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In This Issue:

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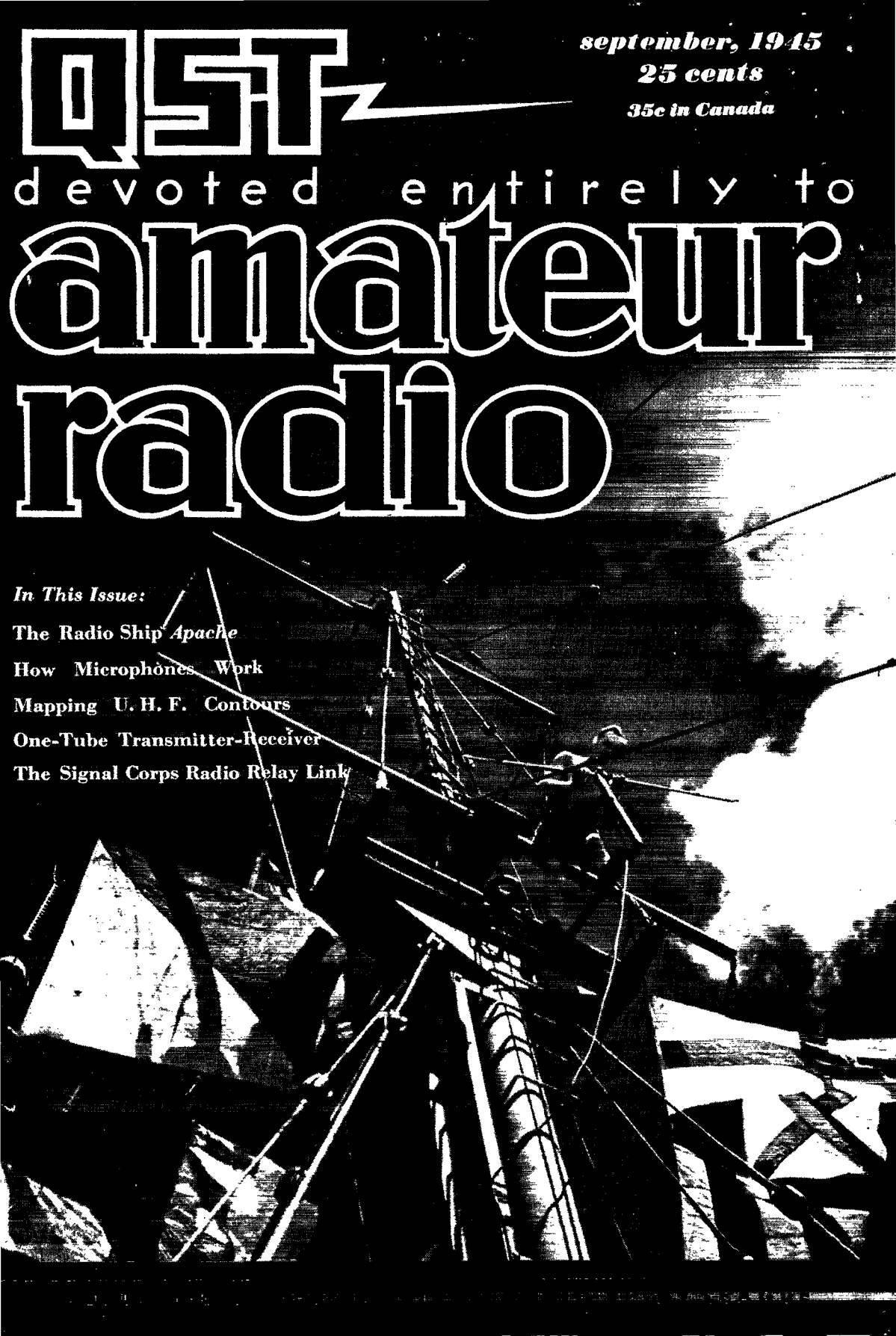
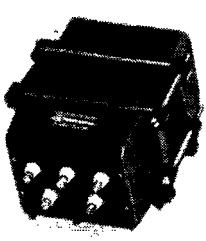
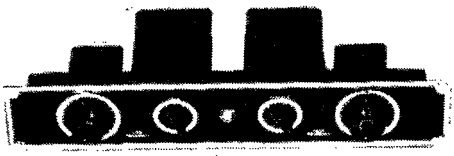
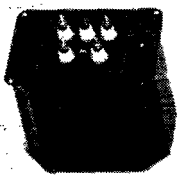
How Microphones Work
Mapping U. H. F. Contours
One-Tube Transmitter-Receiver
The Signal Corps Radio Relay Link

















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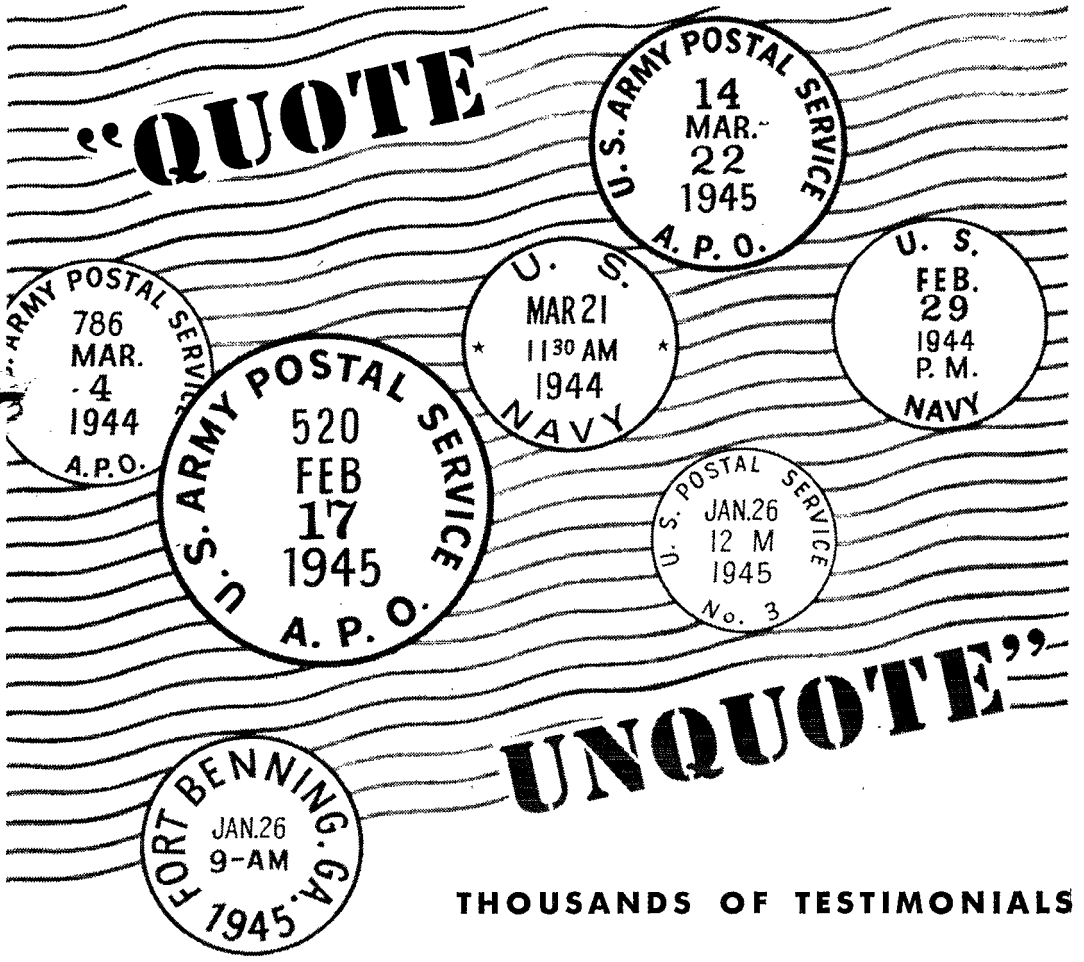

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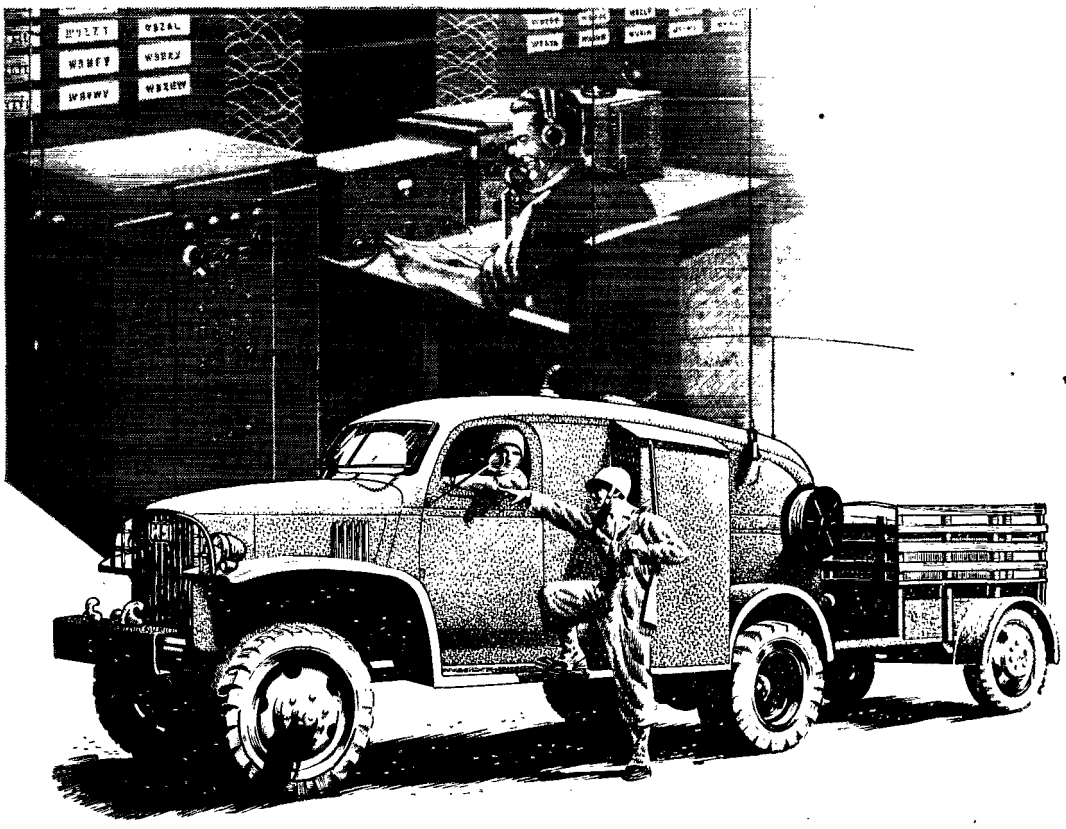

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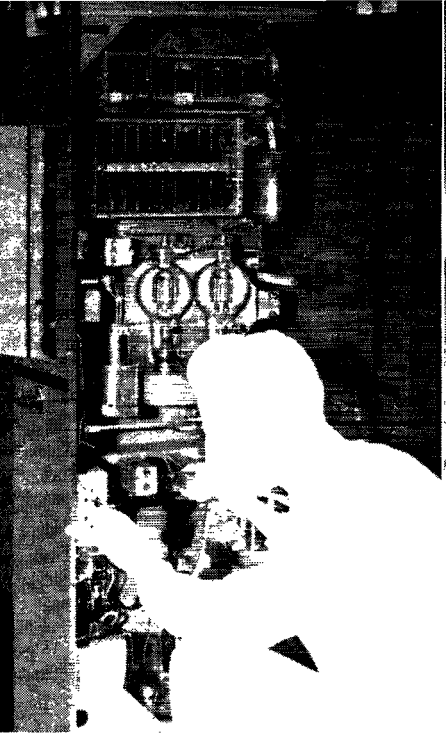

AACS Domestic Station showing a pair of Eimac 450-T tubes

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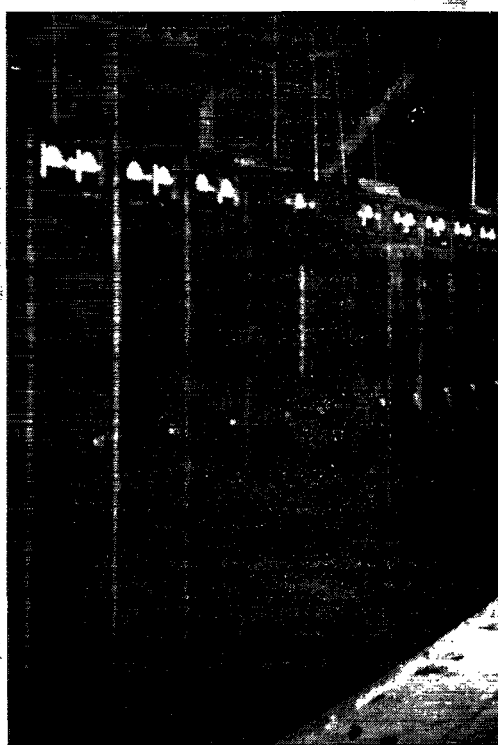

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Reports Invited. All amateurs, especially League members, are invited to report communications activities, training plans, code classes, theory-discussion groups, civilian-defense building or planning each mid-month (16th of the month for the last 30 days) direct to the SCM, the administrative official of ARRL elected by members in each Section whose address is given below. Radio Club reports and Emergency Coördinator reports representing community organized work and plans and progress are especially desired by SCMs for inclusion in *QST*. **ARRL Field Organization appointments,** with the exception of the Emergency Coördinator 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.

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

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

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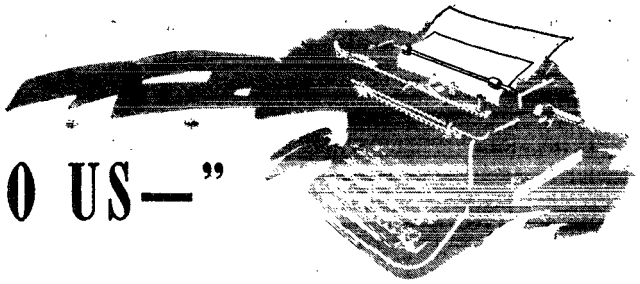

"IT SEEMS TO US—"

THE NEWCOMERS

THE final ending of war, almost certainly a matter of days if not hours away as we write this, suddenly brings into sharp, close-up focus many a question about which we've been pondering these past months. Now, almost overnight, they become perplexities requiring immediate solution rather than conjecturing in terms of futures. There's one problem in particular that concerns us just at this time.

Here's the problem: what are we going to do to get the radio-trained veterans of the armed forces into amateur radio? Mechanically and physically, how are we to go about doing it? It is variously reported that somewhere between a half and three-quarters of a million young men and women in uniform have received some degree of radio training and experience during the war, and a certain percentage of them will be admirable candidates for amateur radio. We want them in the game. We need them.

We might as well pause right here to discuss that question of needing them, for there are always some amateurs who think that we are so crowded that it is poor policy to encourage any new people to enter. That is a very short-sighted view and overlooks several fundamental facts. While we all know numerous amateurs who have been in the game twenty years, or even thirty, it is true that we have always had a pretty good rate of turn-over in amateur radio, just because it is only an avocation in a land that is primarily business-minded. College attendance and courtships have always heavily decimated our ranks but the real grim reaper has been "business," the dawn of a business opportunity, something that makes the amateur "too busy" to carry on. Nearly always, therefore, it is the amateur of some little experience and skill who has to quit — we die off at the top. We always have new fellows coming along, of course, for we have shown constant small growth in our total, year after year until the war. But the war has been going on for years and the new blood hasn't been coming in. Allowing both for our usual rate of turn-over and our normal growth, we figure the war has prevented the entry into amateur radio of at least fifty thousand new people who otherwise would have become experienced hams by now. We are behind that much, because these thousands of young men and women are now in the armed forces. Meanwhile the prewar list of licensees contains more and more who will not resume. Many will not be able to, for they lie buried in foreign lands and seas. Many will be prevented from resuming by the changed pressure of affairs, both business and family; and some will have lost their interest. We really doubt that much more than a third or perhaps a half of the Pearl Harbor ham list will return to the postwar air. We do need new blood: to give us the strength of numbers, to introduce to our activity the knowledge of new techniques these men possess, and to fulfill our destiny as the great training school for America's radio needs.

The new men of whom we speak have had no experience of amateur radio; they're "too young." That was driven home to us just recently when a Government agency telephoned us to ask if we could locate for them a number of prewar amateurs of good code ability between the ages of 17 and 18, so that arrangements could be made to take them on when they were drafted. We had to point out that such lads were under the age of 14 at Pearl Harbor and that there weren't many such in all amateur radio. The new crop of young men and women will be starting fresh.

