of QST appears, the City of Providence, R. I., has developed a satisfactory solution of this need. Perry Briggs, police radio engineer, W1SGF, is largely responsible for getting necessary approval of the defense-organization plan. We are grateful to Rhode Island’s Emergency Coordinator for Greater Providence, Mr. Walter B. Marshall, W1JEC, for sending us a preview of the plan.

Under the Providence self-up for A.R.P. work, much responsibility for civilian-defense communication has been assigned to the police radio system. Threatened with the necessity for low-frequency radio silence during air attack, and in view of the additional burden of “air raid damage” messages that might be expected at such a time, a Mobile Radio Patrol had been planned using u.h.f. and radio amateurs to take care of any emergency. However, with the FCC action withdrawing operating privileges from reactivated amateur station defense groups Providence was obliged to re-plan its set-up to give appropriate public protection for any eventuality.

Providence obtained from the FCC a license for police-experimental communication, with assignment of four designated frequencies between 116 Mc. and 120 Mc., which frequencies are just adjacent to our 2½-meter amateur band. On these u.h.f. extension of regular police coverage is being established. The City is installing equipment, purchased from amateurs with the agreement to sell it back after the need has passed, we understand, at the various important fixed points that have been designated. Schools and other public buildings are usually named for control points in Warden-to-report-center systems.

About 50 radio amateurs are being sworn in as full-fledged but unpaid members of the police force. Their amateur operator licenses must be kept up and a plan of selec­tions insuring high qualifications and considering the interest and facts shown in emergency registrations is followed.

The 2½-meter equipment is easily modified to tune it to the designated frequencies. The new experimental police-radio emergency system is to utilize high class amateur equipment for the control point. The city will cover at least ten districts control or report-points. The equipment will be manned by licensed amateurs sworn in and given special credentials. It is planned, we understand, to have two or three portable-mobile rigs at each district station to cover gaps that pop up in the municipal or commercial wire signalling system, for special assignment, etc. The amateur appointments are in the capacity of captain and lieutenant, and ten appointments as sergeant are being made. Amateurs qualify for third class certificate for operating the system in addition to receiving special identification badges. We hope for more extensive data on the Providence plans and progress for next QST.

The Assistant Chief Signal Officer of the U. S. Army is Colonel James A. Code, Jr.
The Code Proficiency Frolic

BY J. A. MOSKEY,* W1JMY

The Code Proficiency Frolic, held during two weekend periods in September, was well received indeed. Undaunted by a spell of wet weather, the participants performed during the severe magnetic storm, the gang stuck to their posts and came through with many excellent scores. It was an activity open only to the several thousand holders of ARRL Code Proficiency Certificate awards. High quality operating was the prevailing theme and it alarmed the number participating and the rare sections impressed by the number participating and the rare sections bad conditions of the second week-end. - WlFGC. "Lots of amateurs whose glass-armed crickets in my back yard kept sending "CQ Hi!" - WlKIO. "Renewed many new acquaintances anewsection,SanJoaquin Valley." - W9GHD. "I enjoyed it very much and heard many of my old pals from K5AA days also on the air in the CP Frolic." - Eddie Turcotte, op K4CSG. "One thing was noticeable and that was the fact of W9RQM - 26,930 points, 381 QSOs, 50 sections. W9BDR made fifth place with 367 contacts in 63 sections for 24,221. The following deserve special mention as leaders in their respective call areas: W1BIH 19,604 (WITS 21,041, non-competitive), W2NCQ 17,089, W3BES 16,720, W4DWB 12,241, W5XC 21,010, W6BH 15,300, W7RT 5,863, W8NF 22,735, W9DIR 27,417.

Comments

"Thanks for introducing me to a swell bunch of ops." - W9DGM. "Sure had a lot of fun and got in a good lot of operating practice." — W8TOJ. "Even though northern lights messed up conditions on the second week-end, it was a swell get-together." - WSAQ. "This was the first contest of any kind I have ever entered. As far as I am concerned, it was an overwhelming success." - W8GQ. "The CP Contest was one of the most interesting that I have ever participated in. If I could contact under normal conditions as many stations willing to QSP as I did in this contest, I could be BPL every month of the year." - W8EUT. "Enjoyed it very much and heard many of my old pals from K5AA days also on the air in the CP Frolic." - Eddie Turcotte, op K4CSG. "One thing was noticeable and that was the fact that all CP stations sent better than average code." — W4IIHK. "It was plenty of fun and most of the old stand­bys of SS and ARRL QSO Parties were around. Thanks a lot for the fun." — W6CLZ. "One of the finest parties ever!" — W9MRQ. "I was really surprised at improvement in operating ability since the last contest of this type. I found fewer repeats necessary on both ends, even under the very bad conditions of the second week-end." — WIFGC. "lots of fun and good experience." — W8RYP. "Thanks for thirty-two hours of fun." — W3IEN. "I was thoroughly impressed by the number participating and the rare sections heard and worked. Was thrilled by working my first 150 and a new section, San Joaquin Valley." — W9GED. "I enjoyed this contest as much as any QRS, SS or other annual contest." — W2LFJ. "This was my first contest of any sort and it taught me a great deal about break-in operation and station handling." — W9IBU. "Although I was not active for the full fifty hours, I had a great deal of pleasure during the time I spent." — W5DP1/S. "Sure did have a swell time even with only ten watts. Contacted eight new states and really improved my operating ability." — W8UFI. "Worked every section heard." — W3XBE. "I certainly got a big kick out of the contest. After the Frolic a bunch of glass-armed crickets in my back yard kept sending "CQ Hi!" — WIRKO. "Renewed many new acquaintances after a summer lay-off." — W3JW.

Leading Scorers

Scoring was relatively simple in the Frolic. Exchanges consisted of section and the issuance date of the participant’s Code Proficiency Certificate. Special credit was awarded for complete handling of a message, with a maximum of 100 points permitted for traffic work. The sum of contact points and message credits was multiplied by the respective call area factors for the final score. As prizes autographed copies of the new DeSoto book are awarded to the five top exploiting operators.

Highest score was rolled up by that four-star contest performer W3BES. Jerry finished up to the tune of 31,620 points, working 427 stations in 60 sections. The following deserve special mention as leaders in their respective call areas: W1BIH 19,604 (WITS 21,041, non-competitive), W2NCQ 17,089, W3BES 16,720, W4DWB 12,241, W5XC 21,010, W6BH 15,300, W7RT 5,863, W8NF 22,735, W9DIR 27,417. Leaders in number of contacts were: W3BES 427, W9DGM 403, W9DIR 381, W9RQM 381, W9BRD 367, W1TS 357, W3FQZ 366, WITM 356, W3XBE 308, W9GKS 282, W9VFK 280, W1BIH 277, W8SSC 253, W2NCG 253. Leaders in number of ARRL sections worked for the final score. W3BES 60, W9DIR 59, W9RQM 56, W5KC, W9VFK 55, WITS, W3IWM, W9BRD 53, W3IEN, W9GKS 52, W2LPJ, W3DGM, W9SIS1, W3FQZ, W9BRD, W9GFF, W9GED, W9MUK 50.

SCORES

(Stations are listed in order of scores... Score, number of ARRL sections and number of contacts indicated. . .

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Score</th>
<th>Sections</th>
<th>Contacts</th>
</tr>
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<tr>
<td>W3BES</td>
<td>31620</td>
<td>60</td>
<td>427</td>
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<td>29062</td>
<td>59</td>
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<td>27417</td>
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<td>29355</td>
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<tr>
<td>W8NNF</td>
<td>23753</td>
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<td>336</td>
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<tr>
<td>W8SIS1</td>
<td>21800</td>
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<tr>
<td>W9SIS2</td>
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<tr>
<td>W9JNC</td>
<td>17920</td>
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<td>335</td>
</tr>
</tbody>
</table>

* Assistant to the Communications Manager.

March 1942
Meet the SCMs

Armold D. "Army" Brattland, SCM of Northern Minnesota, is a real old timer in amateur radio. He first became interested in ham radio in 1911 and was active as 9EA in 1914. "Army" has since held the calls W9YJL and W9WJU. Commercial radio took him to the West Coast in 1920. Prior to the war he was active on all bands from 1.75 through 10 Mc. with band-switching e.o.o transmitter ending up in a pair of Kenics. His other hobbies include hunting, fishing, dog-training and reading. He participates actively in target shooting, trap shooting, skating, skiing and swimming. Profession: Practicing lawyer.

F.C.C. Disciplinary Actions

For various violations of the rules governing amateurs, the F.C.C. revoked the amateur radio station licenses of Robert J. Lowe, W9YJL, of Minot, N. D., and suspended for the remainder of their terms the amateur radio operator licenses of Lowe, John C. Yednock of Greerboro, Pa., and Robert Hart of St. Paul, Minn. AFL.

Get your WAS yet? Now is a good time to look through all those cards to see if you can qualify. The award rules require that forty-eight cards, one from each state, confirming two-way communication, be submitted. Sufficient postage must be sent with the confirmations to insure their return. Address all applications and confirmations to the Communications Department, ARRL, 33 LaSalle Road, West Hartford, Conn.
We believe it was J. P. Morgan who, when asked for a tip on the stock market some years ago, gave the simple answer "Never sell America short!" That is still good advice. We should like to add to it, "Don't sell amateur radio short, either!"

Amateur radio will come through with flying colors. It has by tradition always met every local or national emergency with skill, resourcefulness and patriotism. Now that amateur radio is faced with its greatest emergency and its greatest opportunity, it is unthinkable that it will fail. It will do the job well, just as surely as a grateful nation will not forget it when peace comes.

It is not an easy job. No one yet knows exactly what services the amateur will be called on to perform, but everyone expects him to be ready when he is needed. No one knows just what the final regulations will be, yet he must anticipate them by proving his discretion as he has already proved his resourcefulness and skill. There will be disappointment too, for many amateurs who do all of these things may never be called upon. Yet the mere fact that they are ready and waiting to serve is itself a great service to the Nation, and to amateur radio.

Waiting does not mean hibernating. K. B. Warner was right last month when he said that this was a marvelous time to take up some things for which we never had time before. QST is staying on the job and incidentally, we are staying with QST. It may be your luck to be off the air for the duration. Perhaps you will not be able to buy the deluxe parts you would like to use rebuilding the rig in the meantime. At least you have the satisfaction of knowing that the parts are being well used, and that when you do get your parts they will be better parts than now exist. The radio industry is not only building fast, it is learning fast.

Maybe you have saved up to buy a new receiver and are disappointed to find that you cannot get it. Well, at first glance a Defense Bond may not look much like a communication receiver, but when the war is over you will find that the bond has what it takes to get good signals. It is better than money in the bank, and dealers dearly love a cash customer.

In the meantime, we have a job to do!

W. A. Ready
The requirements of our wartime production program have made certain raw materials unavailable for civilian use...have restricted the availability of others.

Naturally, substitute materials will have to be used; and, when the substitutes are gone, we may have to use substitutes for the substitutes. But rest assured that under no circumstance will Mallory relax engineering vigilance on quality. There will be no substitute for careful manufacturing, fine workmanship, and rigid inspection at Mallory.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS, INDIANA

Use MALLORY APPROVED PRECISION PRODUCTS

Press Frequencies

Through the courtesy of Mr. Phil Zurian, chief engineer, Press Wireless Inc., New York, we list here the frequencies of commercial stations whose transmissions we recommend for code practice. See page 70 of January QST and page 33 in the February issue for other press frequencies. Addressed information may not be divulged except to the addressee. Keep anything you may copy to yourself.