As we all know, a goodly number of them have heard about amateur radio, chiefly by contact with amateurs encountered in the services and through the study of ARRL publications, and are already intentioned to qualify as amateurs after the war. But doubtless many of them don't even know that there is such a thing as amateur radio, where you can build your own station and communicate all over the world to your heart's content; or, if they do know, that they have any true appreciation of its endless possibilities and what it can mean to them. Yet here they are, possessing already the basic knowledge of code and theory, waiting only to be sparked into the realization that they ought to become amateurs. What shall we do about it as they come home?

A couple of years ago we planned to write a booklet which, with the collaboration of the armed services, would be distributed to radio students at the service schools. We were going to print hundreds of thousands of copies. We were going to tell these students about amateur radio and what it could mean to them after the war. It was in our mind that this vision of what could be done with radio knowl-

edge after the war would give the students an added incentive to study hard and really learn. About that time the manpower shortage caught up with us and we never succeeded in producing the booklet. We doubt if we lost too much by that failure, though, as not too many men would be likely to carry the remembrance of our little booklet close to their hearts all these years; and even if we had their prewar addresses as a mailing list for memory-joggers, what good are prewar addresses now?

No, there is no way we can reach any appreciable percentage of these men while they are still in the services. The thing that will happen now is that they will receive their individual discharges and settle down somewhere, one by one, as civilians. They possess this excellent background knowledge of radio and we have no way of getting hold of them as a group to tell them that they are qualified for ham radio and that it can possess boundless fascinations and delights for them. Left alone, most of them are likely to do nothing at all about it, because they don't know of us and the fun we have. Some of them will find out about amateur radio by accident but most of them may never learn of it — unless we develop a plan. That is our problem.

Have you any ideas for a plan? The League has the means to carry out any good plan as soon as it can replenish its now sadly-depleted headquarters staff. What we want now is the best possible scheme for action, and we think that many ARRL members may have helpful ideas. We'd like to hear from you. We know, too, that *QST* is reaching a goodly number of the very kind of people we are talking about — with service-acquired radio training, amateur ambitions, and no actual amateur experience. Such chaps could be of particular aid to us, for they see things through service-men's eyes, and their suggestions would be particularly welcome.

The way it seems to us, this is going to be a *local* job. Joe and Mac are going to be back home — old home or new home — before we can reach them effectively, we think. This is very likely to mean that the story of amateur radio must be told to them by existing local amateurs. And so we are led straightway to the thought that this whole undertaking really belongs to the local clubs. We have some seasoned amateurs in almost every community and many hundreds of good amateur clubs. How would it be for a solution if ARRL created some attractive literature on the nature and possibilities of amateur radio and made it widely available to the clubs to distribute? The clubs could hold special meetings to which they invite the returned service men who would like to learn about ham radio, and the newspapers would be glad to help with local publicity. Don't you think this would work?

We foresee great days for local clubs after the war. We think they will experience enormous growth in membership, interest and usefulness. In fact, we have been thinking that it may be desirable for the League to extend its organization to the extent of forming an ARRL Club of the local members in every town in the nation, operating under substantially uniform constitutions and under the general supervision of some ARRL field official, such as the SCM. Our thinking goes in this direction because the task before us is much greater than simply that of getting new men and women to make a start in amateur radio. Regardless of their technical skill and code ability they'll still be without practical knowledge of amateur radio and its particular ways of doing things. If you who are experienced amateurs will pause and reflect a moment you'll realize that amateur radio is a peculiarly complex society and that it has taken us years and years to learn and understand as much as we do about the reasons we do things a particular way, the things we don't do and why not, all the intricacies of our traffic handling and our contests, the way we govern our affairs, and so on. All these things will have to be taught the newcomer. He will not automatically be a good amateur just because he was a good military operator. We have a vast body of tradition, we have a long and honorable history as an American institution, we have codes of ethics, and in particular we have an institutional sense of social responsibility and the realization of certain responsibilities to our nation, our community and each other.

These are the very things that set apart the experienced amateur from the newcomer, and it is essential that an adequate comprehension of them be imparted to the new men. It is going to be a job of very big dimensions, for the number of prewar amateurs who remain active is likely to be much less than that of the service-trained newcomers, and if we wish to be sure that amateur radio remains a wholesome and well-regarded and useful avocation it seems to us that we'll all have to pitch in and work like crazy to teach the new men how to go about things the right way. Once these new amateurs are in the ARRL fold, articles in *QST* of course can help a lot, but our current impression is that this is essentially a job that can be accomplished only in local meetings, and that is why we are expecting that postwar local organization will be of higher importance than ever before. To thoughtful old-time amateurs in particular we commend the possibilities of making an exceedingly valuable contribution to the future of amateur radio by preparing to pitch in and help to tell the story of amateur radio to the new postwar gang and to lead them in the directions that make for a sound and enduring structure.

It only takes four people five hours a day to open the mail received at ARRL Hq.! We can stand some more. Have you any ideas on this big subject?

K. B. W.

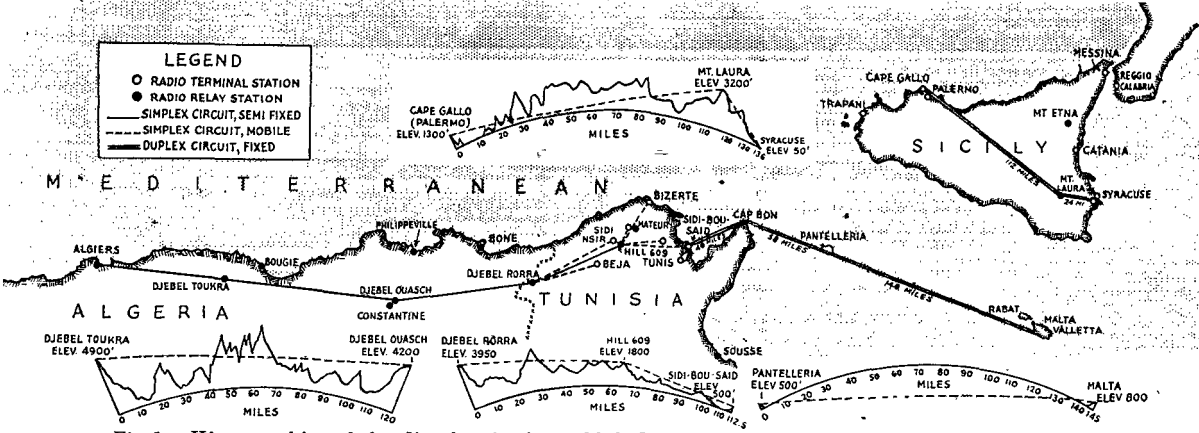

Fig. 1 — History making v.h.f. radio relay circuits established during the Tunisian campaign (April–August, 1943) and on Sicily (July–September, 1943). Profile drawings refute older line-of-sight theories for such v.h.f. transmissions.

Signal Corps Radio Relay in North Africa

The First Application of a V.H.F. Radio Relay System to Military Operation

BY CAPT. O. D. PERKINS,* SC, EX-W7MH, AND A. DAVID MIDDELTON, W2OEN**

ABOUT eleven o'clock on the night of April 19, 1943, a three-quarter-ton weapons carrier towing a small trailer crept cautiously through a Tunisian olive grove into a blacked-out command post, threading its way past foxholes and pup tents, guided only by the ghostly white-gloved hand of an MP. The darkness was punctured at intervals by flashes of artillery fire. The soft swishing of shells in flight could be heard overhead. Off in the distance, streamers of fire reached into the sky and exploded in sharp bursts as they searched out a flight of German bombers.

The truck stopped under a spreading olive tree. The silence of the night suddenly exploded with the putt-putt of a small gasoline engine power unit. A faint glow of radio tubes emanated from beneath the cover of the truck body. Quickly drawing a tarpaulin over the offending light, three men climbed into the weapons carrier. Installed in these cramped quarters were a 50-watt Motorola v.h.f. f.m. police radio set, a British teletypewriter and some unusual-appearing equipment labelled "Apparatus, Telegraph MKII."

Capt. Perkins, ex-W7MH, pressed the button on a telephone handset and spoke — "X-ray to Able — over." From the loudspeaker came the reply "Able to X-ray. Roger." Perkins spoke again. "X-ray to Able. Stand by for A2," and he flipped a switch. One of the men began to type out a message on the teleprinter. After a moment's pause a reply appeared on the machine in front of the three men jammed into that truck body. Thus was history made. V.h.f. radio had spanned a distance of over 350 miles from the battlefield of Tunisia to Allied Force Hq. in Algiers with solid communication on both voice and teletype. The secret? *Radio relay.* This was the first application of radio relay and v.h.f. radio-teletype in tactical operations by Allied forces.

The tremendous amount of work and preparation preceding this historical moment began in December, 1942, when Colonel Dan C. Gilmer, secretary of General Eisenhower's AFHQ General Staff, visited the Chief Signal Officer in Washington as General Eisenhower's personal representative to present requirements for additional communication equipment in the North African Theater of operations. During the discussions that followed, an urgent requirement became apparent. A trunk line communication system was needed to extend eastward from AFHQ Algiers to the combat forces in Tunisia, particularly for the use of General Eisenhower during his frequent trips from Headquarters. Colonel J. D. O'Connell and personnel of the Signal Corps Engineering Laboratories had long visualized and now proposed the use of a *radio relay* based on a system with which the Laboratory had experimented in the 1941 Carolina maneuvers, when the "Blue Army" had used a number of police radio f.m. sets, in what was known as the Combat Zone Warning System. This network employed voice operation between two or more headquarters and between moving vehicles. The system successfully furnished the "Blue Army" advanced information about movements of the "Red Army" as "Blue" observation reports were sent back to the nearest radio station of the Warning System. From there the information was relayed on voice through one or more stations to the headquarters.

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** Assistant Editor, *QST*.

After successful demonstration of this system under simulated battle conditions, the boys at the Laboratories were convinced that they could extend the system and make the relaying automatic instead of manual.

Colonel Gilmer was quite impressed with the details of this relay system formulated and tested under the supervision of Colonel O'Connell; Lt. Col. Wm. S. Marks jr.; Lt. Col. V. A. Kamin, W9US, Capt. Perkins, ex-W7MH, and Julius Kravetz, W2OEF. It was agreed that the required equipment and necessary personnel must be assembled by January 1, 1943, so that it could be employed in the Tunisian campaign.

On December 7, 1942, the Laboratories were directed by the Chief Signal Officer to procure and assemble all available equipment for shipment at the earliest practicable date. This task, an enormous one in normal times and a truly staggering job with such short notice, was turned over to Lt. Col. Marks, Captain Perkins and Kravetz. These men had a reputation of accomplishing the seemingly impossible almost immediately. Through the coöperation of Paul Galvin, Daniel E. Noble and Floyd McCall of the Galvin Mfg. Corp., and Fred M. Link and Fred Budelman of Link Radio, W2OEF and his civilian associates assembled a total of 21,142 articles and delivered them to the New York Port of Embarkation by December 26th. Just 19 days had elapsed since the receipt of the directive from Washington!

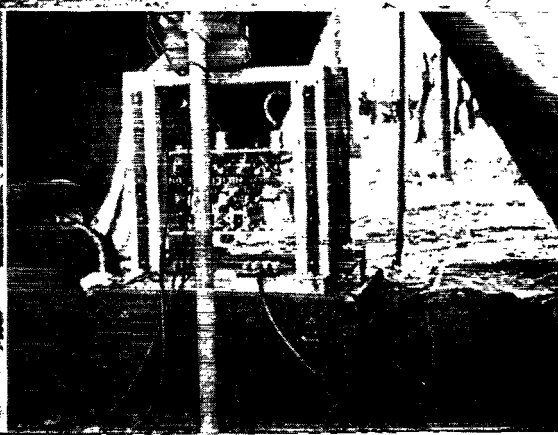
To accompany the shipment and install this radio system in the African Theater, Capt. Perkins was designated officer-in-charge, with Kravetz (civilian-in-charge); Russell A. Berg, W1CIW; J. H. Durrer; V. H. Colagouri, W2GUM; F. W. Neidt of Coles Signal Laboratory, and J. J. Kelleher, W2DSY, of OCSigO, as civilian engineers. At the last minute higher authority decided to retain W2OEF at the Laboratory to organize subsequent operational phases and to assemble additional components. Kravetz had a wealth of information on radio relay as a result of his work in developing the original Combat Zone Warning Net during the Carolina maneuvers.

After a terrific "hurry-up" job of preparation, Capt. Perkins and the civilian engineers set forth on January 9, 1943, to make radio history.

Upon debarking at Oran, local Signal Corps Depot personnel promptly pounced upon the large shipment of equipment with a cannibalistic gleam in their eyes. What a mass of spare parts for their depot and repair stocks! And what a sad awakening they had when, after a frantic search, "Perkins and Co." caught up with them and sounded warnings of the consequences should any piece of their precious relay gear be touched.

After arrangements had been completed for transshipment of the equipment to Algiers, the group proceeded there by air arriving January 31, 1943. They immediately set to work unpack-

Terminal station equipment at Syracuse, Sicily. *Top* — The transmitter location, with Harold Kinnaman of the Camp Coles Signal Laboratories standing by his jeep. *Left* — A close-up shot of the terminal transmitter used by the 15th Army Group. *Right* — An "inside" view of the terminal receiving equipment.



ing, requisitioning additional supplies, and preparing for the arrival of Company D, 829th Signal Service Battalion, commanded by Lt. Lotus B. Blackwell, W5EZD. This organization had received training at Fort Monmouth and preliminary technical instruction at Coles Signal Laboratory from W2OEF. They arrived in Algiers a few weeks after the party from Coles.

Preliminaries

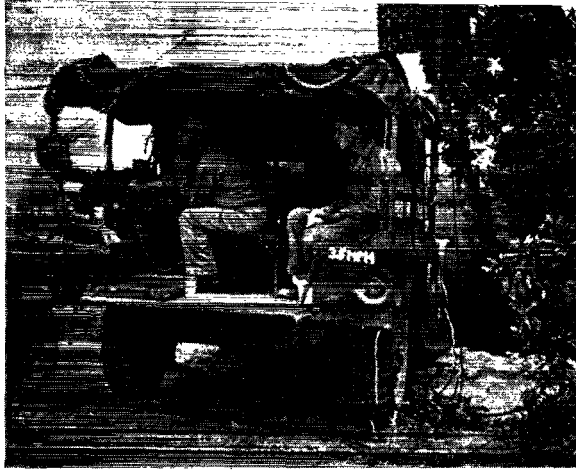
Preoccupied with the complex workings of a major invasion force, the Signal Corps personnel of AFHQ found it necessary to become familiar with the scope and objective of the projected communication system. Quite naturally and forgivably the authorities were reluctant to go all-out in accepting an untried non-standard system employing such a radically different technique. There was also the possible interference with normal routine of existing communication facilities. Furthermore, from the standpoint of possible violation of security, uncoded *voice* transmission over any radio circuit was absolutely out of the question.

It was discovered that some of the signal officers questioned the idea of providing even General Eisenhower with a personal radio circuit, especially one that would be voice-operated and thus lacking in the necessary element of security. They didn't want "Ike" or anybody else using voice radio while at the front because of the risk of interception.

However, due consideration was given to the proposed system during which Capt. Perkins argued loud and long, with the result that Brig. Gen. J. V. Matejka, Chief Signal Officer, AFHQ, approved the initiation of tests. To provide security, Lt. Col. Henn-Collins, Royal Corps of Signals, who headed up the Radio Division of AFHQ, arranged for the provision of British 7B teletypewriters and associated two-tone telegraph apparatus with which enciphered traffic could be handled rapidly. The only two-tone sets available were development models which had been tested over wire teletype circuits and discarded as being unsuited for the required operational use. These two-tone telegraph units performed admirably over the f.m. radio links, however, and the entire African Theater was searched, with the result that a total of six teletype equipments were eventually obtained.

With the preliminary tests a marked success, Capt. Perkins soon convinced Gen. Matejka and his staff that the proposed new communication system could play a vitally important rôle by extending teletype service into combat areas more quickly and easily by v.h.f. radio than by installing wire lines, subject to sabotage and the other normal hazards of combat operations. However, the mere authority to take the equipment into combat zone was far from the solution of the many problems still confronting the boys.

There were many obstacles to overcome. This group of Signal Corps engineers and their GI companions were the *first* Allied military unit ever organized for the specific task of providing a tactical radio relay communication system. They faced overwhelming problems of supply and administration of widely separated detachments operating on isolated and almost inaccessible mountain peaks. There was also the immediate and vital work to modify the police radio equipment to meet the specific tasks, and to supplement the previous training of the GI personnel for the new tasks as they became evident.



A mobile radio-teletype terminal. Installed in this weapons carrier are a complete radio station, a Motorola FMTR 50-B, and a British teleprinter and its associated two-tone adaptor. This equipment was operated as a terminal station on the Malta circuit, at Sidi-bou-Said.

Not the least of their worries was the lack of qualified teletype operators. W2DSY, however, had been a high-speed c.w. operator with the Signal Corps and RCA in previous years and was a "whiz" on a teletypewriter. On him fell the job of selecting and training a group of teletype operators. The company clerk became the first "draftee" for this assignment. Anyone who could recognize a typewriter when he saw one was drafted instantly. Vehicles, ordnance, quartermaster and engineer supplies and equipment had to be obtained far in excess of quantities authorized for the original company organization. This task was, perhaps, the most difficult of all since, at the time, every item was in short supply and vitally needed either at the front or for early replacement of battle-destroyed equipment. The unconventional means resorted to in obtaining many of these supplies are considered by Capt. Perkins to constitute a military secret to be forever closely guarded.

Early in the planning for eventual operations, it became evident that additional military per-

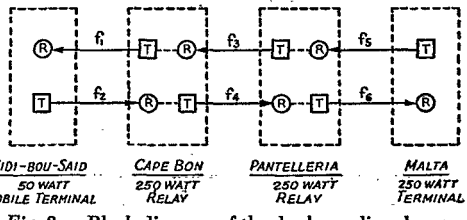


Fig. 2 — **Block diagram of the duplex radio relay system installed between Tunisia and Malta.**

A radio relay receiving station at Pantelleria.

sonnel augmenting the original Company D and that reorganization into an independent signal company operating directly under AFHQ, would be required. Accordingly, Capt. Perkins executed a series of concerted attacks upon the personnel office of Lt. Col. Kirk Buchak, Assistant to the Chief Signal Officer, AFHQ. Perkins soon achieved the distinctive title of "The Terror of Buchak's Office," but his efforts were rewarded eventually by the establishment of the provisional 2650th Signal Radio Relay Station Co. and the assignment of the necessary additional personnel.

Hunting That "Perfect Location"

After overcoming some of these obstacles to the extent that operation could be initiated, the boys began the reconnaissance of sites for the relay chain eastward from Algiers. Perkins, Colagouri, and Durrer started out into the Atlas mountains of Eastern Algeria, a rugged country of high peaks and deep valleys thick with Arab villages bearing unpronounceable names. The first selection from a map, Djebel Toukra, was a dream location, 4500 feet high, and within line-of-sight of Algiers, 86 miles away and accessible by road. The first test with a 25-watt police set in a jeep, before reaching the peak, was an instant success with perfect communication. The party bivouacked for the night. At that time of year, early spring, the peaks were covered with snow, and snow and sleet storms were frequent. Brutally cold, the boys reported a rugged night, sleeping on the steel floor of a GI truck. The accepted night dress was all available GI clothing, including helmets. To add to the discomfort, tribes of monkeys and baboons prowled about the campsite, keeping the men awake with their chattering.

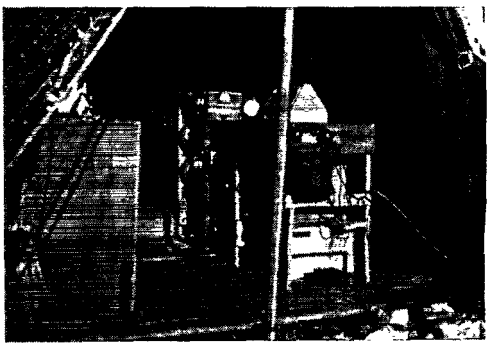
The next morning the party reached the top of Djebel Toukra and selected two promontories, one on either side of a "saddle," for the receiver and transmitter sites, respectively. In their impatience to set up the 250-watt relay station for final tests, the boys were caught in a downpour of sleet and rain, drenching the transmitter and causing all sorts of fireworks when the power was applied. There was nothing to do but return to Algiers, dry out the set and repair the damage, which fortunately proved to be minor.

Returning in a few days with an operating detachment and complete camping equipment, they set up a permanent site and put the first radio relay station on the air. Meanwhile the rest of the party were busily establishing themselves in a permanent company headquarters in Algiers installing the AFHQ radio terminal and assembling a mobile radioteletype terminal. The latter was dispatched to the town of Bougie, on the Mediterranean coast, some 40 miles from Djebel Toukra, where it was placed at the disposal of a British Supply Headquarters for its first trials in handling bona-fide traffic. These trials were successful and highly instrumental in further convincing the signal personnel at AFHQ that the boys had developed a really useful communication system.

The blessings of AFHQ lent new zeal to the efforts in extending the system toward the battle area of Tunisia. Durrer and W2GUM set forth in the radio-equipped jeep to spot the next site.

As the relay expedition continued east they were constantly amazed at the distances they achieved from the original relay station at Djebel Toukra, and 206 miles from AFHQ, when they called in with the radio-jeep giving the location, they were able to relay through without difficulty. Up to this time no one had dared to suggest that such distances could be spanned over that mountainous country.

While preparations were under way to set up the relay station at Djebel Ouasch and move the mobile terminal there from Bougie, Joe Durrer and W2GUM proceeded eastward with high hopes. They lost contact with AFHQ, and Perkins spent several anxious days awaiting word as the boys had entered territory known to contain scattered parties of German troops. However, the party returned without mishap but somewhat discouraged by the results of their efforts. They had traveled through the most rugged terrain yet encountered without finding an accessible site. They had literally cleared their own road for miles over a mountain trail apparently leading to the only promising location in the area to suddenly find



A typical radio-relay receiving installation.

their way completely blocked by mountains. They even told of a family of French settlers who had run away in fright, screaming "Avion! Avion!" — believing them to be Germans dropped by parachutes, as they could not conceive of any vehicle possibly traversing the route over which the party just passed.

With the installation at Djebel Ouasch in operation, however, prospects for extending the system were more promising and once again the reconnaissance party started out, this time with Djebel Rorra, selected from a map, as the objective. They were soon blocked again, however, shortly after leaving the main highway by a rather formidable river. Despite the obvious risk, the boys started across. About six feet from the opposite bank — their jeep went down! The boys managed to haul it ashore and after drying out the ignition system they drove on up the mountain along a nearly impassable trail. With much heaving and pushing they reached a promontory which gave them communication back to AFHQ. Trouble developed with the radio set due to the ducking it had received in the river, and all they could hear was something about "a big change in plans." This was extremely confusing, but they returned to the highway after spending several hours tossing boulders into the river to provide a rough but more reliable ford.

They returned the next day, followed by the truck with the relay station and its operating detachment, with Perkins in the mobile terminal vehicle butting his way through trees and underbrush and nosing boulders out of the trail. Upon reaching the top of Djebel Rorra they saw a fine dirt road winding away before them, unmarked on the maps, but which met the main highway a few miles from the trail junction!

Searching for the II Corps Hq.

When a circuit was established to AFHQ, they learned of the altered plans. The American II Corps was moving secretly from Southern Tunisia to make a surprise attack upon the German forces near Beja. The whereabouts of the American headquarters was unknown, and no communication facilities directly to AFHQ were to be available for some time. Capt. Perkins was directed to report to the Corps headquarters near Souk-el-Khemis. For the rest of that day and the day following he searched to no avail. Finally word came to the mobile teletype station that II Corps had located its CP near Beja.

Perkins eventually found II Corps Headquarters. The necessary password, however, was lacking. That the ensuing pleas were persuasive, however, is evidenced by the fact that the sentry himself gave Perkins the password. He repeated it, the sentry gave the countersign — and the truck passed into Corps Headquarters. There

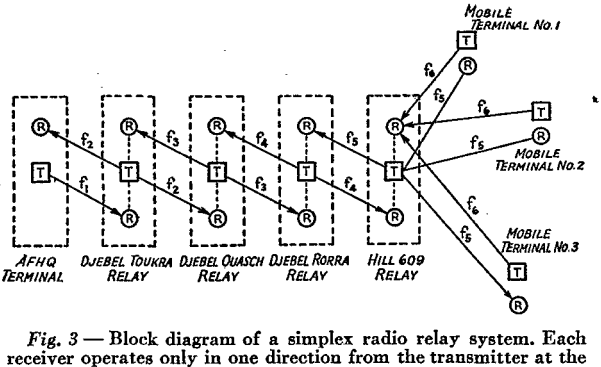


Fig. 3 — **Block diagram of a simplex radio relay system. Each receiver operates only in one direction from the transmitter at the adjacent station. The transmitter, however, operates in two directions to the associated receiver at each of the adjacent stations.**

Perkins reported to Colonel T. J. Tully, Signal Officer, and agreeably surprised him with the information that a radio teletype circuit was in operation to AFHQ!

Operations began the morning of April 20th. Since II Corps had no wire circuits available, the radioteletype circuit to Algiers carried all Corps traffic which otherwise would have been routed over wire lines. II Corps at that time was operating directly under AFHQ and, consequently, independently from the British Armies and the 18th Army Group. It was therefore a vital necessity that traffic for AFHQ be handled as directly and expeditiously as possible.

In the meantime W1CIW, Durrer and Ferd Niedt were rushing to completion a fourth relay station intended to cover the northwestern part of Tunisia. This station was merrily on its way to a likely looking mountain top when the detachment was pulled up short by a motorcycle MP.

"Where do you think you're going?" he snapped. Without waiting for explanations, the MP continued: "This is still enemy territory. Get the hell out of here!" The crew backtracked. Standing by for a few days, they had the opportunity to view at close range the terrific artillery assault upon famed Hill 609. After the fireworks cooled down they set up the relay on a hill a quarter of a mile south of Hill 609. W2GUM tuned to the station on Djebel Rorra while the II Corps terminal leap-frogged from Beja to Sidi Nsir, continuing operation to AFHQ through the additional link with scarcely a moment's lost time.

Hour after hour, day after day, the distinctive two-toned signal from the hidden CPs in the valleys of Tunisia leaped from peak to peak along

(Continued on page 86)

On the peak of Djebel Rorra. The receivers and associated equipment, concealed and camouflaged, are shown about two hundred yards from the transmitter.

Choosing U.H.F. Sites

Using Contour Strips to Predict Circuit Performance

BY PHILIP S. RAND,* WIDBM

For reliable communication at frequencies above 50 Mc., a line-of-sight path becomes of greater importance as the frequency is increased. In this article WIDBM explains how standard government contour maps may be used to plot paths between any points over which high-frequency communication may be contemplated. Included is useful information on interpretation of these paths in terms of probable signal strength.

IN LOOKING over the new frequency allocations one is intrigued by the many new u.h.f. amateur bands. With all the new tubes and circuits developed for war use and with antennas only a few inches long, what will we hams do with them? What sort of DX will be possible when transmitting on several hundred or several thousand megacycles? There is one thing of which we can rest assured — that the ones with the best locations will get out the best. As the frequency goes up and up, a line-of-sight path between the transmitter and receiver becomes more and more important. Undoubtedly there will be plenty of new effects observed with signals bouncing off near-by hills, buildings and even airplanes. Many of these characteristics have been observed on 112 Mc., 56 Mc. and even 28 Mc. Did you ever notice that rapid flutter as a plane flew over?

After V-J Day when the new amateur bands are open and the thousands of hams return from the battlefronts and the war factories, many will be looking around for a new home to buy or build with those war bonds and naturally they will want to locate in a spot as favorable as possible for the new u.h.f. bands. To find a good QTH most hams will not have to do as the writer once did in New Jersey when he drove all over the countryside with an altimeter in the car and when that read the highest level he started looking for a near-by house to rent. Here at WKNQ in Middletown, Conn., we have been able to predict with pretty fair accuracy whether or not communication will be possible and, if so, how good it will be, simply by purchasing a set of geodetic survey maps at 10 cents apiece. These maps are calibrated in twenty-foot contours, and a set of six or eight will pretty well cover any practical range.

Most large book stores or map-supply houses carry these maps or they may be obtained by addressing the Director of the United States Geological Survey, U. S. Dept. of the Interior, Washington, D. C. An index of maps available for any state will be supplied free, from which the titles of the maps desired may be selected. Applications for maps must be accompanied by cash, draft, or money order (no postage stamps!).

The scale is 1 to 62,500, or approximately one inch to a mile, so that airline distances may be measured very quickly with a ruler. Of course, to predict the chances of working another station from a given location it is necessary first to construct an outline of the intervening ground by contours, which takes about ten minutes. This is a lot quicker and easier than waiting till next Sunday between five and seven when you can drive from hill to hill with a WERS mobile, and furthermore it does not use any gas!

The use of this system has been very helpful to us in WERS at WKNQ since we are located in the hilly central part of Connecticut. It was only by this method that we were able to find a location from which a mobile transmitter could establish direct contact with both New Haven and Hartford as well as one from which all our outlying towns could be worked. In the past it has been necessary to drive several miles away to work New Haven. A third hill was necessary to work Haddam and a fourth for Durham.

Hams who are fortunate enough to be at home and connected with a WERS outfit not only can find a good QTH on the map but also can take a portable or mobile rig operating on 112 Mc. to the location to try it out. By drawing contour maps or strips of various known v:h.f. paths and comparing them with known results, it soon becomes easy to predict results over unknown paths. These results can then be converted for u.h.f. use by taking into consideration known modifying u.h.f. propagation data, such as less bending, more bounce and scattering off hills, and greater

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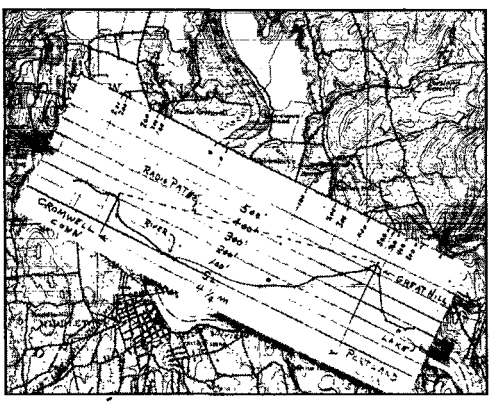


Fig. 1 — Typical contour outline strip laid out along a proposed high-frequency path.

shadow effects from intervening hills as the frequency is increased. In other words, if you find you have a line-of-sight path or practically so, u.h.f. should be as good as v.h.f., especially since beam antennas will undoubtedly be used to a greater extent because of their small size. However, if you find a hill in between which casts a bad shadow at 112 Mc. it will be much worse at u.h.f., especially if the hill is near one end or the other of the circuit.

Making the Contour Strip

The first thing in making a contour strip of any given path, of course, is to purchase the necessary maps. These maps should have the borders trimmed off so that they will butt with one another to form one large map. After trimming, the various sections preferably should be pasted down on a large sheet of beaverboard with wallpaper paste so that the various sections will not skid around while working on them. After the map has dried and can be handled, the first thing to do is to take a red pencil and shade or color the

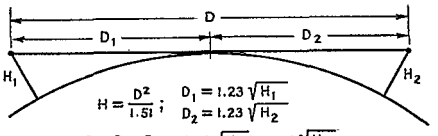


Fig. 2 — Formulas for determining antenna heights required for line-of-sight paths.

highest points in your locality. Here at WKNQ we shaded the 700-, 800-, and 900-foot contours red since they are the highest. The 500- and 600-foot contours were shaded yellow. In this way, it is possible to tell at a glance where all the high spots are. You will notice many high places which you did not realize were there; also you will see that there are roads leading to some of them, although some may be unimproved woods roads.

Now that the map is colored you may see that your favorite mobile spot (shaded yellow) is blocked to the southwest by some hills which are shaded red. No wonder you never got out very well in that direction. However, you also see farther north another hill shaded yellow with a road leading to the top. This hill is farther away from the station you want to work but at the same time it puts the offending "red" hill, which is casting the shadow, farther away from you so that more signal will bend over and reach you.

Now make a contour strip of both paths and if luck is with you the signal from the new hill may cross the offending red hill at a lower elevation which will mean stronger signals both ways. Make a dot on the map with a pencil to locate the position of the transmitters at both ends of the path and then draw a connecting line between the two dots. Lay a piece of paper about two inches wide and long enough to overlap slightly both locations on the map with one edge on the line. See Fig. 1. Mark in pencil the elevation in feet of each end as well as that of each contour on the strip. Now remove the strip of paper and with a ruler draw a series of parallel lines the length of the paper about ¼ inch apart. The spacing of the parallel lines really should be 1/52 inch to be to scale; however, this would so compress the hills that the strips would be hard to read, therefore ¼ inch is selected for their spacing.