New York Los Angeles
4715 WCR KGT
4720 WBG
4725 WCS
5350 WCD
5365 WCP
5360 WCH KGT-2
6920 WEE KGT-3
7340 WBG-3 KJE-5
7355 WBS KJE-6
7510 KGT-4
7615 WBG-2
7620 WBG-7
7625 WDG KGT-5
7630 WBG-4 KJE-7
7850 WCX KCI-8
7995 WII KCI
8810 WJP KGT-6
9390 WCL WCD KJE-8
10010 WJQ KJT-7
10340 WIL KCI-2
10760 WEL KJE-9
11460 WIL-2 KIN
12450 WFJ KJE-3
13185 WFK-2 KIN-2
13760 WBG-8 KIN-3
13840 WPK KGT-8
14665 WPU KIN-4
15565 WCP
15580 WCB KGT-9
15610 WBG-5 KIN-5
15640 WBG-9 KIN-6
15700 WJS
15730 WCA KCI-4
15825 WBC RCI-5
15880 WRW KJE
15885 WBG-6
16010 WRK KCI-6
17440 WHJ KIN-7
18510 WIL-3 KJE-5
18580 WRM KIN-8
19470 WDH KJE-9
19850 WBE KJE-3
20930 WRP KIN-9
23990 WBR KCI-9
23450 WBK KJE-4

Attention amateurs near Boston, Mass.: If you are an amateur license holder between the ages of 21 and 60, in a deferred draft classification, fairly well physically fit, not in Federal service, and want to volunteer a little time toward serving your State, you are eligible to join the Second Division Signal Company of the Massachusetts State Guard which is seeking radio operators for its radio section. Further information may be obtained from Miles W. Weeks, W1WV, 1st Lieut., Radio Section, Second Division Signal Company, M.S.G., by calling BEOacon 2975 or LAFayette 5700 or by appearing at Commonwealth Armory, 925 Commonwealth Avenue, any Tuesday evening after 7 P.M., and asking for Lt. Col. Boyden, Capt. Davies or Lt. Weeks.

Headquarters Staff Note: Robert C. Morwood, W9QMD, who recently replaced James R. Buckler, WlNKC, on our Communications Dept. staff is off to the Dark Continent, having accepted a position as radio operator in the Pan American Airways African system.

The American Radio Institute Radio Club with headquarters at 1123 Broadway, New York City, is issuing CQARL Club Code Proficiency Certificates. Tests are held twice monthly. Sending is done with automatic equipment and...
THE Series 200 "Super-Pro" is not just another receiver created in the Sales Department first and then engineered to sell at a price. It is the result of years of research and engineering moulded into a single unit designed to satisfy the demands of the critical communications engineer whose only impasse is explained as "due to conditions beyond our control." Amateurs are more and more demanding commercial performance and the new Series 200 "Super-Pro" is the answer to that demand. The economy in owning a "Super-Pro" lies in the fact that it is built for years of service. As one owner puts it, "it is cheaper to buy one 'Super-Pro' than trade in an ordinary receiver every year." We might add that even trading for a new receiver every year would still not give him "Super-Pro" performance. Ask your dealer to demonstrate the full-range variable selectivity of the new "Super-Pro" which covers every band width from single signal to nearly 16 kc. for high fidelity. Investigate the adjustable "S" meter, the efficient noise limiter, the variable crystal filter and its many other features and you will agree that it pays to own a "Super-Pro."

SEND FOR BOOKLET

HAMMARLUND MFG. CO., INC.
424-438 W. 33rd St., N. Y. City
Please send New "Super-Pro" Data.

Name .................................
Address ................................
City ................................. State ..............
For A New Amateur Radio

AMATEUR Radio as we have known it, is now a thing of the past. While cessation of operation was a matter of law, all amateurs willingly gave up their hobby to favor the interests of their country.

When victory again brings peace to our shores, there is no question that amateur activities will be renewed with greater enthusiasm than ever before. The present emergency conditions are already pointing the way to this new amateur radio. Intensive research and development work, increased production facilities and stringent Government specifications are all working together for better amateur radio components in the future.

Bliley is producing crystal units in constantly increasing numbers for all National Defense requirements. Today's war-time experience will result in better Bliley Crystal Units for tomorrow's greater Amateur Radio.

BLILEY ELECTRIC CO.
UNITED STATES BUILDING ERIE, PA.
SUPERIOR PERFORMANCE and ease of operation have made the "HQ-120-X" outstanding among amateur receivers. You don't have to "fight" the "HQ-120-X" in order to pull in weak DX stations, its controls are smooth and accurate. Tuning knobs are at wrist-level height eliminating "tuner's cramp," and the dials are accurately calibrated for instant logging. There are no delicate or critical adjustments necessary when searching for DX, maximum sensitivity is always available. The variable selectivity crystal filter cuts through the worst QRM, either phone or CW, with remarkable results. Automobile ignition interference is reduced to a negligible level with an improved noise limiter system. Other features include, calibrated bandspread, antenna compensator, and calibrated "S" meter. Ask your dealer to demonstrate the smooth and dependable performance of amateur radio's most complete moderately priced receiver — the "HQ-120-X."

WRITE FOR BOOKLET!

HAMMARLUND MFG. CO., INC.
424-438 W. 33rd St., N. Y. City
Please send 16-page booklet.

Name
Address
City State
using the former range it can be checked on a communications receiver which only covers the amateur bands.

The converter is built on a 7- by 7- by 2-inch chassis, and only a few points need be mentioned because the arrangement of parts can be seen in the photographs. The tuning condensers are bolted to the chassis in a position that will allow the panel to be supported by the panel bearings of the condensers. The toggle switch and the screw holding the oscillator coil also hold the panel to the chassis. The mixer and oscillator padding condensers, C2 and C4, are fastened to the sides of the chassis under their respective tuning condensers, and C5, the output circuit tuning condenser, is mounted on the chassis directly behind the 6SA7. The output coil, L3, is fastened to the chassis near its tuning condenser. Both L2 and L4 are wound on 1-inch bakelite forms (Millen 4500). L1 is a winding from a 175-kc. transformer. The particular one we used came wound on a piece of dowel which could have been used to mount it except that we used up the dowel in another experiment, so the winding was slipped over a polystyrene stand-off insulator (Millen 30001) which was cemented to the chassis. However, the dowel will serve just as well.

The converter is put into service by connecting its output to your communications receiver and plugging in the line cord of the converter. While both the converter and receiver are warming up, set the receiver to 1950 kc. Then adjust the output trimmer C5 for maximum noise from the receiver. Next the converter oscillator range can be checked by setting the oscillator tuning condenser, C3, to minimum capacity and the receiver to 1800 kc. It should then be possible to tune in the converter oscillator signal by adjusting C4 until the signal is heard. Check the range of the oscillator by setting C4 at maximum — if it can be tuned in at 1750 kc. on the receiver your range is right on the nose. If the range is too great (oscillator is lower than 1750 kc. at maximum capacity) it indicates that fewer turns are required on L2, and vice versa. It is not critical, of course, since the converter is not ganged. The receiver can now be reset to 1950 kc. and C1 and C2 set to the middle of their ranges. Then adjust C4 for maximum noise (with S1 closed) and the converter is lined up for action. It will be found that the mixer tuning control is not too sharp and will only need attention after the signal has been tuned in with the main tuning control, C3. Remember that C3 tunes backward to the usual way — it is tuning the converter to 150 kc. when it is at minimum capacity and to 200 kc. when it is at maximum capacity, the reverse of the mixer condenser action.

The coupling switch, S1, is included so that the converter will not be pumped full of r.f. during transmission periods, and it should be used to...
Before filament assemblies are sealed into the tubes they are placed under a temporary vacuum and heated to much higher temperatures than normal. This vital test enables technicians to weed out faulty parts before the tube is actually pumped.

Hard vacuum is essential to preserve peak filament emission. Special pumps are built in the Eimac laboratories to fit the exact requirements of Eimac tubes. During the pumping process, plate dissipation is run up to ten times normal. Tubes that cannot stand this abuse never leave the factory.

Here is a special Emission Tester which enables laboratory men to ascertain the actual performance capabilities of filaments after the tubes are completed. Under this test, filaments are made to perform much more difficult tasks than could possibly be required under normal operating conditions.

MAXIMUM FILAMENT EMISSION ASSURED IN EIMAC TUBES

All Eimac tubes are unconditionally guaranteed against tube failures resulting from gas released internally. No other tube carries such a guarantee. This guarantee plus the fact that leading engineers throughout the world use and recommend them provides ample reasons for you to consider Eimac tubes for your application.

Follow the leaders to

Eimac TUBES

Eitel-McCallough, Inc., San Bruno, Calif., U.S.A.

Foreign Division
FRAZAR & CO., LTD.
301 Clay Street, San Francisco, California, U.S.A.

With the aid of this Electron Microscope, one can actually observe the action of electrons being emitted from a heated filament. Like a moving picture, the emission characteristics of a filament are projected on a lens-like screen. Observations thus made, enable Eimac engineers to maintain the enviable record of dependability and superior performance enjoyed by Eimac tubes.

Eimac's unusual performance capabilities are receiving the enthusiastic acceptance in all branches of the service ARMY, NAVY, AIR CORPS.

EIMAC 450T
(In use by practically every major airline in the U.S.A.)

Filament Voltage . . . . . 7.5 to 7.7 Volts
Filament Current (approx.) . . . 12 Amperes
Maximum Plate Voltage . . . . 6000 Volts
Continuous Plate Dissipation . . . 450 Watts
Power output at 75% efficiency . . 1350 Watts
NEW ELECTRONIC POWER SUPPLY FOR Emergency Radio Gear!

Model S-1040, Net Price to Amateurs, $18.50 complete, f.o.b., Indianapolis

Now, civilian defense, as well as police, public service company, and other demands, have created an urgent need for a simple, low-cost and completely dependable power supply for 112 megacycle emergency radio communication. To meet this need, Electronic presents the S-1040.

It operates two-way radio from either 115-volt A.C. or 6-volt storage battery. Small and light, yet sturdy and strong, the S-1040 offers maximum convenience for portable field equipment. Widespread use of Electronic Power Supplies by the Signal Corps, Air Corps, and Navy indicates the reliability and efficiency of Electronic units.

The Electronic S-1040 Power Supply conforms completely to the specifications recommended by Technical Editor George Grammer in his excellent article in December QST, page 9:

INPUTS: 6-Volt DC, and 115-Volt AC, 60-Cycle. 
OUTPUT: 300-Volt DC, 100 Milliamperes. 
FILAMENT SUPPLY: 6-Volt AC @ 2½ Ampere. 
VIBRATOR: Std. Electronic 120-Cycle Heavy Duty. 
Tube filaments are fed from Converter. Switch permits instant changeover ... AC to DC, or DC to AC. Separate AC input connection for 115-Volt operation.

Limited quantities of the S-1040 are now available. In order to facilitate continued supply, the need of civilian defense for emergency radio has been called to the attention of the proper authorities. However, it is advisable to order without delay. Address the nearest Electronic office, listed below:

ELECTRONIC LABORATORIES, INC. 
Indianapolis, Indiana

ELECTRONIC Power Supplies

disconnect the converter from the line whenever the transmitter is being keyed.