Label the bottom line "zero" or "sea level," the next "100 feet," "200 feet," etc., until you have enough lines to take care of your maximum elevation. Now, from each of your contour lines drop a vertical line to intersect with the parallel elevation lines and put a dot where they intersect at the elevation marked on the edge of the strip. Connect all the dots with a smooth line, as in making a graph, and there is your first contour.

Repeat the above process for the other location and then compare the two strips. The two may be plotted on the same strip or the two strips may be held up to the light while superimposed for study. Dotted lines may be drawn from the antenna at each end towards the center just missing the top of all hills. The heights of the two antennas also should be taken into account. This will be the approximate line-of-sight path, not considering the curvature of the earth, which is not necessary for the average short 112-Mc. path. However, for longer distances it would be wise to do it. The formula is

$$H = D^2 / 1.51$$

where H is the neight in feet and D is the distance in miles for an optical path. When both transmitters are elevated, the maximum line-of-sight distance to ground level as given by the above formula can be determined separately for each end of the circuit. Adding these will give the maximum optical path, providing the intervening ground is at sea level. See Fig. 2.

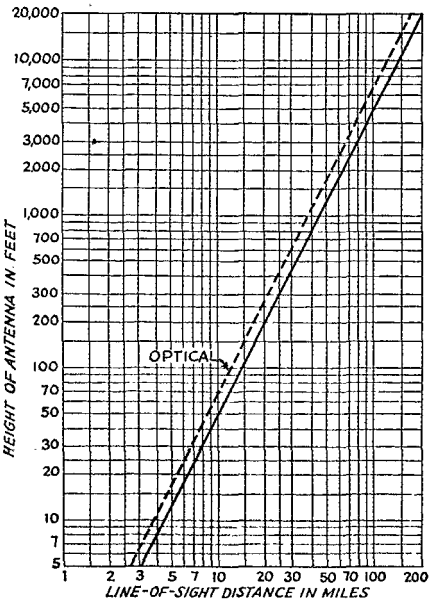


Fig. 3 — Chart plotted from formulas of Fig. 2. The solid line shows distances taking refraction into account, while the dashed line is for the optical path.

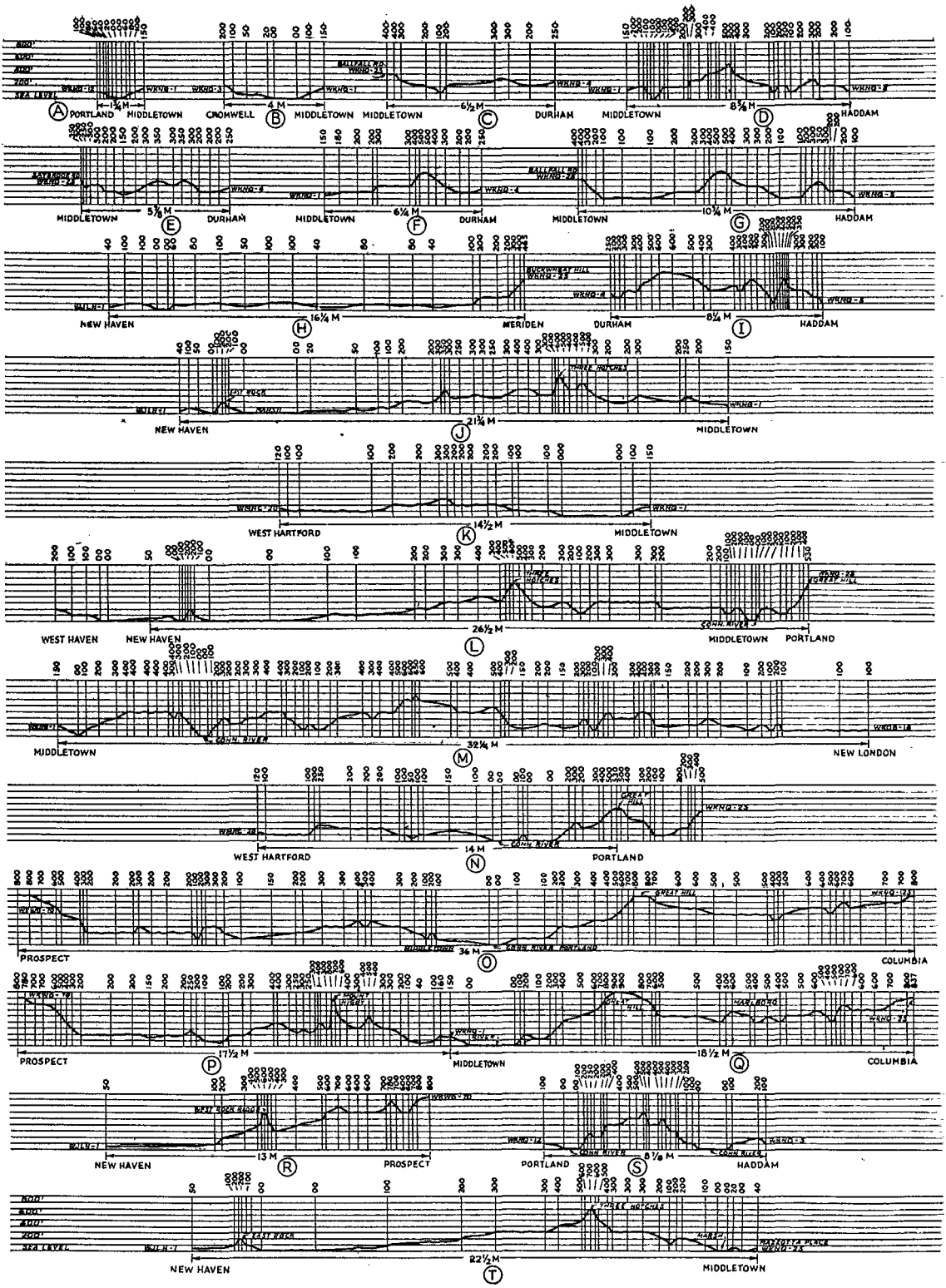


Fig. 1 — Contours showing terrain over various communication paths discussed in the text.

It will be seen from the chart of Fig. 3 that 100 feet of antenna height should be provided for each 12 miles. This is the equivalent of an antenna height of 50 feet at each end of the path. It will be noticed also that the effective range in practice is slightly longer (about 15 miles) when the effects of refraction are taken into account. In our particular case in Middletown we did not bother with the earth's curvature since practically none of our paths were within line of sight and it complicated making the contour strips; also most of the distances were rather short.

In selecting a new QTH for v.h.f. or u.h.f., contour strips should be made from each new location under consideration to all of the surrounding towns and cities with which communication is desired. Also strips should be made to the transmitters of various f.m. and television stations from which you may wish to receive entertainment. In this way you will get a pretty good idea of just what to expect after you have purchased or built your new home, and you won't be disappointed when you find that Bill over on Jones Hill works all DX and gets good f.m. and television reception while you do not, despite the fact that your location is just as high.

Interpreting Contour Strips

Referring to Fig. 4, you will see contour strips of the paths between several of the WKNQ stations. That of (A) between Unit 1 in Middletown and Unit 12 in Portland is the best. It is a line-of-sight path less than 2 miles in length. Signals are S9 plus both ways. (B) is another very good circuit, also a line-of-sight path, between Middletown and Unit 3 in Cromwell, also with S9 signals. (C) is a portable-mobile shot at Unit 4 in Durham from WKNQ-25 on a 400-foot hill in Middletown. It is a very good location but only for Durham and Hartford with S8 signals. (D) shows the tough radio path between Unit 5 in Haddam and Middletown Master Control, WKNQ-1. This path is poor because of the hills which are low but close to each station. Signals average only around S6 despite the comparatively short distance. The rising ground in front of each station seems to attenuate the signals severely.

(E) is another good shot at Durham from a different part of Middletown. Notice that in this case the ground directly in front of the two stations falls away sharply for some distance allowing the radio signals to "get started." Signal strengths here are S8 to S9. Compare it with (F) which is a very difficult circuit. Signals over this path are S6, and yet the two Middletown points are only about 1½ miles apart. This shows the entirely different type of path made possible by selecting a location only a short distance away.

In (G) the signal gets a good start from the Middletown end but the last hill in Haddam casts a bad shadow and communication is difficult. (H) shows the best circuit to New Haven to the southwest. However our mobile unit has to drive 10 miles due west to Meriden to do it although Meriden is very little closer to New Haven. Incidentally, signals are stronger from this 465-foot hill (S9) than they are from the top of Meriden Mountains, 1000 feet high (S6) only about 3 miles farther west, because of the shadow from a hill very close to New Haven. (I) shows the path between WKNQ-4 and -5. These two stations never have heard each other because of the impossible terrain in between. Here are seen severe shadows at both ends, plus very high hills in the middle. The worst conditions exist at the Haddam end. In plotting this strip to try to find out why communication could not be completed over this 8-mile circuit we discovered a woods road leading right to the top of the highest hill. As soon as this becomes passable we plan some mobile tests from that location.

(J) shows another of those impossible paths with rising ground directly in front of both stations and high ground in the middle of a considerably longer path. Once in a while WJLH-1 hears WKNQ-1 but never vice-versa. Apparently some of the WKNQ-1 signal bends over the top of the Three Notches and scatters into New Haven over the top of East Rock; however East Rock blocks the major part of the WJLH-1 signal so not much is left to reach WKNQ-1. (L) shows Great Hill, the location mentioned earlier, whose possibilities were discovered by the contour-strip method. Although it is not quite a line-of-sight path the signals to New Haven are very good — S8 to S9. Compare this with (J) and notice the difference. Great Hill is only about 1 mile out of line with Middletown and is several miles farther away.

(K) shows a fair path between Middletown and West Hartford with signal strengths of about S8. The 300-foot hill is about midway along the path and the signals bend over it without too much trouble. (M) shows a path to New London which is rather spotty. The trouble is caused by the 400-foot hill between WKNQ-1 and the Connecticut River. (N) shows the almost-visual path to West Hartford from Great Hill. S8 to S9 signals were predicted and when the circuit was tested, that's what they were.

(O) is the contour over an S9 circuit between Columbia and Prospect, Conn. Despite its 36 miles, signals are stronger than on many of the other circuits because of its almost visual path. Compare strip (P) with the combined strips (P) and (Q). The direct path (O) crosses Middletown only about three miles north of WKNQ-1 and yet misses the top of Great Hill and also misses Mt. Higby. WKWG-70 in Prospect can be worked easily from Middletown but Mt. Higby knocks the punch out of his signal. As mentioned earlier, a hill close to the transmitter bothers more than one at a distance, hence the signal from WKNQ-1 shoots up to clear Mt. Higby and therefore is weaker at WKWG-70 than -70 is at WKNQ-1. Referring to strip (Q) WKNQ-1 is pretty well blocked by Great Hill so far as Columbia is concerned. However, they can be worked satisfactorily from both Marlboro and Columbia although WKWG-70 is stronger at Columbia.

(R) This shows the path between WKWG-70 and WJLH-1 and is of interest because it is the

(Continued on page 80)

More About Postwar Station Calls

Revision of Proposed Call Areas Adopted by Board and Sent to FCC

BY CHARLES A. SERVICE, JR.,* W4IE

IN OUR July issue we presented a plan for proposed changes in postwar call areas and station calls, adopted at the May meeting of the ARRL Board of Directors and transmitted to FCC for consideration. "Happenings of the Month" for August intimated an amendment was in the works which, if approved by the directors, would result in fewer changes in existing calls. This revision *was* approved and is now before the Commission for study and, we hope, acceptance.

The revision involves a change in call areas and does not affect the original plan, insofar as that provides for a new system of calls in the event the present series proves insufficient for future needs. It has reduced the number of prewar calls which would have to be changed from 19 per cent under the original plan to 11 per cent under the amendment. If changes in split-state areas, which are to be eliminated by FCC in any event, are disregarded, the total loss of prewar calls in the rest of the United States amounts to only 3 per cent.

To understand the basis for this revision let us refer back to the original plan for a moment. It was first proposed to move the W2 part of New Jersey into W3, so that the entire state of New York would comprise the new W2 area, and W3 would then consist of the states of New Jersey and Pennsylvania. Because of the large number of amateurs in the W2 portion of New Jersey as contrasted with the W3 portion, it was later proposed that our plan would be a better one if *all* of New Jersey were placed in W2, thus making it the states of New Jersey and New York.

This was found possible under the expected growth figures for the W2 area, and the removal of New Jersey from W3 to W2 in turn made possible the restoration of Delaware, Maryland and the District of Columbia to W3 without unduly increasing the amateur population of that area. Similarly it was found possible to return West Virginia to W8, without unduly adding to the latter's size or impairing the future workings of the plan. W4 then being reduced by the loss of these three states and the District to an abnormally low figure, it was both necessary and desirable to build it up by the restoration of Alabama and Tennessee to that area from W5. The return of Alabama and Tennessee from W5 to W4 then made possible the shift of New Mexico back to W5 from its placement in W7, proposed in the first plan.

In the final analysis, then, W1 and W5 remain unchanged from prewar practice; the split-state areas of W2, W3, W8 and W9 (peninsular Michigan) are eliminated with the least possible change in prewar calls; W9 is brought into line with other areas by splitting off its western states into a new WØ area and transferring Kentucky and upper Michigan to W4 and W8, respectively; W4 is built up by the addition of Kentucky and Virginia; and the abnormally large W6 is reduced by transferring Arizona, Nevada and Utah to W7, which needed upbuilding.

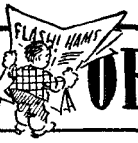
Under the revised plan, therefore, the set-up of future call areas as proposed to FCC looks like this:

Area	*Territory Embraced*	*Changes from Prewar Status*
1	New England States	None
2	New York, New Jersey	Transfer W8 portion of New York and W3 portion of New Jersey to W2, eliminating splitting of states.
3	Delaware, District of Columbia, Maryland, Pennsylvania	Transfer W8 portion of Pennsylvania to W3, eliminating splitting a state. Subtract W3 portion of New Jersey, transferred to W2. Subtract Virginia, transferred to W4.
4	Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee, Virginia, U.S. Possessions in the Caribbean.	Add Kentucky from W9 and Virginia from W3.
5	Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, Texas	None
6	California, U. S. Possessions in Pacific	Subtract Arizona, Nevada and Utah, transferred to W7.
7	Arizona, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming, Alaska	Add Arizona, Nevada and Utah, transferred from W6.
8	Michigan, Ohio, West Virginia	Add W9 part of upper Michigan, eliminating splitting a state. Subtract W8 part of New York, transferred to W2; and W8 part of Pennsylvania, transferred to W3.
9	Illinois, Indiana, Wisconsin	Subtract W9 part of upper Michigan, transferred to W8, and Kentucky, transferred to W4. Subtract Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota to form new Ø area.
0	Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota	Proposed new call area to be formed by transferring these eight states from W9.

(Continued on page 82)

*Assistant Secretary, ARRL.

HAPPENINGS OF THE MONTH



ALLOCATION NEWS

THERE isn't any. Last month we thought that the final FCC announcement of its decisions respecting frequencies below 25 Mc. would be available for this issue but the Commission staff, and others concerned, have been so heavily occupied with other matters that nothing has been done about this job, it not involving as much urgency to permit postwar manufacturing planning as did the frequencies above 25. The present expectation is that the announcement will come along about the time of the Rio conference.

The Rio conference, opening September 3rd, is one of the inter-American region, a conference of governments, with private agencies represented by nonparticipating observers who may speak only through the intercession of their government's delegation. The conference works within the framework of the Madrid Convention and the Cairo Regulations. ARRL is to be represented at this conference by Lt. Comdr. Arthur L. Budlong, USCGR, W1JFN, in civilian status on temporary leave-of-absence from the Coast Guard for that purpose. He goes as senior assistant secretary of ARRL, from which position he is now on leave-of-absence and in which status he was our representative at the preceding regional conference at Santiago de Chile. Later this year we shall expect to have a *QST* article from him on the results of the conference.