General

Any group of hams within several miles of each other in a city and up to ten or more in the country will find they can have plenty of fun and operating practice with wired wireless. We suggest that they keep to around 165 kc., to reduce the chances for radiation, and that the power be kept low — one or two 6L6s will give plenty of output. On several occasions we noticed a difference in signal strength, very probably caused by different loading or routing of the line, and it may work out in some instances that 24-hour communication is impossible or unreliable.

Above all, however, remember to keep away from other services and from interfering with broadcast receivers — continued wired-wireless operation will depend upon our staying in our own backyards and not getting in anybody's hair.

The Panoramic Spectroscope

(Continued from page 18)

from one end of the band to the other, simultaneously with the horizontal deflection of the cathode-ray tube. The result is that the whole band is portrayed on the full width of the calibrated screen as described above, with the signal to which the receiver is tuned appearing in the center.

The sweep width may be varied to increase or decrease the width of the band under simultaneous view. When it is cut to zero, the cathode-ray tube acts as a normal oscilloscope showing the modulation envelope of any signal tuned to the 0 point on the screen.

Several important and interesting uses of the radio spectroscope have been tested, and photographs were taken of the cathode-ray screen. Tracings of these are shown in Fig. 2 and are described briefly below:

1. Carrier modulated with 3000 cycles, sweepwidth 70 kc. The sidebands are clearly separated on each side of the carrier.

2. Same signal as in No. 1. Sweepwidth reduced to 25 kc. The sidebands are spread further, i.e., the resolution is better.

3. 14-Mc. amateur 'phone band. About six modulated 'phone stations are visible.

Fig. 2.—Typical patterns illustrative of different types of signals. The patterns are explained in the text.
Hallicrafters SX-32

Available now... and you can get it for only $37.50 down!

8 months to pay balance plus 6% carrying charge

The new Skyrider 32 for 1942 embodies many noteworthy engineering advancements in the communications field. Covers everything on the air from 500 kc. to 40 mc.

As Low as 59c

SPECIAL
OIL FILLED - OIL IMPREGNATED
FILTER CONDENSERS

Newark

Volts

Mfd. Bc. 
Price

1 1000 5 x 1½ x 1½ $ .50
2 2000 4½ x 1½ x 1½ 1.00
3 3000 5 x 1½ x 1½ 2.00
4 4000 5 x 3¼ x 3¼ 2.75

The lowest price Newark has ever featured... on a condenser that already has made thousands of friends for use in filter applications. Guaranteed at rated voltage.

Remember - BUY DEFENSE BONDS and STAMPS!

Send now for this FREE CATALOG

Thousands of bargains, sets, parts, accessories, supplies, of best known makes. Hundreds of illustrations. This book belongs in every "ham" shack, ready for instant reference. Helps you plan your new rig, figure costs, learn sizes and specifications before you start construction.

Cash Price

$149.50

Complete

Less Speaker

$17.35 down... Balance in 6 easy monthly payments, 6% carrying charge.

Thirteen tubes. Six bands. Two stages preselection on four highest frequency bands. Calibrated bandspread inertia controlled. Micrometer scale tuning inertia controlled. The new Skyrider 32 has been engineered by Hallicrafters to produce superior communications receiver performance at a moderate price. SEND DOWN PAYMENT AND CREDIT REFERENCES WITH YOUR ORDER.

Other Hallicrafters models may also be purchased on Newark's Easy Terms. 25% down, balance monthly.

Newark Electric Company
323 W. Madison St.
Dept. Q
Chicago, Ill.

63
The STRONGEST DEFENSE
for the professional radioman
who wants to be a success

CREI ARMS YOU with the ability to succeed...at a time when technical ability is more important than ever

Every radioman has a responsibility to his job and to his country to work at top efficiency. In the face of the present emergency CREI training takes on new importance—becomes the strongest defense—for professional radiomen who realize that technical ability is more important than ever today. In improving your own technical ability you are performing a duty to your country, your employer and yourself. NOW is a better time than ever before to prepare yourself for the important, better-paying positions in radio engineering. No matter how arduous your duties are now, a CREI planned system of study for your self-improvement during your spare hours will pay great dividends. More than 5000 professional radiomen are doing it now. How about you?

WRITE FOR FACTS TODAY!
Our free booklet and personal recommendations may hold the answer to your future success. In your inquiry please state briefly your background, education, present position—and whether you are interested in Home Study or Residence training.

CAPITOL RADIO ENGINEERING INSTITUTE
Dept. Q-3, 3224 16th St. N. W. Washington, D. C.
Contractors to the U. S. Signal Corps
Contractors to the U. S. Coast Guard
Producers of Well-trained Technical Radiomen for Industry

4. A portion of the broadcast band. Stations are distributed at every 10 kc.
5. Three automatic telegraph stations. Because of the rapid keying the deflections appear closed at the bottom. On the left side a “key click” appears.
6. Frequency modulated carrier during period of silence.
7. Same with very little modulation.
8. Same with increased modulation.
9. Same with heavy modulation.

This new tool is coming into use at a time when receivers, rather than transmitters, are the heart of the amateur operating room. Although transmitters are closed down, no restrictions have been placed on receivers, and a new and interesting field is open for war-time amateur activity. Receivers already in use can be easily equipped with the separate adapter unit as described above, thereby increasing enormously their field of usefulness.

Happenings of the Month
(Continued from page 81)

Responsibility for the whole system. The latter will appoint as his radio aide our Emergency Coordinator or, in his unavailability, his equivalent amongst local amateurs, who will assist in planning the assignment of amateurs to posts of duty. That can be done by direct acceptance of the desired amateurs into the personnel of the local Control Headquarters, without reference to the local Volunteer Office—registration in our AEC is sufficient.

JANUARY CLOSING ORDERS
So that the chronicle in QST may be complete for record purposes, let us report the orders in the “second closedown” of January.

About the end of the year, DCB asked FCC to hold up on the issuances of further reactivations until DCB could study the situation and arrive at more definite policies for the future of amateur radio. FCC had issued 1689 reactivations through January 1st and had applications for another thousand or so on hand but thereafter discontinued and stood by. The halt came about through uneasiness in DCB, particularly in the War Department, over the looseness of reactivating procedure and the looseness of the subsequent control. It was said that in too many cases there was little evidence of well-conceived plans and considerable evidence of “politics” and that the procedure was palpably getting out of hand. As the result of its studies, DCB on January 8th asked FCC to wash out everything up to date, it being understood that consideration would be given a completely new deal if a federal agency stepped forward with a definite request for amateur services. OCD immediately started work on such a plan. Meanwhile FCC acted on the DCB request and on January 9th cancelled all special authorizations by means of a brief order and announcement. W1AW transmitted the word un-
THE MOST WATCHED-FOR SHIP IN THE WORLD
depends upon AlSiMag insulation in its communications equipment

"Who was on yesterday's Clipper?"
"Reserve a seat on the first Clipper!"
"Red shipment by Clipper!"
"Dashing arrival of Clipper!"

AT THIS VERY MINUTE in half a hundred far-flung countries, Pan American Clippers are helping to shape history. They carry the hopes of democracy everywhere that war permits.

Upon their prompt arrival hinge decisions and events of world importance. Flying Clippers speed their vital cargo of men, mail, materials and merchandise along 86,893 miles of scheduled routes. Under wartime conditions, speed and certainty of communications is, more than ever, vital to this far-flung network. Only the best insulation will suffice. Every conceivable climatic condition is faced in Pan American Clippers linking the United States and Europe—binding Alaska, North and South America together—bringing the distant Orient and Australasia within days of our shores.

American Lava Corporation is proud that the performance of AlSiMag has led it to be the preferred insulation in all communications equipment throughout the Pan American Airways System.

America's Merchant Marine of the Air is a DAILY PROVING GROUND for ALSIMAG INSULATION

AlSiMag
FROM CERAMIC HEADQUARTERS

AMERICAN LAVA CORPORATION • CHATTANOOGA • TENNESSEE
CHICAGO • CLEVELAND • NEW YORK • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • BOSTON • PHILADELPHIA • WASHINGTON, D. C.
For TRIPLETT Customers Only

LONG BEFORE the state of emergency was proclaimed, the Triplett Company was getting ready to do its part in building our national security. We knew that we must meet important new responsibilities. At the same time, we felt keenly our continuing obligations to our customers—old friends with whom we have had happy business relations through many years.

We doubled—then tripled—our output to fill the needs of our old accounts. We added to our production facilities... hired many more men... are working extra shifts at time-and-a-half.

All this has not been enough. We have been called on to produce more and more for national defense. We are proud of the job we are doing to help meet the emergency, but it is difficult not to be able to serve our old friends equally as well. In the face of these conditions, the Triplett Company has adopted these policies "for the duration":

FIRST: We will continue to serve you by our service to our mutual responsibility—the national emergency.

SECOND: We will continue to do everything we can to fill orders from our regular customers, even though some deliveries may be temporarily delayed. No business from new accounts has been nor will be accepted until after our old friends have been served, except where priorities make it impossible to do so.

THIRD: Our engineering and research departments will continue to work on the development of superior equipment and improved methods to serve you still better when we can resume normal operations.

The present emergency is incidental and as we work towards the future, we will do our best to continue to merit your confidence and loyalty.

President
The Triplett Electrical Instrument Company

Manufacturers of Precision Electrical Instruments
The shield and anode of Taylor's 866/866A are made of pure Svea metal which eliminates any possibility of filament poisoning due to loose carbon.

The cathode of the Taylor 866/866A is a multi-strand (mesh) filament which has approximately twice the emitting area of the ribbon type.

For the past 3 years, Taylor's 866 has had the ratings of an 866A. See QST advertisement—April 1939.

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RATING
Fil. Volts ........................................... 2.5
Fil. Amps. ........................................... 5.0
Max. Inverse Peak Plate Volts 10,000
Average Plate Amp. ......................... 0.25
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Prepare for specialization in the important defense field of ultra-high frequency communications with the aid of these books.

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THIS Library was selected by radio engineering specialists of the McGraw-Hill publications to give a well-rounded view of communications engineering theory, applications, and special techniques. From important tube and radio fundamentals to special emphasis on high-frequency problems, the essentials of this field and its complete modern background are grouped here, for the aid of those who wish to prepare quickly for design and research work in the vitally important and expanding field of defense communications engineering.

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1. Hudspeth's PHENOMENA IN HIGH FREQUENCY SYSTEMS. Complete survey of theories, practices, and equipment the high frequency communications engineer requires in design and development of ultra-high frequency systems.

2. Hudspeth's HIGH-FREQUENCY MEASUREMENTS. Authoritative treatise on measurements of voltage, current, power frequency, L, C, tube constants and characteristics, radiation, and other high frequency electrical quantities.

3. Streeton's ELECTROMAGNETIC THEORY. Advanced text on electromagnetic theory, treated mathematically through the extensive application of vector analysis.

4. Reisch's THEORY AND APPLICATION OF ELECTRON TUBES. Standard and authoritative text on electron tubes, the heart of modern communication systems.

5. Everett's COMMUNICATION ENGINEERING. Standard, well-known text covering communication practice at all usual frequencies.

6. Glasgow's PRINCIPLES OF RADIO ENGINEERING. Well-known text, relating theory of the thermionic vacuum tube and its associated circuits to communications without slighting necessary mathematical explanations.

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Under this plan you save $2.50 on total price of same books bought separately. In addition, you have privilege of paying in easy installments, while you use the books. These books assemble for your convenience facts, standards, practice, data, for the whole field of communications engineering. Add them to your library now, under this advantageous offer.

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Send me the Defense Communications Library, 6 vols., for 10 days' examination on approval. In 10 days I will send $3.50, plus few cents postage, and $3.50 monthly till $28.50 is paid, or return books post-paid. (Postage paid on orders accompanied by remittance of first installment.)

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QST-3-42

ESMDT — Engineering, Science & Management Defense Training program of OF.

KEEP UP YOUR LICENSE:

You are earnestly urged to keep your amateur licenses in force, both operator and station. You're likely to need them for participation in ARP work; we can't tell what else will break in which you may need them. And they help in getting radio employment or in securing radio assignment in the services. FCC is continuing the renewing of licenses and their modification for change of address in the same old manner. Write your Inspector-in-Charge for amateur application form for either renewal or mod, fill out in the usual fashion, send with your old license to FCC at Washington. Don't let your licenses lapse!

Amateur exams for new licenses are being given as usual (schedule in last QST). None has been actually issued since war began but it is expected that op licenses will be released soon, and perhaps station tickets where needed for a defense purpose.

SELL YOUR TRANSMITTER?

The military services cannot get delivery on fixed transmitters fast enough and are appealing to ARRL Hq. to find amateurs who possess standard manufactured transmitters they are willing to sell. There is as yet no interest in homemade jobs, however good, but you can get a good fair price for a transmitter of 100 to 1000 watts input, of such a standard make as Collins, Hallicrafters, RCA, RME, Temco, etc., capable of working anywhere in the 2000-6000 kc. range.

ARRL gladly centralizes this information. If you're willing to sell your "boughten" transmitter, drop a letter or card to ARRL, West Hartford, Conn., giving following data: (1) Your name, address, call. (2) Make of transmitter, model number, power rating in watts in or out, 'phone or c.w., frequency range. (3) Whether rig has been altered by you. (4) Date acquired, cost, your selling price at your shack.

Uncle needs help. Are you willing?

An Acoustic System

(Continued from page 64)

various types of screens have been designed to protect the microphone from the wind and yet provide ready transmission of sound waves. However, in this case, we have the additional problem of weather-proofing the microphone. One type of weather-proof housing is shown in Fig. 2. While it may not be as efficient as others which might be designed, it is of simple construction. The upper portion consists of a square box supported on legs at each corner. The side walls of the box should be made of heavy material to prevent vibration. The joints should be sealed against rain and the whole thing given a coat or two of weather-resistant paint. A strip of silk may be wrapped around the four legs to reduce
The ability to design and produce so many specialized types in a short time is important. It is, however, only a secondary consideration in the selection of Sprague Condensers for Defense applications. Far more important is the assurance of utmost dependability for each and every unit given by Sprague's long record of performance as a leading supplier to the Radio Trade.

Although new condenser mechanical arrangements are sometimes made overnight, basic condenser section design and resulting dependability are not.
wind noise. The microphone should be provided with a suspension of rubber bands or springs. If the housing is mounted on a flat surface, sound waves striking the flat surface will be reflected upward into the box. The microphone and the speaker must be separated some distance to prevent feedback howls. It will probably be more economical to mount the amplifier with the microphone and extend the power and speaker leads, rather than to extend the microphone cable.

Tests which were made with the simple unit described showed very successful results. Even in a poor location in the center of a traffic section of town it was possible to detect the presence of aircraft quite as readily as with the unaided ear. In a quiet location without the blare of automobile horns and exhausts of truck motors, it should do a real job. Experience has shown that an acoustic system is much more dependable than a system which depends upon sighting the aircraft. In cloudy weather, the acoustic system is indispensable. During tests, there were numerous instances when it was utterly impossible to see aircraft immediately overhead, although the weather was not too cloudy for flying. Yet the receiving room was filled with the roar of motor noise. Similarly, aircraft anywhere in a wide area between the sun and the observer cannot be seen. Even in slight haze, it was found possible to detect the approach of aircraft much more quickly with the acoustic system than with the eye, particularly with the aircraft at high altitude.

Navy Day

(Continued from page 59)
DEPENDABILITY

...to Match Today's Needs

One after another, almost since the beginning of Radio, IRC has pioneered and perfected leading fixed and variable resistor developments. The natural result of this leadership is a line of resistance products for practically every application, which not only matches today's most exacting requirements but that frequently sets the standards by which other resistors are judged.

INTERNATIONAL RESISTANCE COMPANY
401 North Broad St., Philadelphia, Pa.

MAKERS OF RESISTANCE UNITS OF MORE TYPES, IN MORE SHAPES, FOR MORE APPLICATIONS THAN ANY OTHER MANUFACTURER IN THE WORLD.
NEW ENGLAND DIVISION

CONNECTICUT—SCM, Edmund R. Fraser, WIKQY

Your new SCM wishes to take this opportunity to thank and appreciate the splendid cooperation being shown by the gang. Nineteen new EC appointments bring the total to 28. Complete list of officials: ASTC, SCM, CTI; PAT, LTV; EAC, W1BY; BRADFORD, APA; BRIDGEPORT; KGE, Darien; LWZ, E. Hartford; NQG, E. Haven; AJO, Greenwich; JQK, Hamden; KDK, Hartford; WR, Litchfield; FSH, Manchester; DBM, Middletown; DGG, Milford; BQS, New Britain; BQS, New Canaan; BHM, New Haven; QV, New London; LWT, New Milford; NWK, Norwalk; JXP, Old Lyme, Lyme, Essex, Saybrook, ON, Putnam; EFW, Southington; FXS, Stamford; BHJ, Torrington; KSJ, Waterbury; TD, West Haven; MPF, Westport; JWN, W. Hartford; KYC, Willimantic; EAC's reporting; FSH, Manchester-Reactivation was obtained by Geo. Waddell of the EFW, Southington; FXS, Stamford; BHJ, Torrington; KSJ, Waterbury; TD, West Haven; MPF, Westport; JWN, W. Hartford; KYC, Willimantic; a note of appreciation for the splendid co-operation being shown by the gang.

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plan for the community. Most of the functions of the original plan have been taken over by OCD, but the communications setup is still basically the same. Similar plans were used in other states, and now the plans are organized under the direction of NJZ. Each individual ham is requested to register in the AEC, and if your community has no EC, send your recommendation to me. Only by knowing every operator and piece of emergency equipment available can we make our best showing. Let's still keep plugging away.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTV — Amateur radio in New Hampshire is getting in line. Despite the fact that the amateurs in the state have not held a meeting for over a year, the amount of activity is becoming noticeable. On Dec. 29th a meeting was held at the Manchester Radio Club with 42 hams from all over the state in attendance. A Mr. A. C. Hudson gave a short talk on work of GMC and the preparations for an emergency. Mr. F. Floyd gave a very interesting talk on Air Wardens and their duties. Defense work was discussed at length and AVJ has been selected as State Emergency Coordinator to work in cooperation with the Governor and the Defense Council. CNX, BSTEM, GYB and CMR are chosen as Emergency Coordinators for their respective communities. The Governor is very cooperative with the amateurs and AVJ has been appointed by him to serve on the Defense Council in regard to radio matters. On Jan. 17th a meeting of a Concord amateurs was held at AVJ's house and plans were made for local work in the defense set-up. CNX was chosen as EC for Concord. A Civilian Air Patrol is being organized and it is expected that this will be in operation by the end of February. On Jan. 17th the Nashua Mike and Key Club held their annual meeting at The Brick House, JMY, Asst. Comm. Mgr. of ARRL was present and gave a timely talk on conditions as they affect the Amateurs. The money talk on defense work done so far in this state. GEY was chosen as EC for Nashua. FFL is expected home from England before long. We understand that AVJ is now in England, the Nashua Mike & Key Club is working on 112-Mc. equipment, and plans to tie in with the telephone company. It is with a great deal of pleasure that we announce the engagement of W1MWW to JMY of ARRL Headquarters staff. We are sure that all the W2BELs will gain much happiness and extend congratulations to Joe. NMM applied for membership as a solicitor for details. Appointee stations having nothing to report are not required to send in activity reports. Failure to report will not be held against you when renewal of appointments is required. The SCM is elected for 1942 with the result that HRC is now president, AFO is vice-pres., KKE treas. and LYE secy.; LCS and CNJ are on board of directors. JXA is chairman of radio school committee which starts soon.

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3ZI. This column originates almost entirely from the correspondence secretaries of various organized club-groups throughout the state who take the time and interest to write monthly of what is going on in their station. These news letters are extremely interesting in preparation. I do not believe these writers are any more friendly or helpful or any better hams than anybody else, but they do have the relations of their group with ARRL at heart and do their part by keeping us in touch with what goes on in our community, and let us know who they are so that we can keep them posted about what goes on at ARRRL. Why don't you fellows who feel ARRL does not cooperate start now to give us a try by writing the SCM with a monthly letter dated the 16th of the month? Any club or group not yet represented on the Board of Directors of the Phila. Area Amateur Radio Council should take steps to do so at once. Contact WSAKZ, secretary, for details. Apointee stations having nothing to report are not required to send in activity reports. Failure to report will not be held against you when renewal of appointment is required. The SCM is elected for 1942 with the result that HRC is now president, AFO is vice-pres., KKE treas. and LYE secy.; LCS and CNJ are on board of directors. JXA is chairman of radio school committee which starts soon.

SOUTHERN NEW JERSEY — SCM, Lester H. Allen, W3CCO. Asst. SCM, G. Bumby, W3BEX; E. R. Toretti, W3BAQ. Emergency Coordinators: Atlantic City, W3EFL; Camden, W3KW; North Plainfield, W3CGU; Vineland, W3GMY; Somerville, W3BEC. Since the FCC order of Dec. 27th several letters have come to the SCM asking the same question, “Where and how can I help in Civilian Defense?” Here is the set-up for the state of New Jersey. The New Jersey Defense Council set up a five-man committee with three men representing the commercial and engineering side of the picture and W3BAQ and W3CCO to represent the amateurs. It was the duty of BAQ and myself to assemble the men and material for large scale emergency communications work should their services be required for defense. Any club or group not yet represented on the Board of Directors of the Phila. Area Amateur Radio Council should take steps to do so at once.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC, has failed in the past to give them sufficient credit for their work, and this is supposed to be the reason for their coolness towards ARRL-sponsored activities. Since I do not know the group there nor in Woonsocket, the following will explain it all. Boys. News items that appear in this column entirely from the correspondence secretaries of various organized club-groups throughout the state who take the time and interest to write monthly of what is going on in their section. These news letters are extremely interesting in preparation. I do not believe these writers are any more friendly or helpful or any better hams than anybody else, but they do have the relations of their group with ARRL at heart and do their part by keeping us in touch with what goes on in our community, and let us know who they are so that we can keep them posted about what goes on at ARRRL. Why don't you fellows who feel ARRL does not cooperate start now to give us a try by writing the SCM with a monthly letter dated the 16th of the month? Any club or group not yet represented on the Board of Directors of the Phila. Area Amateur Radio Council should take steps to do so at once. Contact WSAKZ, secretary, for details. Apointee stations having nothing to report are not required to send in activity reports. Failure to report will not be held against you when renewal of appointment is required. The SCM is elected for 1942 with the result that HRC is now president, AFO is vice-pres., KKE treas. and LYE secy.; LCS and CNJ are on board of directors. JXA is chairman of radio school committee which starts soon.

(Continued on page 79)
FOR CIVILIAN DEFENSE

The unique RCI1 “three-way” design of individual transmitter, modulator and receiver units with external cable connectors gives maximum flexibility and performance in fixed, mobile and portable use. Highest-quality parts; high-C, high-Q circuits. Receiver radiation reduced to a minimum. Stable, efficient, rugged, dependable. Ask your dealer or write for Circular CD.