ELECTION NOTICE

TO ALL Full Members of the American Radio Relay League residing in the Atlantic, Dakota, Delta, Midwest, Pacific and Southeastern Divisions:

You are hereby notified that, in accordance with the constitution, an election is about to be held in each of the above mentioned divisions to elect both a member of the ARRL Board of Directors and an alternate thereto for the 1946–1947 term. Your attention is invited to Sec. 1 of Article IV of the constitution, providing for the government of ARRL by a board of directors; Sec. 2 of Article IV, and By-Laws 12, defining their eligibility; and By-Laws 13 to 24, providing for the nomination and election of division directors and their alternates. Copy of the Constitution & By-Laws will be mailed to any member upon request.

All steps in the election process now occur one month earlier than heretofore. Voting will take place between October 1st and November 20, 1945, on ballots that will be mailed from the headquarters office in the first week of October. The ballots for each election will list, in one column, the names of all eligible candidates nominated for the office of director by Full Members of ARRL residing in that division; and, in another column, all those similarly named for the office of alternate. Each Full Member will indicate his choice for each office.

Nomination is by petition. Nomination petitions are hereby solicited. Ten or more Full Members of the League residing in any one of the above-named divisions may join in nominating any eligible Full 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 provide for the transfer of 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 as 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 Full Members of the ARRL residing in the.....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 1946–1947 term.

(Signatures and addresses)

The signers must be Full Members in good standing. The nominee must be a Full Member and 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

Get Set!

We have just time (and space) for a few words as one of the momentous periods of history ends — marked by the first use of atomic bombs, Russia's entry into the Pacific war, and the Japanese capitulation. The rapid culmination of these breath-taking events means that we should be back on the air months sooner than was visualized even a week ago.

ARRL has already moved for the reactivation of amateur radio. We have asked first for release of the 2½-meter band and the cancellation of WERS, so that amateurs may reassume their traditional preparedness to furnish emergency-communication service. That band, and the gear for it, are available for the job. It is probable that the next bands to be released to us will be the higher-frequency ones, above 200 Mc. The DX frequencies will come slower; the armed services will need many of them a while longer.

But they're coming, OM, and we're on our way to great things — the greatest boom in the history of amateur radio! FCC is eager to resume the licensing of amateur stations as soon as BWC will permit, to get on with the job before the great rush starts. Stand by for ARRL bulletins to directors, SCMs, clubs and radio stores the instant there is good news to report. And expect in *QST*, as soon as secrecy goes off, the most interesting radio dope you've ever read.

The days we have been living for seem close at hand: our beloved amateur radio is about to come into its own once more!

Get set!

AMATEUR WAR SERVICE RECORD

Name

Call, present or ex; or grade of op-license only

Present mailing address

SERVICE

- ☐ Army
- ☐ Navy
- ☐ Coast Guard
- ☐ Marine Corps
- ☐ Maritime Service
- ☐ Merchant Marine
- ☐ Civil Service
- ☐ Radio industry. 100% war

Rank or rating

Branch or bureau: Signal Corps, AAF, BuShips, WAVES, etc. If civilian industry, give title and company.

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; provided that if a candidate's membership has been interrupted by reason of service in the armed forces of the United States, he shall not be deemed to be disqualified so far as concerns continuity of membership if he has, since May 7, 1943, renewed his ARRL membership within ninety days of discharge from the military service. 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 EWT of the 20th day of September, 1945. 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 signature of at least ten Full Members in good standing; that is to say, ten or more Full 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 be Full 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.

League members are classified as Full Members and Associate Members. Only those possessing certificates of Full Membership may nominate candidates, or stand as candidates; members holding certificates of Associate Membership are not eligible to either function.

Present directors and alternates for these divisions are as follows: Atlantic Division: director, Walter Bradley Martin, W3QV; alternate, Herbert M. Walleze, W8BQ. Dakota Division: director, Tom E. Davis, W9VVA; alternate, Aaron E. Swanberg, W9BHY. Delta Division: director, E. Ray Arledge, W5SI; alternate, Samuel H. Dowell, W5ERV. Midwest Division: director, Floyd E. Norwine, jr., W9EFC: alternate, C. A. Colvin, W9VHR. Pacific Division: director, J. L. McCargar, W6EY; alternate, Elbert J. Amarantes, W6FBW. Southeastern Division: director, Wm. C. Shelton, W4ASR; alternate, Wm. P. Sides, W4AUP.

These elections constitute an important part of the machinery of self-government in ARRL. They provide the constitutional opportunity for members to put the direction of their association in the hands of representatives of their own choosing. Full Members are urged to take the initiative and to file nominating petitions immediately.

For the Board of Directors:

K. B. WARNER,
Secretary

July 1, 1945.

ARE YOU LICENSED?

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

NOTICES TO MEMBERS DISCHARGED FROM THE MILITARY SERVICES

THE requirement of continuous membership in the League for eligibility to ARRL offices has been waived for members serving in the uniform of the United States. See particulars on page 39 of *QST* for July last. Those desirous of taking advantage of this arrangement are asked to claim the right when renewing membership, stating the beginning and ending dates for their military service.

YOUR WAR RECORD?

THE little coupon on the top of this page has brought thousands upon thousands of reports to ARRL headquarters at West Hartford where the League is compiling a card record of every known case where an amateur or former amateur of either the United States or Canada has employed his ham know-how in war work — whether in the armed forces, the Maritime Service or merchant marine, the Civil Service or other government service, the contract laboratories, or in industry 100 per cent devoted to war manufacturing.

Are you on our records? If not, we want you — and any of your buddies on whom you can supply dope. It'll only take a moment to clip and fill out this form, or to reproduce its essentials on a post card if you prefer. Thanks very — it will help!

Matching the Antenna for Two-Band Operation

Flat Lines with Fundamental and Second Harmonic

BY JOHN G. MARSHALL,* W9ARL

QUITE often a fellow thinks of his future station with the ultimate in multiband and rapid QSY operation. One of the oldest problems in this respect is the operation of the station's single antenna on more than one band without readjustment or retuning. Even by retuning usually there are large standing waves on the feed line. In some cases, a trip out of doors is made to change matching stubs. Some are more fortunate in having a system of relays to do the outside work.

An impedance-matching network may be designed and constructed to provide matching of the antenna to the feed line on two bands, whether it is a simple half-wave or an elaborate multielement array. When properly constructed and adjusted, no retuning or mechanical readjustments of any kind are necessary for two-band operation with a flat line.

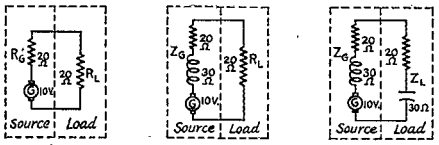


Fig. 1 — Foundation circuits.

To clarify the points concerned here, a review of the basic principles involved in impedance matching is in order. A knowledge of vector algebra will help greatly and for those not familiar with it, a good understanding of the article "Meet Mr. *j*.," appearing in an earlier issue,[1] or an evening with a good textbook should suffice. Use of the slide rule also will help and its accuracy, to three significant figures, is generally sufficient. Special care should be exercised in reading the *A* and *B* scales. Use of the *C* and *CI* or *D* and *DI* scales will be especially helpful.

The primary purpose of impedance matching is to deliver the greatest possible power to the load. To do this, the load impedance, Z_L, must equal the internal impedance, Z_G, of the source of power. In the case involving only pure resistances, such as in Fig. 1-A, it is assumed that the generator supplies 10 volts and has an internal resistance, R_G, of 20 ohms. If $R_L = R_G$, the total R in the circuit is 40 ohms and with 10 volts applied, the current is $E/R = 10/40 = 0.25$ amperes. The power in R_L is $I^2R = (0.25)^2(20) = 1.25$ watts. If R_L is less than R_G, for example 10 ohms, the total R is 30 ohms, the current is 0.33 amperes, and the power in R_L is only 1.11 watts. If R_L is greater than R_G, for example 30 ohms, the total R is 50 ohms and the power in R_L is only 1.2 watts. Therefore when $R_L = R_G$ the greatest possible power is delivered to the load, R_L.

In the circuit of Fig. 1-B, where the generator has an internal impedance containing both resistance and reactance, there is another condition to satisfy in addition to having $R_L = R_G$. As before, with no reactance present, Ohm's Law shows that R_L would receive 1.25 watts. However, there is reactance present and the total circuit, as seen by the generator, is composed of 40 ohms R and 30 ohms X_L in series. This results in an impedance $Z = \sqrt{R^2 + (X_L - X_C)^2} = \sqrt{40^2 + 30^2} = 50$ ohms. The current $I = E/Z = 10/50 = 0.2$ ampere and the power in R_L is $I^2R = (0.2)^2\ (20) = 0.8$ watt. As shown in Fig. 1-C, adding a capacitive reactance of 30 ohms to the load to balance out the 30-ohm X_L results in an impedance $Z = \sqrt{40^2 + (30-30)^2} = 40$ ohms. The current is now 0.25 ampere and the power in $R_L = (0.25)^2\ (20) = 1.25$ watt, the same as with no reactance. Then, it is evident, to supply the load with the greatest possible power, R_L must equal R_G, and the net reactance must be zero. When these two conditions are met, impedances are matched. Note that when $X_L = X_C$ the net reactance is zero and this is also the condition for series resonance.

In Fig. 2-A, R_L is necessarily 4 ohms which is greater than R_G. If R_L is made to appear as 2 ohms to the source, although actually 4 ohms, an impedance match can be accomplished and R_L will be supplied the greatest possible power. R_L

One of the objections to amateur use of "flat" or untuned lines for feeding amateur antennas is that normally the antenna system may be operated without standing waves on only one band without encountering the practical complications of remote switching or some equivalent device. Especially those who have two- or three-element rotatable arrays will find unusual interest in this article, which describes the design of networks which provide "flat-line" operation of a single antenna system on two bands without switching of any kind.

* 723 Paseo, Kansas City 6, Mo.

[1] Noll, "Meet Mr. *j*," *QST*, Oct., 1943, p. 21.

can be made to look like 2 ohms to the source by placing in parallel with it, a reactance of 4 ohms. By the admittance method, $Y = G + B$, $Z = 1/Y$, $G = 1/R$ and $B = 1/jX$ where the conductance, G, the susceptance, B, and the admittance, Y, are in mhos and the resistance, R, the reactance, X, and the impedance, Z, are in ohms. Solving the Z in this parallel combination,

$$Y = G + B = 1/R + 1/jX = 1/4 + 1/-j4 = 0.25 + j0.25 \text{ mho.}$$

$$Z = 1/Y = \frac{1}{0.25 + j0.25}$$

$$= \frac{(1)\ (0.25 - j0.25)}{(0.25 + j0.25)\ (0.25 - j0.25)}$$

$$= \frac{0.25 - j0.25}{0.125} = 2 - j2 \text{ ohms.}$$

Here Z is expressed in its rectangular form which means that Z in this parallel combination equals the impedance produced by 2 ohms R in series with 2 ohms X_C. Then, 2 ohms R in series with 2 ohms X_C is the electrical equivalent series circuit of 4 ohms R in parallel with 4 ohms X_C, since both are equal to the same impedance.[2] So far as points A and B in Fig. 2 are concerned, one circuit may be substituted for the other.

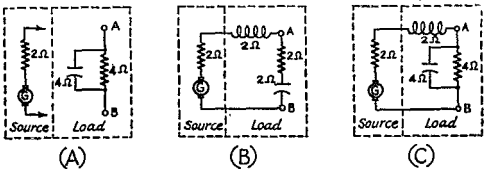


Fig. 2 — Foundation circuits.

Fig. 2-B shows this equivalent series circuit substituted for the parallel combination and with 2 ohms X_L added to produce a net reactance of zero. Now $R_L = R_G$ and the net reactance is zero, so R_L receives the maximum possible power. Fig. 2-C shows the equivalent parallel circuit between points A and B, thus providing a perfect impedance match for the 4-ohm load to the 2-ohm source. If the R_L necessarily is smaller than R_G, the same method may be used by paralleling R_G with a reactance of such value as to make R_G appear the same value as R_L and adding a reactance, of opposite sign, in series to balance out the series equivalent of the parallel reactance. These same principles will be used in matching the antenna to the feed line.

Application to Antennas

Everyone is familiar with the half-wave antenna and, since it performs well for two-band operation, it is used here as the "example in detail." Selecting the popular 7- and 14-Mc. bands, the center-fed antenna will operate as a simple half-wave on 7-Mc. and as two half-waves in phase, colinear, at 14 Mc. With self-resonance assumed on both bands, the popular 600-ohm line must be matched to a 73-ohm pure-resistance load on 7 Mc. and about a 1200-ohm pure-resistance load at 14 Mc. The center of a half-wave antenna varies from 57 to 96 ohms for heights above $\lambda/4$, with 73 ohms being the average. Even though there seems to be several opinions concerning the impedance of the colinear arrangement, 1200 ohms is representative and is used here to illustrate the network.

The antenna impedance, being a pure resistance load, may be represented by R_L. When terminated by an impedance, Z_L, equal to its characteristic impedance, Z_o, which is necessary to prevent standing waves, a line may be represented by a generator having an internal impedance $Z_G = Z_o$. Since Z_o is independent of frequency, Z_G may be considered to be a pure resistance, R_G, equal to Z_o, which in this case is 600 ohms.

On 7 Mc. the 600-ohm R_G must be shunted by a reactance of such value as to produce an equivalent series circuit containing a resistance component equal to the 73-ohm R_L. The use of X_L is preferable to X_C here because when the frequency is changed to 14 Mc. the value of X_L will double and will produce an equivalent series circuit containing a resistance component much closer to the value of the 1200-ohm R_L than if X_C were used. This is especially desirable because the required value of reactance across the 1200-ohm R_L will then be much greater and will cause a smaller upset in the 7-Mc. calculations, which are to be made without any reactance across the 73-ohm R_L.

At 14 Mc. R_L is greater than R_G so it must be shunted by a reactance of such value as to produce an equivalent series circuit containing a resistance component equal to the resistance component produced by X_L in parallel with R_G. The use of X_C is preferable to X_L across this 1200-ohm R_L because, when looking back to 7 Mc., the value of X_C doubles and upsets the 7-Mc. calculations much less than if X_L were used.

7-Mc. Network

On 7 Mc., the value of X_L in parallel with the line R_G to produce an equivalent series circuit containing a resistance component of 73 ohms may be found from the formulas

$$B_P = \sqrt{\frac{G_P}{R_s} - G_P^2} \text{ and } X_P = \frac{1}{B_P},$$

where X_P is the value of the parallel reactance, B_P is the susceptance of this parallel reactance which equals $1/X_P$, G_P is the conductance of the resistance representing the line which equals $1/R_G$, and R_s is the value of the resistance component of the equivalent series circuit, all in basic units. Solving for X_P,

$$B_P = \sqrt{\frac{G_P}{R_s} - G_P^2} = \sqrt{\frac{0.00167}{73} - (0.00167)^2}$$

$$= \sqrt{0.00002} = 0.004475 \text{ mho.}$$

$$X_P = \frac{1}{B_P} = \frac{1}{0.004475} = 223 \text{ ohms}$$

[2] Although not necessary here, the absolute impedance, Z, is found from the series circuit where $\tan \Theta = X/R = 2/2 = 1$, $\Theta = 45$ degrees and $Z = X/\sin \Theta = 2/0.707 = 2.83$ ohms. This is written $Z = 2.83/\underline{45°}$ ohms.

The reactance component of the equivalent series circuit may be found from the formula

$$X_s = \frac{B_P}{G_P^2 + B_P^2},$$

where X_s is the reactance component of the equivalent series circuit. Solving for X_s,

$$X_s = \frac{B_P}{G_P^2 + B^2_P} = \frac{0.004475}{(0.004475)^2 + (0.00167)^2}$$
$$= 196 \text{ ohms}$$

Then the 223-ohm X_L in parallel with the 600-ohm source, R_G, produces an equivalent series circuit of 73 ohms R in series with 196 ohms X_L. Fig. 3-A shows this equivalent series circuit representing the actual circuit, with 196 ohms X_C as a balancing reactance added to produce a net reactance of zero. Since $R_L = R_G$ and the net reactance is zero, the maximum possible power is supplied to R_L.

Fig. 3-B employs the actual parallel circuit and shows the 600-ohm line matched to the 73-ohm antenna. The 196-ohm X_C is divided between the two legs to maintain symmetry. This is all there is to the design of the 7-Mc. impedance-matching transformer. Easy, wasn't it?

Adding 14 Mc.