WWV Schedules

The standard frequency service of the National Bureau of Standards station WWV has been extended to include another carrier frequency (15 megacycles). Temporary equipment is still in use while a new transmitting station is being built. The broadcast is continuous at all times day and night from 1-kilowatt transmitters, and carries the standard musical pitch and other features. The radio frequencies are:

- 5 megacycles ( = 5000 kilocycles = 5,000,000 cycles) per second
- 15 megacycles ( = 15,000 kilocycles = 15,000,000 cycles) per second

The standard musical pitch carried by the broadcast is the frequency 440 cycles per second, corresponding to A above middle C. In addition there is a pulse every second, heard as a faint tick each second when listening to the 440 cycles. The pulse lasts 0.005 second, and provides an accurate time interval for purposes of physical measurements.

The 440-cycle tone is interrupted every five minutes for one minute in order to give the station announcement and to provide an interval for the checking of radio measurements based on the standard radio frequency. The announcement is the station call letters (WWV) in telegraphic code (dots and dashes).

The accuracy of the 5- and 15-megacycle frequencies, and of the 440-cycle standard pitch as transmitted, is better than a part in 10,000,000. Transmission effects in the medium (Doppler effect, etc.) may result in slight fluctuations in the 440-cycle frequency as received at a particular place; the average frequency received is, however, as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.000 01 second. The 1-minute, 4-minute, and 5-minute intervals, synchronized with the seconds pulses and marked by the beginning and ending of the announcement periods, are accurate to a part in 10,000,000. The beginnings of the announcement periods are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods; this adjustment does not have the extreme accuracy of the time intervals, but is within a small fraction of a second.

The service from the temporary transmitters will continue for some months. It will be continuous except for such breakdowns as may possibly occur because of the use of temporary apparatus. As rapidly as possible the Bureau is establishing a new station to provide more fully than in the past standard frequencies reliably receivable at all times throughout the country and adjacent areas.
pens the state of New Jersey will parallel this plan and im-
mediately go into action. You will be notified by postal card
or form letter as to the set-up and a state-wide meeting will
be held in Trenton where all amateurs will be in-
come and sit in. When the new plan is adopted it no doubt
will require 24-hour operation so please organize accordingly
particularly for operating personnel. I ask your cooperation.
Rest assured that BAQ and myself will do everything pos-
able to have amateur radio represented in the State of New
Jersey. New calls added to the AEC files this month: GZS,
JAQ, FMR, JNZ, ETL, I27, EIT, IKG, JBU, CVM, INO,
YuA, HVA, FO, JOL, HMO, JAQ, JPB, JAQ, JAQ.

Syracuse about 50 hams and radio service men were on hand
to greet him and had arranged an informal dinner party for
his reception for being on the job. TTD is a member of the
local defense council at Export and intends to continue
his ARRL membership throughout our layoff. After long
waiting he has been awarded his WAS. HKU sends in his
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his ARRL membership throughout our layoff. After long
waiting he has been awarded his WAS. HKU sends in his

(Continued from page 79)

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mediately go into action. You will be notified by postal card
or form letter as to the set-up and a state-wide meeting will
be held in Trenton where all amateurs will be in-
come and sit in. When the new plan is adopted it no doubt
will require 24-hour operation so please organize accordingly
particularly for operating personnel. I ask your cooperation.
Rest assured that BAQ and myself will do everything pos-
able to have amateur radio represented in the State of New
Jersey. New calls added to the AEC files this month: GZS,
JAQ, FMR, JNZ, ETL, I27, EIT, IKG, JBU, CVM, INO,
YuA, HVA, FO, JOL, HMO, JAQ, JPB, JAQ, JAQ.

Syracuse about 50 hams and radio service men were on hand
to greet him and had arranged an informal dinner party for
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of Perth Amboy have constructed 15 112-Mc. units. They conducted code classes four nights per week and radio
teachers are under consideration. 1942
prices, AUI; secy., NLH; sgt.-at-arms, CNP. Clifton and
a few days before orders from the control station located at Passaic City Hall.
izer in Kearny were BRD, HRO, HXO, JBN, LSH, LTI and
receiver design to be installed in cars and outlying fire-
defense nets in this Section. Now that we have virtually
been assured of the reopening of 112-Mc. and up to the prop-
it is safe and well serving in the U.S. Naval forces. So Harvey
Bonds, too. GOR has been appointed Asst. Emergency
Coordinator. Fellow hams of the Tennessee Section: Now
their districts and make some plans for future high-impact
AUGUST 1942

ROANOKE DIVISION

VIRGINIA — Acting SCM, Thomas S. Jones, W3BZE — VIRGINIA just wasn’t mentioned here last month and
can you blame it on me? Yes, SCM has a part to play in the
appointment let the report go by in the excitement. You
do remember? It didn’t happen again. My apologies! The
number of hams registering in the ABC has been encour-
I say this with a certain amount of pain, but SCM is middle-aged and
should be placed on the roll. If you haven’t sent in your
application yet, ask ARRL for “Form 7” and show that you
mean business but with facts! There are rumors and some
news of the organizations being formed by the kites of
our Defense Council, but not enough! Please keep your
SCM informed of any plans on actions being taken by the
various communities in this work. And don’t forget; the
SCM has the latest and most authentic information avail-
able. A state-wide emergency net has been established and
well worked out, “24/7” seems to be the order of the day, so
follow QST and keep building.” Here’s Good News! W3GQW
expects his work to let up enough very shortly for him to take over the SCM job once again; so please con-
continue your loyalty and support him as in the “good old
days.” W3CLD reports excellent results using a rewound
transformer à la QST in his emergency power supply.
Incidentally, his supply cost but $0.75 in cash! Ask him
about it. Sit tight, follows. Read QST and keep in touch with
your SCM and really find out what you can do. Best regards
to all and thanks for this brief span of glory.

WEST VIRGINIA — SCM, Kenneth M. Zinn, W8RJ — Huntington Radio Club working on new 112-Mc.
transmitters, KGT, former officer of MARA, visited
hams in Clarksburg. BWK moved to Norfolk, Va.
and QB have jobs in Washington. D. C. ZW was appointed
chairman of Civilian Radio Defense in Wheeling territory;
his assistant is HD. KW1 and MMJ just finished building
112-Mc. portable equipment. QJS has three transmitters,
all portable powered. TDL won 1941 u.h.f. marathon of West
Virginia by contacting 43 stations. Our sympathy to NEP,
his assistant is HD. KWL and MJJ just finished building
a 77...
A Precision Crystal — Secondary

FREQUENCY STANDARD

That Has Been "Designed for Application"

A precision frequency standard capable of being adjusted to WWV or some other primary standard and putting out uniformly accurate calibrating signals with 10, 25, 100, 1000 KC intervals. Uses the new GENERAL ELECTRIC No. 18A 1009 KC crystal having a frequency temperature coefficient of less than one cycle /°C. The crystal is sealed in Helium in a standard metal tube envelope. The self-contained AC power supply has VR150-30 voltage regulator tube. In addition to oscillator, multivibrators, and harmonic amplifier, a built-in mixer with phone jack and gain control on panel is incorporated.

REMEMBER

"It’s overloading that ends the life of most amateur parts."

PLAY SAFE with

HYTRON

Assure yourself of continued readiness to serve at any time in your amateur defense net. Hytron tubes used at their conservative continuous-duty ratings will enable you to keep your station on the air—ready for any emergency.

U. S. A. Calling

(Continued from page 28)

work probably can do so without reduction in income. Address correspondence to Office of the Chief Signal Officer, Washington, attention Colonel Hugh Mitchell.

NAVY RADAR TECHNICIANS

We remind our readers of the Navy’s urgent need reported on page 29 of February QST for some thousands of amateurs to receive training in the maintenance and operation of the radiolocator. Candidates must be high school graduates, 17 to 50, Class A or B amateur experience, or skilled in service work or the design and operation of h.f. gear; code knowledge not required. So important is this work that original enlistment is offered in the rating of radioman second class, up four pay grades above the usual enlistment basis. An RM2C receives $72 a month and everything found, plus $34.50 if married or having dependents. Eight months of very special u.h.f. training, with eligibility then for promotion to RM1C at $94 or CRM at $99. For particulars, call at your nearest Navy recruiting station.

MECHANICS FOR THE CARIBBEAN

The Caribbean Defense Command naturally has a sizeable communication establishment. Radio mechanics are wanted in considerable quantity for the installation and maintenance of all sorts of radio gear. If you’re looking for a late winter West Indies cruise, here it is.

Service may be either by enlistment in the Signal Corps or as a civilian under Civil Service. For guidance in enlisting in the corps, write the Office of the Chief Signal Officer, Washington, mentioning mechanic and Caribbean. If you prefer Civil Service, see C.S. Announcement 134 at your post office, as reported in QST on page 28, November: five pay grades, depending upon abilities, $1440 to $2300; but write also to the above address so that arrangements may be made to get you assigned to the Caribbean service.

ENLISTED OPERATORS AND MECHANICS

All the services need operators and mechanics. ARRL has received information that vacancies exist in the Army Air Corps for both aerial and ground radio operators, mechanics and technicians. Amateurs with a code speed of 15 w.p.m. or better, living in the northeastern section of the United States, who intend to enlist in the Army in the near future and are interested in filling these vacancies, are asked to notify the League at West Hartford, Conn., to receive additional information. Give name, address, call and experience.

Here’s something to think about: Ordinarily a man cannot enlist in the Signal Corps itself, at least not for radio work. An exception is made in
"FB" reports that keep coming in, tell us that the TR-4 is measuring up to the most rigid and exacting requirements of many of our country's communications services.

ABBOTT TR-4, 2½ METER TRANSMITTER-RECEIVER

A compact, efficient unit, designed for either fixed station or mobile operation. Transmitter and receiver sections are completely separated. The 5-inch PM speaker is self-contained. Single interconnected switch permits use of a common antenna for both transmitter and receiver. The TR-4 requires a 6-volt battery or 110 volt, 60 cycle AC power supply. Receiver radiation is necessarily reduced to a minimum.

- FREQUENCY: 112 to 116 MC. • RANGE: Varying from 5 to 75 miles, depending upon terrain. Contacts up to 150 miles have been completed in field tests • TUBES USED: One each of Hytron HY-615, Hytron HY-75, 7F7, 6V6 or 6L6 • MICROPHONE: Any good single button microphone.

TR-4 — Overall size 9" x 8" x 4½", less tubes and power supply, list price, subject to amateur discount ......................................................... $65.00

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the case of operators possessing an amateur (or commercial license. Display of this license at an Army recruiting office will enable an amateur to get into the Signal Corps, the only way he can volunteer and be assured of radio work in that branch.

Navy also seeks operators. As you know, the draft does not feed men into the Navy. Only way you can get salt in your hair is to volunteer. If you prefer Navy brass-pounding to radar maintenance, see the Navy recruiting officer.

**ARMY ELECTRONICS TRAINING**

You are reminded that the Electronics Battalion of the Army Signal Corps is not only going great guns but is vastly expanding, so that applicants are still wanted by the hundreds for commissioning as second lieutenants in this all-important radiolocator activity.

Applicants must be between 21 and 36, without dependents, physically sound, possessing a degree in electrical engineering or electronic physics or the equivalent in special experience. Those under 30 must be unmarried. Amateur license helps a lot. Qualified candidates are immediately commissioned and given active duty, receive brief training on this side, and then go to England for instruction — about three months at school, five in the field observing the operation of the apparatus. Upon returning to this side, their duties probably will involve instructing and supervising Army personnel in this complex field of work. Second lieutenants receive allowances above the $125 base pay which yield a total of $183 per month, and while in England will receive an additional $4 per diem. (There may be some openings for men who do not wish to go to England.)

Particulars may be had from ARRL President George W. Bailey, chairman of the radio section, Office of Scientific Personnel, National Research Council, 2101 Constitution Avenue, Washington.

**On the Ultra Highs**

(Continued from page 44)

and the "raising" was scheduled for December 7th!

And this is the sum total of news received by this department since the preparation of last month's column. As all operating activity will henceforth probably be on the Ultra-Highs, the reporting of such activity is now to be taken over by the Communications Department. There is the light-beam communication angle — several of the u.h.f. gang have evinced interest in this field — but it is almost entirely experimental in nature, and so is being handled in another section of QST.

All of which leaves this department facing a rather barren prospect for the duration! After more than two years of being at our wits' end trying to squeeze all the reports into each month's column, we now face the prospect of running out of material. Do you of the u.h.f. fraternity wish this section of QST to continue? If so, let's have your suggestions as to ways in which we may best serve your interests.
RESEARCH AND DEVELOPMENT GO ON!

Notwithstanding the uncertainty of present-day conditions, Astatic continues its laboratory and field research in the development of products for a market of the future. Astatic Microphones, Pickups, Cartridges, Recording Heads, and Accessories have played an important role in the evolution of today's radio and sound equipment. Astatic looks forward to even greater accomplishments in the days ahead.

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WANT A RECEIVER?

Receivers are scarce. But we have a large complete stock of Hallicrafters, Hammarlund, National, Howard, RME at lowest net wholesale prices. Order from us for immediate delivery. YOU get 10-day trial. You don't buy unless you are satisfied. YOU get best trade-in for your radio. We want trade-in radios. Tell us what you have to trade. YOU get best terms; financed by ourselves so you can buy with less cost — no red tape — prompt delivery. Write, telephone, telegraph, or visit us anytime about any receiver, transmitter, tubes, meters, 2½ meter equipment, parts. We are on the job 24 hours a day, 365 days a year. Your inquiries invited.

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"WORLD'S LARGEST DISTRIBUTOR OF COMMUNICATIONS RECEIVERS"
Radio and Atom Smashing
(Continued from page 88)

too distant future, for uranium 235 can already be cracked and made to yield enormous amounts of energy, relatively speaking. The difficulty lies in the scarcity of uranium 235. If such power does become available in considerable amounts men will no longer fight for oil fields and similar natural resources. Energy will be so easily obtained, and in such concentrated forms, that it will revolutionize much of our living. If men still choose to have wars they will be fought more fiercely, for modern wars are fought with such materials as gasoline and high explosives, which are very concentrated forms of energy. Atomic energy will be 5000 times more concentrated than gasoline.

The Experimenter’s Section
(Continued from page 45)

stance. One practical application of this system which suggests itself is that of providing a link for bridging streets, etc., in a “back-yard” tone telegraph circuit. Wire telegraph circuits were popular among amateur experimenters before the days of radio and may again come into use for keeping up the old fist.

Project D — Temporary group leader — Clinton B. DeSoto, W1CBD, ARRL Headquarters, West Hartford, Conn.

Communication by means of low-frequency radio induction fields.

This is also an entirely new field. The FCC has set up a formula by which radiated fields, the use of which is now forbidden, and inductive fields, which may be employed, may be divided. The ruling which has heretofore been applied principally to “wireless” record players and remote control systems, states that the field may be considered inductive when the field strength at a distance from the transmitter of \( \frac{f}{157,000} \) does not exceed 15 \( \mu V \) per meter, where \( f \) is the frequency in kilocycles and the distance is in feet. At a frequency of 30 kc., for example, this means that a field strength of 15 \( \mu V \) per meter would be permissible at a distance of 5233 ft., or just about a mile from the transmitter.

Project E — Temporary group leader — Don Mix, W1TS, ARRL Headquarters, West Hartford, Conn.

Acoustic system for aircraft detection.

An article on this subject appears in this issue. It is a project with plenty of room for development — one in which we can make a contribution to national defense. The means of obtaining increased ranges, noise reduction and the development of simple, fast-operating, directive systems are interesting problems to be solved.

Project F — Temporary group leader — Clark C. Rodimon, W1SZ, ARRL Headquarters, West Hartford, Conn.

Communication by means of supersonic waves. Obviously we can’t shout to each other for distances of several blocks by means of amplifiers.

NOT FOR AMATEURS

VITAL FOR COMMUNICATIONS

One of the many special Cardwells that you seldom see, though hundreds of them are working for you 24 hours a day.

A part of our all-out effort for national defense, to which our facilities are 100% committed, for the duration.

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are learning the code the right way, quickly and easily with the all-electric Ayers machine. Built by Code Champion McElroy for our future champions. Largest selection of tapes in the World available with each machine. Low monthly rental. Tapes for MacAutos, recording slip and special inks for sale.

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Whether you wish to enter radio as a career or as a hobby, the All Electric Master Teleplex Code Teaching Machine will show you how. Teleplex records your sending in visible dots and dashes on a specially prepared waxed paper tape and then sends back to you at any speed you desire. It does not merely show you code. It is code. No experience needed. There are NO PERFORATIONS — NO INK. A marvel of simplicity.

While not designated as standard equipment, Teleplex is used at many U. S. Army Posts, Naval Training Stations, as well as by the American Telephone & Telegraph Co. Also by practically every private school in the U. S. teaching code; and many foreign governments.

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Latest series on "Electronic Devices" in the monthly Aerovox Research Worker is chuckful of practical "gadgeteering." Simply write for "Devices Series." And ask your local Aerovox jobber to endorse your free subscription to this helpful information.

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NEW BEDFORD, MASS., U. S. A.
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Don’t let the fact that your station has been ordered off the air cause you to set aside your equipment. Dust collectors will irk the XYL and carefully storaged gear can serve no useful purpose.

USE YOUR RIGS

The amplifier probably represents many hours of painstaking assembly and wiring (not mentioning expenditure). Nothing wrong with that power supply, either.

An AM or FM tuner might make these into an FB receiver.

Add a microphone, turntable and recording mechanism and have some fun with instantaneous recording.

Interested? HARVEY has a complete stock of accessories that can convert your shack into a home ”sound studio.”

OR LET OTHERS USE THEM

We’ve had requests for amplifiers, good communications receivers, etc. . . . and, in many instances, the manufacturer has been unable to deliver. If you’ve no occasion to use yours, we’re interested in buying. Send us the make, model number and age, as well as the price you would consider. We’ll buy for cash. Or, if you prefer, trade for broadcast receivers, cameras, photographic equipment, electrical appliances, etc. . . . Let’s hear from you.

DO NOT WASTE EQUIPMENT

and loudspeakers. But how about the use of super-audible frequencies? It’s a subject on which we are decidedly in the dark. Perhaps some accommodating member who has worked in super-sonics will be in a position to step forward and tell us what the chances are, if any.

This, therefore, constitutes the beginning of the rejuvenation of the Experimenter’s Section. Its success or failure will depend upon the response by the individual amateur. If you are interested:

1. Enroll by sending your name and address to the group leaders in the projects in which you are in a position to carry on some work, or contribute some information. (Enrollment in not more than two projects is suggested, unless you have lots of spare time.)

2. If you have had any previous experience in the chosen subject, so inform your group leader.

3. If you have the interest, apply for appointment as group leader in one of the projects chosen.

4. Get to work as soon as possible.

5. Report progress (or lack of progress) to your group leader monthly, if possible. Your report should reach him by the first of each month to enable him to summarize the work of his group for publication in the succeeding month’s issue of QST.

Let’s go, experimenters!

Correspondence

(Continued from page 49)

VR-TUBE RATINGS

RCA Mfg. Co., Inc., Harrison, N. J.

Editor, QST:
The vacuum-tube voltmeter circuit as published in the December issue of QST offers some very interesting features for both the amateur and experimenter. However, in reading over the material on calibration, I wonder if the information on the VR-150 is not somewhat misleading.

Our production records on this regulator type indicate that individual tube may read as high as 160 volts at a load of 30 ma., although the average of a large number of tubes will run close to 150 volts.

While the bulk of our product does center quite closely around the 150-volt value, the user runs the risk of checking with a marginal tube which shows a larger variation.

A voltage variation may also be expected during the life of the tube. We mention this because we believe the 1% figure indicates an accuracy of control that we cannot maintain in all tubes. A better figure would be a positive variation of 5%, . . .

R. E. Lawrence

EDITOR’S NOTE. - Checks of a number of VR-150’s in the QST laboratory before publication of the article indicated close adherence to the 150-volt rating. However, in view of the possibility of securing an off-rating tube, some other form of calibration check is recommended where high precision is necessary.

MISTAKEN IDENTITY

332 “I” Chula Vista, California

Editor, QST:
I’m not kidding, understand. Anybody can make a mistake - even a ham. (However, some of them only make one!)

But when the boys start whistling at me over the air, try to date me up and even question the XYL on the side, call me Helen (and without apologies to the Helen), then I begin to wish I’d stayed on c.w. In fact, I think I’ll have to go back on forty - but even there will soon be ‘phone.
No greater tribute than the best can be paid to those whose very existence depends upon unfailing communications.

We are proud to be a part in the lives of our armed forces and fully realize the great responsibility that is ours.

With all sincerity they may rest assured that no compromise with quality will ever be made — that the combination of the finest in material and skilled craftsmanship will always justify ... this mark of excellence.

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SICKLES COILS
ALL TYPES OF RF AND IF WINDINGS
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you owe it to yourself to investigate DODGE training.
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Pioneers in the field of Morse telegraphic instruction, our present radio courses are thorough and modern. Complete instruction in Practical Radio Engineering, Broadcasting, Aviation Radio, Police Radio, Servicing, Morse (wire) Telegraphy and Railway Accounting given in a minimum time.

Our courses have the approval of State Vocational Departments, Major Airlines, State Police Systems, hundreds of Broadcast Stations, the War Department and Radio Manufacturers.

We have been "swamped" with requests for trained radio technicians. A choice of radio employment is open to those who avail themselves of our training NOW! Ask our graduates about DODGE training.

Let us send you our catalog without obligation.

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Super DAVOHM

Recommended for use in exacting equipment where accuracy, stability and dependability over long periods of time are of prime importance. Accuracies from ±1% to ±0.1% are available.

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Write today for the New Candler Book of Facts. It’s FREE! It tells you the whole interesting story of how you can build a career. Send for it today. A postal card will do, and there’s no obligation.

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110 VOLTS A.C. for EMERGENCY
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KATOLIGHT, 4 Elm St., Mankato, Minn.

Anyhow, the boys on 2½ hereabouts have not let me forget that on page 80 of QST for October, 1941, one Helen, W6Q0J, is plenty on 10 meters with the YL’s. Not that I wouldn’t like to have the fine reputation they have built for themselves, but when 50 of them start checking in with me a certain XYL wants the particulars!
— C. Clayton Bullen, W6Q0J

Environ’s Note. — QST and Authoress W8TAY apologize to both W6Q0J and W6Q0G — the latter the real Helen, 6th District YLRL chairman, XYL of W6MBD. It was under the OM’s call that she acted as NCS of the 10-meter YLRL net.