On 14 Mc. the X_L across the line becomes 446 ohms and the line, of course, remains at 600 ohms since it is independent of frequency. Solving for Z in this parallel combination,

$$Y = G + B = 1/R + 1/jX = 1/600 + 1/j446$$
$$= 0.00167 - j0.00224 \text{ mho.}$$

$$Z = 1/Y = \frac{1}{0.00167 - j0.00224}$$
$$= \frac{0.00167 + j0.00224}{0.00000779} = 214 + j288 \text{ ohms}$$

As mentioned previously, Z is expressed in its rectangular form which is actually the equivalent series circuit. Then on 14 Mc., the X_L in parallel with the line produces an equivalent series circuit of 214 ohms R in series with 288 ohms X_L. The 1200-ohm R_L now must be paralleled with a reactance of such a value as to produce an equivalent series circuit containing a resistance component of 214 ohms. X_C is preferable in this position because, when looking back to 7 Mc., its value will be twice and will have much less effect upon the 73-ohm R_L. Using the same formulas as before,

$$B_P = \sqrt{\frac{G_P}{R_s} - G_P^2} = \sqrt{\frac{0.000833}{214} - (0.000833)^2}$$
$$= 0.00179 \text{ mho.}$$

$$X_P = \frac{1}{B_P} = \frac{1}{0.00179} = 559 \text{ ohms}$$

$$X_s = \frac{B_P}{G_P^2} + B_P^2 = \frac{0.00179}{(0.000833)^2 + (0.00179)^2} =$$
459 ohms.

Thus an X_C of 559 ohms in parallel with the 1200-ohm R_L will produce an equivalent series circuit of 214 ohms R in series with 459 ohms X_C.

Fig. 4-A shows the two equivalent series circuits representing the actual parallel circuits, with 171 ohms X_L as a balancing reactance added to produce a net reactance of zero. Since $R_L = R_G$ and the net reactance is zero, the maximum possible power is supplied to R_L.

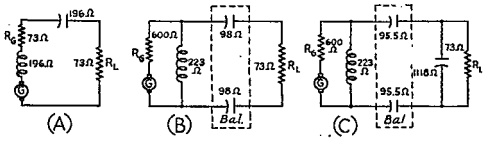


Fig. 3 — Development of 7-Mc. network. (A) — Electrical equivalent series circuit. (B) — 600-ohm source matched to 73-ohm load. (C) — Same as (B) but corrected after 14 Mc. has been added.

Fig. 4-B employs the actual parallel circuits and shows the 600-ohm line matched to the 1200-ohm antenna. The 171-ohm X_L is divided between the two legs to maintain symmetry.

Since making the 7-Mc. calculations, the load, R_L, has been shunted by X_C which becomes 1118 ohms on 7 Mc. This will alter the 7-Mc. calculations only slightly. Solving,

$$Y = G + B = 1/R + 1/jX = \frac{1}{73} + \frac{1}{-j1118} = 0.0137$$
$$+ j0.0009 \text{ mho.}$$

$$Z = 1/Y = \frac{1}{0.0137 + j0.0009} = \frac{0.0137 - j0.0009}{0.000188}$$
$$= 72.8 - j4.78 \text{ ohms}$$

This 1118-ohm X_C across the 73-ohm R_L produces an equivalent series circuit of 72.8 ohms R in series with 4.78 ohms X_C. For all practical purposes, the 73-ohm R_L is unchanged but there has been added about 5 ohms X_C in the circuit which can be compensated for by reducing the value of the balancing reactances. Fig. 3-C shows this reduction. If the X_C across the load upsets the 7-Mc. calculations too much, the entire problem should be reworked, using a lower value of X_L across the line R_G. Figs. 3-C and 4-B show correct matching for 7 and 14 Mc. respectively.

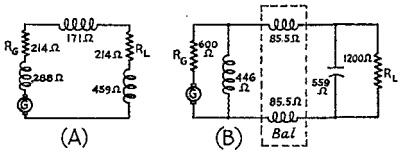


Fig. 4 — Development of network for the addition of 14 Mc. (A) — Electrical equivalent series circuit. (B) — 600-ohm source matched to 1200-ohm load.

Inspection of Figs. 3-C and 4-B will show that to change from one band to the other, the only change necessary is the balancing of reactances, all other components changing value automatically. If each balancing reactance is made up of both X_L and X_C, a certain combination will have a value of 95.5 ohms X_C at 7 Mc. and at the same time have 85.5 ohms X_L at 14 Mc. This combination may be found from a few attempts using the "cut and try" method or directly from a pair of

simple simultaneous equations. At 7 Mc., the X_L and X_C must add up to 95.5 ohms X_C. With these same reactors on 14 Mc., the X_L is doubled and the X_C is halved and must add up to 85.5 ohms X_L. Since X_L is positive and X_C is negative the two equations are

$$1)\ X_L - X_C = -95.5$$
$$2)\ 2X_L - 0.5X_C = 85.5$$

Solving (1) for X_L and substituting in (2),

$$2(X_C - 95.5) - 0.5X_C = 85.5$$
$$2/X_C - 191 - 0.5X_C = 85.5$$
$$X_C = 184.3 \text{ ohms}$$

Substituting this in (1),

$$X_L - 184.3 = -95.5$$
$$X_L = 88.8 \text{ ohms}$$

These values of X_L and X_C are used as the balancing reactances in Figs. 5-A and 5-B which illustrate, in ohmic values, the complete networks for 7 and 14 Mc. respectively.

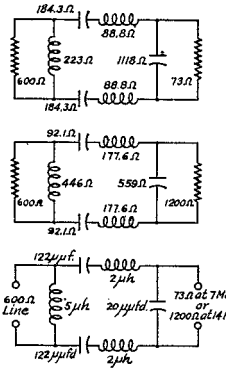


Fig. 5 — Complete two-band network. (A) — Ohmic values at 7 Mc. (B) — Ohmic values at 14 Mc. (C) — (A) and (B) converted to L and C thus showing the complete two-band network for matching a 600-ohm line to the center of a 7-Mc. half-wave antenna and two half-waves in phase at 14 Mc.

Use of the reactance charts found in the *Handbook* or the reactance slide rule or the formulas $\left(L = \frac{2\pi f}{X_L}\right)$ and $\left(C = \frac{1}{2\pi f X_C}\right)$ to convert Figs. 5-A and 5-B to L and C will result in the values shown in Fig. 5-C. Fig. 5-C illustrates the complete network for matching a 600-ohm line to the center of a half-wave antenna at 7 Mc. or to the center of a "two half-waves in phase" combination at 14 Mc.

Proof

In Figs. 5-A and 5-B, all components must be acting together as a 600-ohm pure resistance load terminating the 600-ohm line. At 7 Mc., Fig. 5-A shows a total admittance across the line

$$Y = \frac{1}{j223} + \frac{1}{\frac{1}{\frac{1}{73} + \frac{1}{-j1118}} + 2(-j184.3) + 2(j88.8)}$$

mho,

which, with slide rule accuracy, reduces to $Y = -j0.00448 + 0.00167 + j0.00448 = 0.00167$ mho of pure conductance. This is an impedance $Z = 1/Y = 1/0.00167 = 600$ ohms pure resistance. At 14 Mc. Fig. 5-B shows a total admittance across the line

$$Y = \frac{1}{j446} + \frac{1}{\frac{1}{\frac{1}{1200} + \frac{1}{-j559}} + 2(-j92.1) + 2(j177.6}$$

mho,

which reduces to $Y = -j0.00224 + 0.00167 + j0.00224 = 0.00167$ mho of pure conductance. This is an impedance $Z = 1/Y = 1/0.00167 = 600$ ohms pure resistance.

Thus, the line is terminated in a 600-ohm pure-resistance load at both 7 and 14 Mc.

Parts Ratings

In adjusting the network, capacity adjustment is suggested, since on these frequencies variable condensers are more practical than variable inductors. With this in mind and an assumed output of 1 kw., which upon 100-per-cent modulation reaches a peak of 4 kw., the condenser ratings may be determined. In the finished network of Fig. 5-C, the 20-$\mu\mu$fd. capacity and the antenna resistance have the same voltage across them. Since the power in the antenna resistance is 4 kw. for both a 73-ohm and a 1200-ohm antenna, the voltage will be greatest across the 1200-ohm resistance. This voltage is

$$E = \sqrt{PR} = \sqrt{4000 \times 1200} = 2190 \text{ volts},$$

which has a peak value of

$$E_{max} = 1.41E = (1.41)(2190) = 3090 \text{ volts}.$$

A 50-$\mu\mu$fd., 5000-volt condenser will be satisfactory in this position.

The voltage across the 122-$\mu\mu$fd. capacities may be found when the current through them is known. This is the same current which flows through the antenna resistance and 20-$\mu\mu$fd. capacity in parallel. The current through this parallel combination has the same value as the current which would flow through its equivalent series circuit because one circuit may be substituted for the other. Also, the power in the resistance component of the equivalent series circuit will be of the same value as the power in the antenna resistance. Figs. 3-A and 4-A show that the current will be greatest at 7 Mc. because on this frequency the resistance component of the equivalent series circuit has the lower value, 73 ohms, as compared to 214 ohms. The current through this resistance component is $I = \sqrt{\frac{P}{R}} = \sqrt{\frac{4000}{73}} =$ 7.4 ampere. With this same current flowing through the 122-$\mu\mu$fd. capacities, the voltage across them is $E = IX = (7.4)\ (184.3) = 1290$ volts, which has a peak value of 1820 volts. Two 250-$\mu\mu$fd., 3000-volt condensers should be satisfactory in these positions.

The coils may be made from the coil charts found in the *Handbook*. Accuracy is stressed, especially with coils of small inductance. The greater the accuracy the less the magnitude of standing waves after the network is "tuned up."

Adjustment

7-Mc. adjustment is accomplished when acquiring resonance by the simultaneous adjustment of the condensers of the balancing reactances. 14-Mc. adjustment is accomplished when acquiring resonance by adjustment of the condenser across the antenna. Tuning on one band will affect the other slightly, but going from one to the other a few times should put the network "on the nose" for both bands. These adjustments may be closely approximated in the station by substituting carbon resistors for the antenna and feed line, and loosely coupling the unit to the transmitter. These odd values can be made by filing down lower values. checking against an ohmmeter.

Those of us who will receive the most benefit from the network described here are those having a small space who must be satisfied with only one antenna. Many, having limited space, have installed a two- or three-element rotatable. Ordinary operation of these is confined to a single band. The accompanying chart shows the values of the components for the two-band network which should be placed between the feed line and the driven element of 2- and 3-element rotatables operating fundamentally at 14 Mc. and as 4- and 6-element systems at 28 Mc. The foregoing procedure was used in making up this chart.

Parasitic Elements

With these "rotary beams" operating fundamentally at 14 Mc., the driven element itself will operate also at 28 Mc. as two-half waves in phase, colinear, simply because it is center-fed. The 14-Mc. parasitic elements will function at 28 Mc. if opened in the center. Then a system of opening the center for 28 Mc. and closing the center for 14 Mc. will make possible two-band operation of the parasitic elements. A series-resonant circuit having low r.f. resistance, resonating at 14 Mc., placed in the center of the element, will effectively close the circuit for 14-Mc. operation. A parallel-resonant ciruit, having a high Q under operating conditions and resonating at 28 Mc., will effectively open the circuit for 28-Mc. operation. A combination circuit can be made to perform both functions. When operating at 14 Mc., the 28 Mc. parallel-resonant circuit will have a net inductive reactance. A pair of variable capacities may be placed in series at the element to balance out this X_L and produce series resonance at 14 Mc. These capacities will affect the 28-Mc. adjustment only slightly. This can be corrected by a slight readjustment of the parallel condenser. Thus, the center of the element is effectively closed for 14-Mc. operation and open for 28-Mc. operation, automatically with the change in frequency.

Another method providing two-band operation of the parasitic element, which is simpler and probably superior, was mentioned in *QST* in a discussion of antennas of the DX men by Goodman, W1JPE.[3] In that article, W9TB used a quarter-wave open stub in the center of the element, as in Fig. 6-A. As applied here, a quarter-wave stub having negligible losses, open at the receiving end, may be considered to present zero impedance at the sending end. At 28 Mc. this stub becomes a half-wave long and when open at the receiving end will, when its losses are zero, offer an infinite impedance at the sending end. Thus such a stub effectively will open the element for 28 Mc. and effectively close it for 14-Mc. operation automatically with the change in frequency.

The latter method may be improved upon by the proper placement of two identical variable condensers. These condensers will make possible exact adjustment on both bands. First, it must be determined which frequency of operation requires the shorter over-all physical length of stub plus element. This can be done by a careful consideration of the element spacing, element function (reflector or director) and the relationship of the two frequencies of operation. A more positive method would be the physical comparison of separately-adjusted stubs for each of the two frequencies. If the over-all physical length at 28 Mc. is shorter, adjustment of the stub length will provide 14-Mc. adjustment, and two identical variable condensers placed in the center of the stub will provide 28-Mc. adjustment, as shown in Fig. 6-B. If the over-all physical length at 14 Mc. is shorter, adjustment of the stub length will provide 28-Mc. adjustment, and two identical condensers placed in series with the junctions of stub and element will provide 14-Mc. adjustment, as shown in Fig. 6-C. Adjustment on one band will affect the other, particularly so with the arrangement of Fig. 6-B, so care should be exercised when cutting the stub to prevent cutting it too short.

The approximate value of these capacities and the approximate stub length may be determined for each individual case by preliminary adjustment of the array, when within reach from the ground, using any available condensers with low-power input. When the stub lengths and condensers of the parasitic elements are adjusted for maximum field strength on both bands, the approximate working capacity of each condenser may be determined by visual inspection and the voltage across each can be calculated after measuring the current through it. This voltage will have a peak value of $E_{max.} = 1.41\ IX_C$. At full power

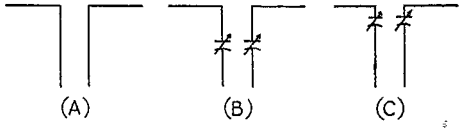


Fig. 6 — Two-band parasitic elements. (A) — Half-wave element with quarter-wave open stub at 14 Mc. or two half-waves in phase with a half-wave open stub for 28 Mc. (B) — Same as (A) but with the stub cut to length at 14 Mc. and condensers added for 28-Mc. adjustment. (C) — Same as (A) but with stub cut to length for 28 Mc. and condensers added for 14-Mc. adjustment.

[3] Goodman, "Fashions in Antennas," *QST*, June, 1939, p. 14.

Type of Array	Type of Line	(L_1)			(L_2)			(C_1)			(C_2)		
		X_L (ohms)			X_L (ohms)			X_C (ohms)			X_C (ohms)		
		14 Mc.	28 Mc.	μh.	14 Mc.	28 Mc.	μh.	14 Mc.	28 Mc.	μμfd.	14 Mc.	28 Mc.	μμfd.
2-element antenna-director type at 14 Mc. (13-ohm load) and 4-element antenna-reflector type at 28 Mc. (2200-ohm load)	73-ohm Line	34.0	68.0	0.38	82.7	165	0.925	550	275	20.5	96.6	48.3	115
	600-ohm Line	89.3	179	1.0	67.8	136	0.77	660	330	17	112	55.8	100
3-element at 14 Mc. (8-ohm load) and 6-element at 28 Mc. (3800-ohm load)	73-ohm Line	25.6	51.2	0.28	92.6	185	0.103	608	304	18.5	104	52.0	108
	600-ohm Line	69.8	140	0.77	80.9	162	0.9	688	344	16.5	115	57.6	97

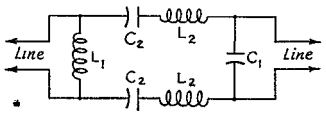


Fig. 7 — Chart showing values of components making up the two-band impedance matching transformer for the popular two- and four-element arrays. With 0.1λ element apacing, antenna-director type is superior and with 0.2λ element spacing, antenna-reflector type is superior. Therefore, this chart treats the two-element as antenna-director at 14 Mc. and as a four-element antenna-reflector type at 28 Mc. All adjustments must be made for maximum gain in the desired direction.

this voltage has a peak value of $E_2 = E_1\sqrt{\frac{P_2}{P_1}}$, where E_2 and P_2 are full-power values and E_1 and P_1 are values at the reduced power used during adjustment.

When the permanent condensers are selected and placed in a weather-proof box, with adjusting rods extended to within reach from the tower to facilitate adjustment in the air, the parasitic elements are ready for final adjustment.