We understand the padlock has since been removed from the doghouse in Chula Vista.

CTC
Somewhere in England
Editor, QST:
As one of the first lot of radio men who have arrived across the pond on the new radiolocation work, it was my thought that some sort of word could be passed along to the gang back in the States.

Some of you may know that a considerable amount of red tape was used in the steps taken to get us off to England. Those of us who survived this period of waiting are now obtaining ten weeks of the most valuable and startling kind of radio training. It is well worth the risk and uncertainty that possibly may come up in cross-over.

Several active WAMS are among the first radio group now in training. More are on the way. Those now here in camp are: W2ITA, W2JU, W4GKR, ex-W2PL, ex-W2WLG, ex-WF7LZ, and myself.

After a few weeks more at this school we shall be placed out at various points. Not much information can be sent as to the equipment or the radical technique employed, but it is most interesting and amazing to see the results obtained.

We who have come here would like to see more hams take the step and see for themselves just what wonders are performed. Men are needed who have radio training, and our American hams can easily adapt themselves to this work. We are attached to the RAF.

As is natural under war conditions, some inconveniences are to be expected. However, we are all healthy and in fact some of us are gaining in weight. . . .

The British Government should by now realize the great value that experienced amateurs have in times of stress, and I think the amateur status over here may be better after the war.

I would like to hear from some of the old New Jersey AARS gang and only wish that a few of them were among us. Our locations are not to be used for mail purposes but mail may be sent either to C.T.C., Montreal, Canada, or c/o ARRL for forwarding. . . . — Roy L. Richardson, W8ETHX

APPRECIATION
Federal Communications Commission
Washington, D. C.

Gentlemen:
You are advised that the special auto-alarm and voice intelligibility tests being conducted for experimental purposes on 2072 kilocycles by the Federal Communications Commission with the cooperation of the U. S. Coast Guard between Cleveland, Ohio, and Marblehead, Ohio, are to terminate September 28, 1941.

The commission desires at this time to express its appreciation to the American Radio Relay League for the splendid cooperation of the large number of individual amateurs participating in these tests. It is expected that the data thus obtained will be very useful in ascertaining the transmission characteristics of this frequency. — T. J. Sluice, Secretary

"MODERN DESIGN"!
16 Gulmer St., Mattapan, Mass.
Editor, QST:
I have just heard a radio broadcast of the “First Nighter” in which a sketch called “Dynamo Dan” was presented. . . .

During the course of events the hero and heroine chanced to be marooned upon an island with no means of communication with the outside world. The hero was a cartoonist who drew a popular comic strip of the “superman” type called “Dynamo Dan, the Invincible.”
A directory of suppliers who carry in stock the products of these dependable manufacturers.

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<thead>
<tr>
<th>Location</th>
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<th>Address</th>
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<tbody>
<tr>
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<td>Uncle Dave’s Radio Shack</td>
<td>356 Broadway</td>
</tr>
<tr>
<td>ATLANTA, GEORGIA</td>
<td>Radio Wire Television Inc.</td>
<td>265 Peachtree Street</td>
</tr>
<tr>
<td>BOMBAY, INDIA</td>
<td>Eastern Electric &amp; Engineering Company</td>
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<td>BOSTON, MASS.</td>
<td>Radio Shack</td>
<td>167 Washington Street</td>
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<td>BOSTON, MASS.</td>
<td>Radio Wire Television Inc.</td>
<td>110 Federal Street</td>
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<td>BRIDGEPORT, CONN.</td>
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<td>177 Cannon Street</td>
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<td>BRONX, N.Y.</td>
<td>Radio Wire Television Inc.</td>
<td>542 East Fordham Rd.</td>
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<tr>
<td>BUFFALO, N.Y.</td>
<td>Dynac, Inc.</td>
<td>1531 Main Street</td>
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<tr>
<td>BUTLER, MISSOURI</td>
<td>Henry Radio Shop</td>
<td>211-215 N. Main Street</td>
</tr>
<tr>
<td>CHICAGO, ILL.</td>
<td>Allied Radio Corp.</td>
<td>833 W. Jackson Blvd.</td>
</tr>
<tr>
<td>CHICAGO, ILL.</td>
<td>Radio Wire Television Inc.</td>
<td>901-911 W. Jackson Blvd.</td>
</tr>
<tr>
<td>CINCINNATI, OHIO</td>
<td>United Radio, Inc.</td>
<td>1103 Vine Street</td>
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<tr>
<td>DETROIT, MICH.</td>
<td>Radio Specialties Co.</td>
<td>325 E. Jefferson Ave.</td>
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<tr>
<td>DETROIT, MICHIGAN</td>
<td>Radio Specialties Co.</td>
<td>11800 Woodward Ave.</td>
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<tr>
<td>HARTFORD, CONN.</td>
<td>Radio Inspection Service Company</td>
<td>2827 Asylum Street</td>
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<tr>
<td>HOUSTON, TEXAS</td>
<td>R. C. &amp; L. F. Hall</td>
<td>1021 Caroline Street</td>
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<tr>
<td>INDIANAPOLIS, IND</td>
<td>Van Sickle Radio Supply Co.</td>
<td>34 West Ohio Street</td>
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<tr>
<td>KANSAS CITY, MO.</td>
<td>Burstlein-Applebee Company</td>
<td>1012 McGee Street</td>
</tr>
<tr>
<td>NEW HAVEN, CONN.</td>
<td>Hatry &amp; Young, Inc.</td>
<td>1172 Chapel Street</td>
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<tr>
<td>NEW YORK, N.Y.</td>
<td>Harrison Radio Co.</td>
<td>12 West Broadway</td>
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<tr>
<td>NEW YORK, N.Y.</td>
<td>Radio Wire Television Inc.</td>
<td>100 Sixth Ave.</td>
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<tr>
<td>NEWARK, N.J.</td>
<td>Radio Wire Television Inc.</td>
<td>24 Central Ave.</td>
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<tr>
<td>READING, PENN.</td>
<td>George D. Barbey Company</td>
<td>100 Walnut Street</td>
</tr>
<tr>
<td>SCRANTON, PENN.</td>
<td>Scranton Radio &amp; Television Supply Co.</td>
<td>519-21 Mulberry St</td>
</tr>
<tr>
<td>WASHINGTON, D.C.</td>
<td>Sun Radio &amp; Service Supply Co.</td>
<td>298 F Street, N.W.</td>
</tr>
<tr>
<td>WATERBURY, CONN.</td>
<td>Hatry &amp; Young, Inc.</td>
<td>199 South Main Street</td>
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Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.
He happened to find a piece of quartz, and remembered a former adventure of his brainchild, Dynamo Dan. In this escapade the invincible one was stranded in a quartz mine and rigged up a "quartz-crystal sending set" (so called in the script) with which he reached help.

Our hero, the marooned cartoonist, connected the piece of quartz in some mysterious circuit with a piece of wire and a battery and proceeded to emit distress signals on "phone."

When they were picked up, the signals were so strong that it was impossible to receive anything else on any band! To summarize: In the words of the script, the rig was made from a piece of quartz, some wire and a battery. There were no oscillating tubes, nothing to tune the circuit, and no microphone or modulator — yet this creation put out a "phone signal which was so strong that it drowned out everything else on the air!

As QST said several months ago in describing an aerial "suspended 110 feet above the ground," it's a nice trick if you can work it.

P.S. Why not tell you of two other strange coincidences? Although not having to do with amateur radio, they would be interesting to any radio listener.

While listening to an Atlantic SOS and the distress traffic that followed on 600 meters one night, a nearby Chicago broadcasting station was continuously in the background. While the speedy wireless signals from the ship in distress and other vessels in the vicinity were flashing their story of shipwreck and efforts at rescue, a chorus in the background was singing the familiar song about the "rockin' road" and the "rollin' rockin' rhythm of the sea." That made drama, fellows — real drama!

Again, in Omaha, several years ago I was listening to a radio play concerning the flight of the famous locomotive "The General" during the war of the states. The Yankees who had stolen the locomotive were being hard pressed by the Confederates who were pursuing them on a hand car. One of the Yankees in the locomotive cab had just exclaimed, "We've got to stop for water, or the boiler will blow up!"

At that moment, there was a terrific explosion in Omaha, about a half mile from my hotel. From the window I saw a great cloud of smoke and steam rising from the vicinity of the Union Station, intermittently lighted up by flashes from broken electric wire.

By one of those strange coincidences, at the very time the actor in the radio play was warning of a locomotive explosion, the locomotive on the crack Burlington passenger train which was at the moment entering the station had blown up! The engineer and firemen in the cab were killed, together with a red-cap on the station platform, and many were injured. Such a thing as that could happen only "once in a lifetime."

— W9BPS

W9IBC advises that the Tri-Town Radio Amateur Club is providing paid-up ARRL memberships for the duration, to all club members who enlist or are drafted into the services.
KITS

A remarkably good Code Practice Oscillator—complete parts including 5" Magnetic Speaker and Tube—detailed instructions for construction included. To us this job sounds as good as the more expensive ones.

Your cost $5.29

Emergency 112MC receiver as described on page 22, January QST.

This simple 7A4 type regenerative receiver is an excellent companion to the transmitter as listed below, for the completion of your 112MC emergency station. Complete parts including tubes and drilled chassis—detailed instructions furnished.

Your cost $15.50

A 112MC emergency Transmitter as described on page 14, December QST.

Oscillator—complete kit of parts including drilled box, tank inductance, and tube $7.35. Modulator—complete kit of parts including chassis, tubes and microphone battery $10.15. Monitoring meter—Simpson type 27S, 3" square meter mounted in matching cabinet with cord and plug.

$6.30

A combination Power Supply for operation from a 6-volt DC source or 110-volt AC line consisting of a well-filtered Vibrapack and AC supply mounted on a single chassis. Output 300 volts at 100 mils, completely filtered and wired.

Your cost $34.50

Mail Orders Promptly Filled
HE BOUGHT AN ECHOPHONE EC-1!

Echophone Model EC-1


$2450

ADVERTISEMENT
**HAM-ADS**

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters or use which would tend to make one advertisement stand out from the others.

(3) Date is 15¢ per word, except as noted in paragraph (4) below.

(4) All notices in full must accompany copy. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-ads is the 22nd of the second month preceding publication date.

(6) Special rate of 7¢ per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of both radio surplus equipment owned, and for sale by an individual or company, or availing itself for advertising linguistic for special equipment. If by a member of the American Radio Relay League the 7¢ rate. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising by him takes the 15¢ rate. Provisions of paragraphs (1), (2), (4) and (5) apply to all advertising in this column regardless of which rate may apply.

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

***

Gear is short. You can sell your old and extra gear through Ham-Ads.

***


TELEPLEXES, Instructographs bought, sold. Ryan's, Hanibal, Mo.

ICONOSCOPE tube wanted, new or used. Will swap new General Electric Television set, or cash. William B. Still, W2GJR, 338 Elmora, Elizabeth, N. J.

WANTED: HQ-120X or equivalent receiver from near Boston. William B. Still, W2GJR, 338 Elmora, Elizabeth, N. J.


CRYSTALS: Eidson crystals are on the job and will continue. Commercial crystal units meet FCC requirements and satisfaction is guaranteed. Wire or write us your needs. Eidson's, Temple, Texas.