Conclusion

By knowing the load impedance represented by the antenna on each of the two frequency bands selected, the network described here may be applied to any antenna providing it is fed at a point considered to be substantially a pure resistance, with a feed line selected to have a value of characteristic impedance falling between the two values of antenna impedance. Any of the common feed lines will fall between these two values with any of the common antennas except some of the long-wire types. The long-wire types in general have an impedance, at the current loops, above 100 ohms, which eliminates the use of the popular 72-ohm line when a minimum of standing waves is desired. This same feed point, when operated at the higher frequency, has an impedance much greater than any of our feed lines. Then the logical choice of feed line for the long-wire systems is the 600-ohm open line.

It is regretted that concrete information concerning the impedances of the various popular antenna systems operating on frequencies other than the fundamental, isn't available at this time, so that more accurate values of components which make up the impedance-matching network, together with more examples, could be included in the accompanying chart. When postwar operation begins, these load impedances may be measured, while on the air, by one of several methods, such as the standing-wave ratio or the resistance-substitution method. However, it is believed the values shown are workable and should not produce standing waves having too great a magnitude.

A word of caution is in order concerning harmonic radiation. Since the antenna system is simultaneously operative on two bands with magnetic coupling to the transmitter, operation on the lower-frequency band will cause a very strong radiation at the higher frequency if some means to minimize the generation of harmonics isn't employed. Obviously, a Farady screen will be effective only at frequencies other than the two for which the network is designed. Push-pull operation with plenty of capacity in the tank circuit (high *Q*) and matched tubes with equal grid drive will greatly reduce the generation of harmonics. This may be a sufficient precaution.

An antenna system designed along the lines described here seems to be quite involved but the results and convenience of the finished product should be very encouraging and well worth the trouble.

Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

W3DVE, M. J. McKenna, Philadelphia, Pa.

W9GEX, Pvt. David R. Lebeson, Winnetka, Ill.

W9TDM — ex-W5GEU, Capt. Lawrence G. Boyts, AC, Ft. Knox, Ky.

Strays

C. J. Harpold of Chicago, Illinois, reported "better than usual reception of signals between 23 and 30 megacycles" during the eclipse of the sun on July 10, 1945.

"Bismarck"

The Tale of the Electronic Dog

BY CPL. D. M. CRAFT,* W8CDX

SCENE: A bar. The character jostling my elbow speaks:

"Did I ever tell you about my dog, Bismarck?"

"No," I answered. "Have another beer?"

"Thanks," he said.

"Now, what were you saying about a dog?"

"A dog? Oh, yes — my dog, Bismarck."

"Didn't you mention a dog before?"

"Yes, but we got off on another story."

"I remember now," I said. "It was something about herding cattle with a jeep down in a Mexican shack with a blonde on your knee and a Boston aristocrat from Chicago and his daughter saving the jewelry from train robbers. Now proceed."

"Bismarck," he said, "was an electronic dog conceived by me and another dope at Brookley Field. That's in Alabama."

"What's in Alabama — the dog?" I asked.

"No," he said. "Brookley Field. Anyway, we accidentally created this dog while we were designing an electronic 'still' to take on the ship."

"What ship?" I asked.

"This ship we were going on," he said.

"What kind of drinks were you going to get from this still?" I asked.

"Electronic drinks. You know — give me a shot of electrons and a double proton chaser, old boy."

I laughed at this, so we had another beer. Things began to look better.

"What did this dog do?" I asked.

"I'll tell you. At first we couldn't keep track of him. Once I ran into him and I fell right in the middle of the shop. Another time this buddy of mine stepped on his tail. He still has an r.f. burn from the bite."

"Who — the dog?" I asked.

"No, my buddy. One day a young girl who was working near us spilled some yellow paint. She started to clean it up when Bismarck walked through it. Of course you couldn't see him, but his tracks went right through the paint and on across the floor."

"What happened?" I asked.

"The girl fainted. Later she said she got the shock of her life. After that we put a bulb on his tail so we could see him. He stayed lit up like my brother, Neon. We finally got him in an r.f. can, and when we left on the ship we stored him in the radio shop."

"Who — your brother?"

"No, Neon — I mean Bismarck, the dog. After we got things working okay in the shop we let Bismarck out and put the 'scope on him to see how he was doing. When he had warmed up and the 'scope had warmed up, we got the shock that was heard 'round the world."

"Huh?"

"I looked at the 'scope and turned pale. My buddy looked at the 'scope and turned pale. The beer looked at the 'scope and went flat. Where was I, anyway?"

"You were drinking pale beer and went flat." I said.

"Oh, yes. The miracle had happened. Bismarck was no longer a Mr. He was a Mrs. — and about to have sixteen little Bismarcks. Things were happening fast."

"I'll say! How do you account for the change?"

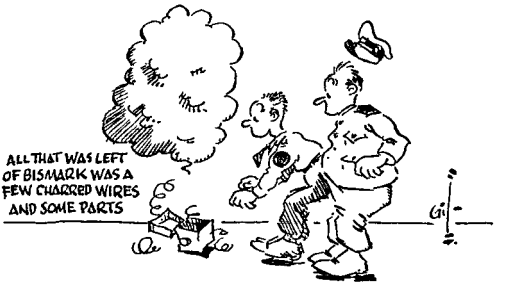
"Well, this r.f. can must have become grounded to the ship and Bismarck got an overdose of protons. I always said that if diode would have told what anode and cathode did, Bismarck's bleeder resistor would not have ceased to bleed. I think triode messed us up somewhere, too."

"What did you do?" I asked.

"When?" he said.

"When all this happened to your dog."

"We called the rubber repair department," he continued, "and put in an order for eight little foot pads. We didn't want the pups to ground



themselves out. They informed us we would have to go through channels. I called all departments including the chaplain. In ten minutes the sides of the ship were bulging because there were so many people in the shop. R.f. was arcing everywhere. I had a gold ring on my finger that just faded away. One of the ship's crew opened his mouth to say something and lost six teeth. A brass hat started to sit down and lost his hat. A submarine twenty miles away flashed us a message that the hull of the ship was glowing at a sixty-cycle rate. We were watching the 'scope. The big event was about to happen. We were ready, the medics were ready, and then —"

"Then what?"

"The lights went out and there was a deathly silence. Then the lights came on. All that was

(Continued on page 82)

*APO 347, c/o Postmaster, San Francisco, Calif.

IN THE SERVICES

THANKS to you fellows in Civil Service and 100% industry status for waiting so patiently for your names to appear in this column. We have given preference to men in the armed forces while many hundreds of non-military amateur listings waited in file till space permitted their being used. New registrations in all classifications still arrive daily but in decreasing amounts and the reserve supply now can be tapped to keep this column up to its usual size for months to come.

If you have registered, you can be certain your name will be used. If this is your first notice of the In The Services roster, be sure and send us the blank on page 22.

ARMY—AACS

ex-1BQX, Sprague, Sgt., foreign duty
1GGQ, Patten, Sgt., foreign duty
1LDX, Nelson, Pfc., foreign duty
1LNK, Burke, 2nd Lt., Atlanta, Ga.
1NUM, Guyette, Sgt., foreign duty
ex-2ARR, Olsen, S/Sgt., foreign duty
ex-2FUR, Runey, Pfc., foreign duty
2IGN, Lattanzio, S/Sgt., foreign duty

Hamming for the U. S. Coast Guard, CRT Nils Segerdahl, W2UX, *left*, and RT2c Ernest Jerome, W2AQH, were stationed at the U. S. C. G. Radio Engineering and Maintenance School, Groton, Conn., when this photo was taken.

ex-2KMA, Malumut S/Sgt., foreign duty
2LYL, Colonna, Pfc., foreign duty
2OIN, Shubick, S/Sgt., foreign duty
2OIP, Lipnick, Sgt., foreign duty
3CWQ, Backenstose, S/Sgt., foreign duty
ex-3FYE, Smith, 2nd Lt., foreign duty
3HKC, Huffman, Capt., foreign duty
3HSD, Olmstead, 2nd Lt., foreign duty
3JMW, McAdams, Capt., foreign duty
3JNF, Walker, Cpl., foreign duty
3JQS, Uptegrove, S/Sgt., foreign duty
4CJR, Long, Cpl., foreign duty
4EZX, O'Berry, M/Sgt., foreign duty
ex-4QV, Wheeler, Major, foreign duty
5DQB, Simpson, Pvt., foreign duty
5EUH, McCumber, Capt., Miami, Fla.
5EWD, Cole, Pfc., foreign duty
ex-5GDF, Harmon, S/Sgt., Miami, Fla.
5GQA, Hilbun, S/Sgt., foreign duty
5IWB, Welborn, Lt., foreign duty
5IZE, Hooser, Pfc., foreign duty
5JIT, Martin, S/Sgt., foreign duty
5JNG, Newton, Cpl., foreign duty
ex-6LMR, Benson, S/Sgt., foreign duty
6LTW, Cheney, 2nd Lt., foreign duty
ex-6NNT, Plemons, T/Sgt., foreign duty
6PYF, Dickinson, Cpl., foreign duty
6SSX, Tannehill, Pfc., foreign duty
K7FSU, Dyer, Pfc., foreign duty
7HIT, Wheeler, Pvt., foreign duty
ex-8BYC, Young, S/Sgt., foreign duty
8EL, Murrill, T/Sgt., foreign duty
8JJY, Springer, Sgt., foreign duty
8LNR, Smith, W/O (jg), foreign duty
8NFU, Cassell, S/Sgt., foreign duty
8OVJ, Hothem, Capt., foreign duty
8OYM, Polewka, T/Sgt., foreign duty
ex-8PGY, Weltz, Pvt., Sheppard Field, Texas
8QNN, Graser, 2nd Lt., foreign duty
8QUW, Bortz, Lt., foreign duty
8RBO, Janoff, Sgt., foreign duty
9BRV, Schlaugat, T/4, foreign duty
ex-9PPM, Ralston, Cpl., foreign duty
9PPN, Milligan, Major, foreign duty
ex-9YEP, Srebalus, Sgt., foreign duty

Operator's license only:

Anderson, Sgt., foreign duty
Bruner, Pvt., foreign duty
Evans, Cpl., foreign duty
Folsom, Sgt., foreign duty
Harbin Cpl., Liberal, Kansas
Hays, Pvt., foreign duty
Helvey, S/Sgt., foreign duty
Herne, T/Sgt., foreign duty
Hoelzel, T/Sgt., foreign duty
Hollinger, Pvt., foreign duty
Jamerson, Pfc., foreign duty
Kocak, Pvt., foreign duty
LaChance, Pfc., address unknown
Lambert, T/Sgt., foreign duty
Lesho, Cpl., foreign duty
Levick, Cpl., foreign duty
Lewis, Pfc., foreign duty
Lipstein, Pfc., foreign duty
Maier, Lt., foreign duty
Marcink, Pfc., foreign duty
Meek, Capt., Hensley Field, Texas
Partridge, S/Sgt., foreign duty
Perkins, Lt., foreign duty
Peruzzi, Pfc., foreign duty
Quick, Pfc., foreign duty
Renk, Cpl., foreign duty
Roberts, Lt., foreign duty
Ronanosky, T/Sgt., foreign duty
Schulte, S/Sgt., foreign duty
Semrad, S/Sgt., foreign duty
Spence, Sgt., Tinker Field, Okla.
Stone, Sgt., foreign duty
Supplee, Sgt., foreign duty
Swongut, Lt., foreign duty
Trauger, S/Sgt., foreign duty
Wall, Sgt., foreign duty
Welch, S/Sgt., foreign duty
Willar, 2nd Lt., foreign duty

COAST GUARD

1JEN, Drown, RT3c, Southampton, N. Y.
1JWT, Whitney, CRM, Winter Harbor, Me.
1MSQ, Collins, SP1c, Boston, Mass.
1MWS, Reynolds, CRM, New Smyrna Beach, Fla.
2KSX, Hackworth, CRE, address unknown
2LCK, Sallet, CRM, Westport, Wash.
2LQP, Amoroso, CRM, address unknown
2NRJ, Gilbert, ARM2c, Biloxi, Miss.
4FTA, Herrin, RM1c, Cherry Point, N. C.
6SOQ, Vanderheyden, ARM1c, Biloxi, Miss.
7GGD, Goble, EM1c, foreign duty
ex-8TGC, Rabe, CRM, address unknown
9DGZ, Daniels, RM2c, Charleston, S. C.
9QDF, DuBord, CRM, foreign duty
9TOM, Felthouse, RM2c, foreign duty
9VXY, Oatman, CRM, foreign duty

Operator's license only:

Cain, RM1c, Pacific Palisades, Calif.
Cameron, RM2c, Alameda, Calif.
Hiltunen, RM1c, foreign duty

ARMY—AIR FORCES

ex-1AIT, Burton, Capt., New Haven, Conn.
ex-1OS, Copland, Lt. Col., Maxwell Field, Ala.
2KJU, Peterson, 2nd Lt., Yuma, Ariz.
ex-3HEH, Longendorfer, M/Sgt., foreign duty
4IEO, Parrish, A/T, Albany, Ga.
5EQG, Sturges, Major, Maxwell Field, Ala.
5HZB, Gallagher, 2nd Lt., Randolph Field, Texas
5ION, Bailey, Major, Orlando, Fla.
5JLV, Coleman, Col., Orlando, Fla.
6LSG, Mueller, Sgt., foreign duty
ex-6OZT, Hascall, Major, Orlando, Fla.
6SLF, Allbright, Lt., foreign duty
6TFU, Jones, Lt., Tonopah, Nev.
7BDG, Goodwin, Capt., Orlando, Fla.
7ETG, Francis, Capt., Smyrna, Tenn.
ex-8CCI, Davis, Major, Orlando, Fla.
ex-8EOF, Bell, Lt., foreign duty
8PAO, Larabel, Pvt., Sheppard Field, Texas
8QXH, Jones, Capt., Orlando, Fla.
8RUJ, Sproull, Major, Orlando, Fla.
8THB, Peters, T/Sgt., Harlingen, Texas
8WKI, Gowen, Pvt., Sheppard Field, Texas
9AKV, Asire, 2nd Lt., Key Field, Miss.
9DSN, Minor, Capt., Newark, N. J.
9HID, Winter, Capt., Orlando, Fla.
9JOG, Wolfers, Lt., Robins Field, Ga.
9LTS, Gilling, Pfc., Wilmington, Del.

Operator's license only:

Dapron, S/Sgt., foreign duty
Jeziorski, T/Sgt., Gowen Field, Idaho
Quibell, T/Sgt., Port Jefferson, N. Y.
Syverson, Pvt., Sheppard Field, Texas
Walls, Cpl., Greensboro, N. C.
Whitney, S/Sgt., Boca Raton, Fla.
Wooten, Pvt., Sheppard Field, Texas

NAVY AERONAUTICS

1JFG, Cook, ART2c, Chincoteague, Va.
1MEH, Kachuck, ACRT, Michigan City, Ind.
1MUF, Snow, ACRT, foreign duty
ex-2HYH, Medler, ACRM, Memphis, Tenn.
2JNK, Hart, ART1c, address unknown
2NIR, Raske, CRE, Corpus Christi, Texas
ex-3BBM, Kleckner, ART2c, Corpus Christi, Texas
3HJY, Tarlton, ACRT, Norfolk, Va.
3IPD, Green, ARM2c, Memphis, Tenn.
3JPA, Smith, ARM2c, Memphis, Tenn.
4DUW, Call, ACRM, address unknown
4EAT, Carroll, ARM1c, Memphis, Tenn.
4GHG, Black, ACRT, address unknown
4HES, McKellar, RE, Corpus Christi, Texas
5ELQ, Lankford, ART1c, Corpus Christi, Texas
ex-5FXB, Reisgen, ACRT, Chincoteague, Va.
5IAO, Bourgeois, ACRM, Memphis, Tenn.
5JNV, Lister, ACRM, address unknown
5KHD, Stapp, ARM2c, Banana River, Fla.