BOB Henry, WBARA, can make immediate delivery of Hallidin transmitter, Harnmarland, National, Howard, RME receivers and other radio supplies. You get lowest prices, best 6% terms (financed by us), best trade-in, ten day trial. Write, telephone, WANTED: HQ-120X or equivalent receiver from near Boston. Wire or write us your needs. Eidson's, Temple, Texas.


WANTED factory built 500 watt and 1 kw. input transmitters wanted. No home modifications; 100; State Highway Police. Henry Radio Shop, Butler, Mo., or 2353 Westwood Blvd., W. Los Angeles, Calif.


HIPOWER black relay-panel panel model, late issue T-147, perfect condition, matched Cinaudagraph FM speaker, Brush crystal phones. Nat. power supply, best offer cash over $150. Damont 14-142 "transistorized" oscilloscope precision and adequate paper. Perfect condition, $50. 100 watt transmitter, 2000 v. — 1500 v. each side e.t. Amperex HF005 used about 150 hours, latest cash offer. T. M. Ferrill, Jr., 4 Clare Rd., East Hampton, N. Y.

WANTED: Bargains in transmitters, receivers and parts, etc.; also laboratory apparatus, etc. What have you? W9KDJ, 215 N.W. 10 St., Oklahoma City.

COLIN Kennedy 230 receiver two stage amplifier — working condition. QST 1930 inclusive 1939. Make offers. W9DUD.

WANTED: radio operators for Merchant Marine, must have commercial license, wages $350 to $355 monthly. Radio Officers’ Union, 205 West 14th St., New York, N. Y.

**CRYSTALS by HIPOWER**

The HIPOWER Crystal Company, one of America’s oldest and largest manufacturers of precision crystal units, is able to offer the amateur and experimenters magnificent quality, high-grade crystals at competitive prices. HIPOWER is the exclusive HIPOWER grinding process. Whatever your crystal need may be, HIPOWER can accommodate you. For full information, write:

HIPOWER CRYSTAL CO.
Sales Division—205 W. Wacker Drive, Chicago.
Factory—2035 Charleston Str., Chicagc, Ill.
1922-1942
20 YEARS of SERVICE
and NOW – OUR MOST IMPORTANT YEAR!
★
WE ARE READY
WITH THE GREATEST STOCK OF RADIO PARTS and ELECTRONIC EQUIPMENT EVER IN OUR HISTORY!

At no time in our long career has such added emphasis been placed upon the necessity of manufacturers and distributors alike in providing materials with the least possible delay and utmost efficiency. SUN RADIO is proud of the part it is doing in this National Defense Emergency and has geared and dedicated itself to high speed operation for the duration. Now, as never before, despite priorities, shortages and allotments, and in the face of seemingly unsurmountable obstacles, we have amassed one of the greatest stocks of assorted radio parts and supplies ever beheld on the surface of this earth—the newest and latest communications receivers, ultra-high frequency transmitter-receivers, tubes, meters, batteries, condensers, resistors, transformers and the many myriads of small parts known to the industry. All this has been done with super-human endeavor and as long as our energies and facilities do not fail us, SUN will continue to provide in the future the same dependable service that marked its path in the 20 years past.

* A Complete Source of Supply for RADIO AMATEURS, ENGINEERS, EXPERIMENTERS, INDUSTRIAL ORGANIZATIONS, LABORATORIES, AIRPORTS, MANUFACTURERS, SCHOOLS, COLLEGES, BROADCAST STUDIOS, ARMY, NAVY, COAST GUARD, and many other U.S. GOVT. AGENCIES

CIVILIAN DEFENSE HDQTRS.
Local, State and Emergency Defense Network Officials are invited to discuss their communications problems with SUN'S experienced, trained technical staff, who will be pleased to make recommendations regarding the proper equipment for their needs.

"NEW YORK'S OLDEST AMATEUR SUPPLY HOUSE"

PREPARE YOURSELF FOR A COMMERCIAL RADIO POSITION
through a Home Study Course, written for the man who has forgotten higher mathematics and who has had a non-technical education. This course qualifies you to pass the Federal Radio Telegraph and Telephone Examinations. An easily read, easily understood course. Moderate tuition fee. Write for particulars.

American Radio Institute, 1123 Broadway, N. Y.

COMMERCIAL RADIO INSTITUTE

LEARN RADIO • TELEVISION

MASS. RADIO SCHOOL
18 Boyleston Street
Boston, Massachusetts

RADIO COURSES
RADIO OPERATING • BROADCASTING • CODE
RADIO SERVICING • TELEVISION
SPECIAL RADIO TECHNICIAN COURSE
ELECTRONICS—1 year day course; 2 years eve.
Day and Evening Classes—Rookies upon request!

NEW YORK YMCA SCHOOLS
4 West 63rd Street, New York City

Nilson's MASTER COURSE IN RADIO COMMUNICATION
Fits you for a job, advancement or license examination. Course by A. R. Nilson for home study covers same scope as resident school course. Every Nilson graduate to date has commercial license, or a good radio job.

FREE circular 3-Q gives full information. Write today.

NILSON RADIO SCHOOL, 51 East 52nd St., New York City

RADIO TECHNOLOGY
RCA Institutes offer an intensive course of high standard embracing all phases of Radio and Television. Practical training which modern equipment at New York and Chicago Schools. Also specialized courses in Aviation Communications, Radio Servicing and Commercial Operating. Illustrated Catalog on request.

RCA INSTITUTES, INC. Dept. ST-42
A Radio Corporation of America Service
75 Varick St., New York 1154 Merchandise Mart, Chicago

SPECIAL DEFENSE EDITION
OF THE
HANDBOOK
(See page 95)
Your Nearby Dealer Is Your Best Friend

Your nearby dealer is entitled to your patronage. He is equipped with a knowledge and understanding of amateur radio. He is your logical source of advice and counsel on what equipment you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

One of these dealers is probably in your city — Patronize him!

<table>
<thead>
<tr>
<th>ATLANTA, GEORGIA</th>
<th>HOUSTON, TEXAS</th>
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<tbody>
<tr>
<td>Radio Wire Television Inc.</td>
<td>R. C. &amp; L. F. Hall</td>
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<tr>
<td>265 Peachtree Street</td>
<td>1021 Caroline Street (C 0721)</td>
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<tr>
<td>&quot;The World’s Largest Radio Supply House&quot;</td>
<td>&quot;Specialists in Amateur Supplies&quot;</td>
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<tr>
<th>BALTIMORE, MARYLAND</th>
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<tr>
<td>Radio Electric Service Co.</td>
<td>Radio Wire Television Inc.</td>
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<tr>
<td>3 N. Howard St.</td>
<td>94 Central Avenue</td>
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<tr>
<td>Everything for the Amateur</td>
<td>&quot;The World’s Largest Radio Supply House&quot;</td>
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<td>Radio Equipment Corp.</td>
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<td>326 Elm Street</td>
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<tr>
<td>W8PMC and W8NEL — Ham service and sound equipment</td>
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<tr>
<th>BUFFALO, NEW YORK</th>
<th>PROVIDENCE, RHODE ISLAND</th>
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<tr>
<td>Dymac, Inc.</td>
<td>W. H. Edwards Company</td>
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<tr>
<td>1531 Main Street — Cor. Ferry — GA. 0252</td>
<td>85 Broadway</td>
</tr>
<tr>
<td>One of the Largest Ham Supply Houses in Western New York</td>
<td>National, Hammarlund, Hellicrafter, Thorderson, Taylor, RCA</td>
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<tr>
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<tr>
<td>Radio Inspection Service Company</td>
<td>Scranton Radio &amp; Television Supply Co.</td>
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<tr>
<td>297 Asylum Street</td>
<td>519–521 Mulberry Street</td>
</tr>
<tr>
<td>What do you want? We have it. Radio exclusively</td>
<td>Complete Stock of Quality Amateur Supplies</td>
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<tr>
<th>HARTFORD, CONNECTICUT</th>
<th>WATERBURY, CONNECTICUT</th>
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<tr>
<td>Hatry &amp; Young, Inc.</td>
<td>Hatry &amp; Young, Inc.</td>
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<tr>
<td>203 Ann Street</td>
<td>199 South Main Street</td>
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<tr>
<td>Stores also in Bridgeport and New Haven</td>
<td>Time Payments for Connecticut Hams</td>
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YOU CAN BE SURE
WHEN YOU BUY FROM
QST ADVERTISERS

"Advertising for QST is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from QST's advertising rate card.

Every conceivable need of a radio amateur can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff.
THE RADIO AMATEUR'S HANDBOOK
A Manual for Radio Training Courses

PUBLISHED BY THE
AMERICAN RADIO RELAY LEAGUE
$1.00

SPECIAL DEFENSE EDITION

In response to the need for a special textbook for radio training courses the A.R.R.L. now makes available a SPECIAL DEFENSE EDITION of "The Radio Amateur's Handbook." Using the space normally devoted to equipment, operating procedure and etc., it contains special material not normally found in the regular edition. This in no way affects the regular edition which will continue to be available. The SPECIAL DEFENSE EDITION, too, sells for $1.00.
In addition to the electrical characteristics, many customers' application problems are related to the physical appearance and dimensions of their transformer components. Fortunately, the UTC sheet metal division supplies practically all the housings, laminations, brackets, and other devices which control the mechanical characteristics of UTC units. Instead of restricting designs to specific cases, the sheet metal division can run off a special case to more closely fit the final transformer dimensions, or to effect the particular mounting provisions required by the application.

Illustrated are a few (just a very few) typical cases as supplied for some special applications.

The sheet metal division has drawing, forming, and other press facilities to cover the entire gamut of transformer housings from tiny transformer channels, to large oil tanks for broadcast and industrial service. Since these housings are produced at UTC, fast service can be given.

If YOU have a special problem, may we have an opportunity to cooperate?
When the going is tough and there is a man's job to be done, old friends of proven dependability are doubly welcome.

NATIONAL COMPANY, INC., MALDEN, MASS.
USE THESE RCA TRANSMITTING TUBE INSTRUCTION SHEETS AS YOUR GUIDE

INSURE LONGER LIFE
FOR TUBES THAT MAY BE DIFFICULT TO REPLACE!

FOR LONGER TUBE LIFE—

For types using pure tungsten filaments, a reduction in filament voltage greatly lengthens tube life.

For types using thoriated-tungsten filaments, maintaining filament at rated voltage results in longer life. Operation either under or over normal voltage may result in shorter life.

For types using oxide-coated cathodes, maintain filaments at rated voltage.

For all types, reduce dissipation in grids and plates to a minimum to avoid overloading and to obtain materially longer life.

Many new Transmitting Tubes for commercial and civilian uses may become even harder to obtain because of the tremendous War-purpose demand. It is, therefore, not only a patriotic duty, but sound business policy as well, for tube users to conserve tube life by observing special care and operating practices which may add thousands of hours of life to tubes now in operation.

It is an old story that RCA Transmitting Tubes are built to withstand plenty of abuse — so much so that abnormal operating conditions are frequently accepted as "normal." Even though tube life has been entirely satisfactory under such conditions, it is by no means as long as might be obtained, simply by careful, conservative use of the tubes as outlined in the instruction booklet packed with each one.

In short, these are days when it is essential to give tubes all the care you can give them. Maximum life now becomes far more important than optimum performance. RCA welcomes the opportunity to cooperate in helping RCA Transmitting Tube users extend tube life to its fullest!

If you do not have instruction booklets on the RCA Tube types in your transmitter, write Commercial Engineering Section, RCA Manufacturing Co., Inc., Harrison, N. J., for free copies. Be sure to mention type number.