NAVY—GENERAL

1ACS, Quinn, Ens., Cambridge, Mass.
1ANC, Dreyer, Lt., New York, N. Y.
ex-1AT, Coolikoff, Lt., Washington, D. C.
ex-1BMC, Needham, Lt., Washington, D. C.
1BNG, Whittemore, REIc, Hingham, Mass.
ex-1CBU, Hull, Capt., Washington, D. C.
1DG, MacLean, Lt. Comdr., Mare Island, Calif.
1GFN, Levinson, Lt. (jg), foreign duty
ex-1GS, Van Dyck, Comdr., address unknown
1GSB, Sunderland, RE, foreign duty
1HUG, Muckenhoupt, Lt. Comdr., Washington, D. C.
1IIB, Wallace, RE, Washington, D. C.
1ILK, Macy, Midshipman, Notre Dame, Ind.
1IRE, Murray, CRE, Chatham, Mass.
ex-KA1JD, Desrosiers, Lt. Comdr., foreign duty
1JEX, Menzel, Lt. Comdr., Washington, D. C.
1KJF, Ellefsen, RM1c, foreign duty
ex-1KSM, Richards, Ens., foreign duty
1KYR, Purinton, CRM, Chatham, Mass.
ex-1LBY, Fenn, Lt. Comdr., address unknown
1LDY, Licht, Ens., Noroton Heights, Conn.
1LOF, Ciaburri, S1c, foreign duty
1LVV, Gauthier, RM3c, foreign duty
1MCY, Favream, Ens., Notre Dame, Ind.
1MUV, Geyer, Lt., Washington, D. C.
1NGV, Spiller, S2c, Sampson, N. Y.
1NKB, Pitman, Lt., Washington, D. C.
1NSH, Kostecki, SoM3c, Charleston, S. C.
1NSX, Gramolini, RM2c, foreign duty
1QE, Reegan, Lt. Comdr., foreign duty
1QH, Benner, CRM, foreign duty
1RV, Chamberlain, RM2c, Great Lakes, Ill.
ex-1US, Johnson, Lt. Comdr., foreign duty
1YB, Hayes, Comdr., Washington, D. C.
2AG, Runyon, Lt. Comdr., Washington, D. C.
ex-2AGE, Casper, Lt., Washington, D. C.
ex-2AUO, Pleasanton, Lt. Comdr., address unknown
2BFZ, Payton, CRM, foreign duty
ex-2BRK, Schultz, CRM, foreign duty
ex-2CER, Cosman, Lt. Comdr., Washington, D. C.
ex-2CJE, Linn, Lt. Comdr., address unknown
ex-2CQW, Stay, Lt. Comdr., address unknown

MARINE CORPS

6PEU, Garlow, 2nd Lt., foreign duty
6TSQ, Canter, Sgt., San Francisco, Calif.
6UBZ, Talbert, MT/Sgt., El Toro, Calif.
7IKT, Johnson, MT/Sgt., Columbia, S. C.
8OYQ, Zetts, Cpl., foreign duty
8VJH, Holt, Sgt., foreign duty
9LCB, Davidson, Cpl., foreign duty

Operator's license only:
Hull, S/Sgt., Camp Miramar, Calif.
Ziske, Pfc., foreign duty

Honor man of his graduating class at Radioman's School, U. S. Naval Training Center, Sampson, N. Y., S1c (RM) Arnold Nocks, W2OAF, *center*, was transferred to d/f school at Casco Bay, Maine, last December and subsequently to sea duty. The gentlemen on either side of Nock's knees are Ebonee and Brandee, son and father respectively.

ARMY—GENERAL

2CMX, Meyer, T/5, Atlantic City, N. J.
2MZR, Christiana, Pvt., Ft. Leonard Wood, Mo.
2NUQ, Rausch, Sgt., foreign duty
ex-3AB, Ballou, Col., Camp Blanding, Fla.
4FAN, Park, T/5, foreign duty
6OFQ, Bee, Pfc., foreign duty
6QLK, Swarthout, Pfc., foreign duty
6SKX, Raffensperger, Pfc., Redwood City, Calif.
6TRX, Hendrickson, Capt., Boise, Idaho
6UDP, Lantz, Major, Columbus, Ga.
8NRU, Johnson, T/Sgt., foreign duty
8PFW, Fisher, S/Sgt., foreign duty
8WVO, Edwards, T/5, foreign duty
9QCF, Barrett, T/3, Oak Ridge, Tenn.
9WUK, Belott, Pvt., Ft. Knox, Ky.

Operator's license only:
Bumgardner, T/4, Ft. Ruckman, Mass.
Burnet, Pfc., foreign duty
Huber, Pvt., Camp Lee, Va.

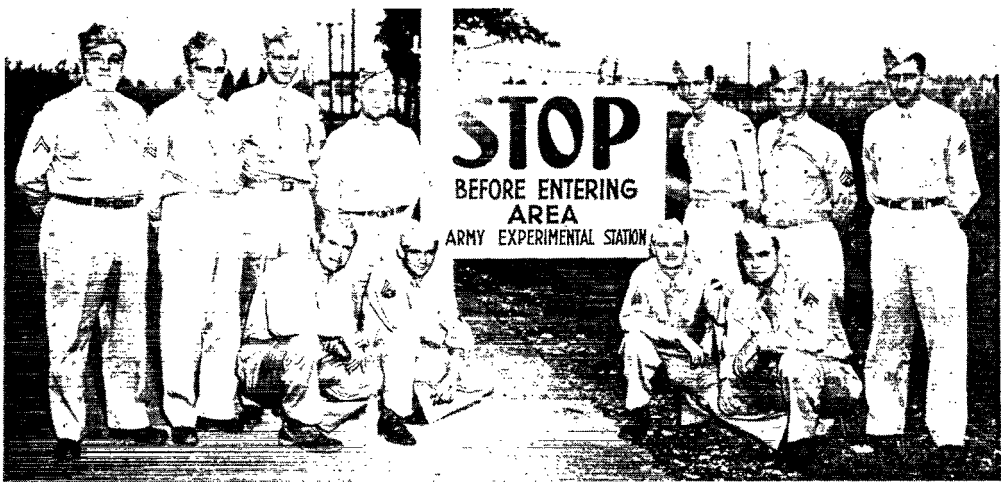
NAVY—SPECIAL DUTY

ex-1JMU, Woodhouse, CRT, foreign duty
1JTH, Young, S1c, Chicago, Ill.
1LHP, Rose, Palm Beach, Fla.
ex-1LLC, Alley, RT1c, foreign duty
2ILB, Tumulty, RT1c, address unknown
2LJA, Speiser, CRT, foreign duty
2LQS, Goldman, RT2c, foreign duty
2NSX, Smith, RT2c, foreign duty
2OAB, Dayhoff, RdM, foreign duty
3IQT, Merryman, RT3c, Chicago, Ill.
ex-1AKT, Higgins, CRT, foreign duty
4EXK, Barker, RT1c, Chicago, Ill.
4FEZ, McGuire, RT1c, Mechanicsburg, Pa.
4HFU, Lane, CRT, foreign duty
5GCC, Stipp, RT3c, Chicago, Ill.
5HET, Weisfeld, CRT, foreign duty
5IAA, Graham, CRT, Pittsburgh, Pa.
5JEA, Durham, RT3c, Chicago, Ill.

ARMY—SIGNAL CORPS

ex-1AES, Beard, Pvt., Camp Crowder, Mo.
1LMW, Dufour, M/Sgt., foreign duty
1NLA, McKeown, Cpl., foreign duty
2INR, Thomas, T/5, foreign duty
2JD, Baldwin, T/3, foreign duty
3BGF, Olson, Sgt., Ft. Monmouth, N. J.
3FDW, Schaeffer, S/Sgt., foreign duty
3JTZ, Huey, T/5, foreign duty
4AYP, Constantine, T/5, Upper Darby, P
ex-4CMS, Brown, T/3, foreign duty
4HVJ, Kaiser, T/3, Ft. Monmouth, N. J.
6PZW, Stewart, Pvt., Camp Crowder, Mo.
7DWI, Gunning, T/3, foreign duty
7FKQ, Phillips, Pfc., foreign duty
7HDB, Boden, Pvt., Ft. Jackson, S. C.
7HQE, Janssen, S/Sgt., foreign duty
7ICH, Rumbaugh, Pvt., Camp Crowder, M
8PHH, Gilbert, T/5, foreign duty
ex-8QCA, Fox, Sgt., foreign duty
8SAK, Skeen, T/5, foreign duty
8TED, Juengel, Lt., foreign duty
8TFA, Bobish, Lt., foreign duty
8TNU, Sterling, Capt., foreign duty
8VJX, Lyman, T/5, foreign duty
9ICQ, Nordstrom, T/5, foreign duty
9JBL, Lyon, 2nd Lt., foreign duty
9KCK, Koski, T/Sgt., foreign duty
9KNL, Hassel, S/Sgt., foreign duty
9OTA, Cook, T/3, foreign duty

Operator's license only:
Bailey, T/5, foreign duty
Drorbaugh, Pvt., Camp Crowder, Mo.
Halstead, T/5, foreign duty
Horton, CWO, foreign duty
Kruse, Cpl., foreign duty
Prakken, Sgt., foreign duty
Steunenberg, Sgt., foreign duty
Sullivan, Major, Cleveland, Ohio



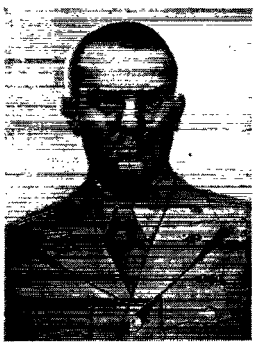
Amateurs stationed with the 9402 Technical Service Unit, Signal Corps, Army Experimental Station, Pine Camp, N. Y., send greetings to fellow amateurs in and out of the service. *Left to right, standing:* Pfc. Bleier, W2CR; Sgt. Kohler, W9JHC; T/4 Becker, W1NDJ; 2nd Lt. Wiggin, W1GEV; Pfc. Payer, W8VUC; T/5 Hook, W1EKU; Sgt. Lavetsky (operator's license). *Kneeling:* Pfc. Schraut, W9DDG; T/5 Wing, W4FSA; T/4 Bodwell, W9TML, and T/5 Skinner, W8LNQ.

MERCHANT MARINE AND MARITIME SERVICE

1EHV, Varey; 1GYO, Nystrom; 2AES, Hartnett; 4BJN, Heller; 4CWM, Swift; 4FMA, Dickens; 5AFB, Leonard; 5HOW, Hill; 5HQM, Maupin; 6PTJ, Libby; 6QXM, MacKenzie; 7HRY, Smith; 8TER, Dibble; 8VHT, Slutz; 8WKF, Watson; 9OFN, Graff; 9RSP, Wiley, and 9VAE, Meyer. Ballard, Bearden, Berg, Buonocore, Forsyth, Harmon, Hermann, Holland, Pleuler, Sadler, Sahud, Sepe, Thornhill and Williams hold operator's license only.

CIVIL SERVICE

1ADA, Taylor, technician, foreign duty
1BWH, Merrill, Navy Dept., Washington, D. C.
1FAK, Lyman, FCC, monitoring officer
1FHH, Curtis, Navy Dept., Washington, D. C.
ex-1KKF, Gainer, Navy Dept., Washington, D. C.
2AYN, Borsody, BuShips, Washington, D. C.
3EKH, Hall, BuShips, Washington, D. C.
3FRW, Miller, BuShips, Washington, D. C.
3HUM, Hemingway, Navy Dept., Washington, D. C.
3IFG, Springer, Navy Dept., Washington, D. C.
3WO, Hedrick, CAA, traffic controller Alexandria, Va.
4AEL, Marshburn, Navy Dept., Washington, D. C.
4FEY, Gaillard, AAF, radio mechanic, Columbus, Miss.
4GIE, Davidson, Navy Dept., technician, foreign duty
ex-5BRR, DeLaMatyr, Navy Dept., Washington, D. C.
6ADX, Sitar, Navy Dept., Washington, D. C.
6BGJ, Barbour, Navy Dept., Mare Island, Calif.
6DHA, Bailey, Navy Dept., radio mechanic, Clearfield, Utah
6FTT, Boltz, Navy Dept., technician, foreign duty
6FUU, Moore, AAF, instructor, Mesa, Ariz.
6GU, Jallu, Navy Dept., radio inspector, Clearfield, Utah
ex-6GWR, Hanmore, Navy Dept., radio mechanic, Clearfield, Utah
6RPJ, Patnode, Navy Dept., radio mechanic, Clearfield, Utah
6STU, Matthews, CAA, radio electrician, foreign duty
K6UDJ, Siegfried, AAF, installer, foreign duty
6UHZ, Robinson, Navy Dept., Washington, D. C.



Colonel Fred J. Elser, SC, W6ANM, started his radio career in Manila as pi1ZA about 1924, later becoming better known in DX circles as KA3AA before moving to the States. His Army career included twenty-eight months overseas, most of the time as signal officer for the Mediterranean Air Service Command. Back in this country, he is now air communications officer of the Eastern Flying Training Command, stationed at Maxwell Field, Ala.

To Ensign Jack Nelson, W8FU, U. S. Maritime Service, special thanks from the In The Services Department for sending us long and frequent lists of amateurs in and near his home in Amsterdam, N. Y., for the ITS roster. Many men overseas who have never sent us information of their war work have him to thank for their listing in this column.

7EET, Maggini, SC, radio repairman, Ft. Lewis, Wash.
7HGF, Crowley, CAA, foreign duty
K7HRW, Bahls, CAA, aircraft communicator, foreign duty
7IJS, Updegraff, FCC, monitoring officer
7INA, Holmes, FCC, asst. monitoring officer
8NTU, Seals, AAF, inspector, foreign duty
8WEV, Waslovas, Navy Dept., technician, foreign duty
9BON, Bernstein, SC, inspector, Chicago, Ill.
9DWP, Buerman, Navy Dept., inspector, Chicago, Ill.
9GPO, Young, SC, chief analyst, Dayton, Ohio
9IBL, Hodson, Navy Dept., radio mechanic, Berkeley, Calif.
9JXW, Fulton, Navy Dept., technician, foreign duty
9MRV, Martin, Navy Dept., Washington, D. C.
9PCH, Thompson, Navy Dept., Washington, D. C.
9TQQ, Phillips, Navy Dept., Washington, D. C.
ex-9UND, Deckwerth, SC, inspector, Chicago, Ill.
9VND, Jaeger, Navy Dept., foreign duty

Operator's license only:
Bradford, foreign duty
Meachem, Navy Dept., Washington, D. C.

100 PER CENT WAR WORK—INDUSTRY

Hallicrafters Co.

ex-1AUT, Pariseault
3JWU, Greenfield
5BMW, Mayberry
ex-9ANR, Williams
ex-9BJH, Drury
9BOB, Schuette
ex-9BOW, Johnson
ex-9BYK, Coverdale
ex-9CZU, Ebel
9GQP, Foot
9GSR, Lindquist
9IAV, Polkinghon
ex-9KOP, Prizy
9LDP, English
9NLG, Croxen
9NRI, Denk
9QVM, Palilonis
9QVW, Miller
ex-9RAD, Samuelson
9RHR, Bereczky
9SIN, Larson
ex-9SLR, Rieman
ex-9TLW, Heilig
ex-9VAA, Linenick
9VJO, Bauer

York Safe and Lock Co.

2ATX, Dillmeier
2BGF, Goffe
3BIL, Turkington
3EMB, Yelton
ex-3GA, Trout
3GIH, Sechler
3HYH, Waelde
3JNT, Coulson
3JOH, Cullison
8BQ, Walleze
8CRJ, Smith
8HAF, Altman
8KJU, Spotts
8KUQ, Payne
8RFM, Shade
8TTM, Calvert
8WAC, Davis
9FSW, Brooner

Remington Rand

1AL, Lamb
ex-1BAI, Bloomquist
1BFH, Nejako
1BFW, Muskatallo
1BR, Whittemore
1DBM, Rand
1DF, Grammer
1KHL, Bennett
1NKA, Smithwick
2KJL, Wilder

Eitel-McCullough

5CI, Patterson
6AAZ, Gordon
6AY, Brown
6BAX, Taylor
6BET, Ballou
6BIP, Becker
6CEM, Norton
6CEO, Howes
6CHE, McCullough
6DAM, Isgitt
6DBO, Koski
6DUW, Wunderlich
6DVB, Tallmon
6DZZ, Hoetzel
6EHW, Eaves
6HAM, Mandoli
6HB, Brown
6HTR, Coutts
6IUZ, Sanderson
6KFQ, Rothman
6LOK, Kehler
6LV, Baker
6LWA, Blanchard
6MVQ, Lawton
6OMC, Murdock
6ONQ, Woerner
6OS, Sigourney
6RRR, Leonard
6SC, Hall
6SZ, Johnson
6UF, Eitel
6VR, Patterson
6VX, Atkins
6WN, Arrigoni
6ZS, Snyder
9AIO, Higgins

Philco

ex-2BJL, Bernbaum
3CBU, Nager
3DNP, Hambleton
3ETM, Richter
3GFZ, Alexander
3JPP, Travers
3JYB, Foote
3SA, Adelberger
4AZT, Holland
4BAC, Cannon
4BOW, Sonderup
4DES, Evenhouse
4HGR, Walbert
5FCG, Butcher
5IWV, Siegel
6GUU, Garris
ex-8BFL, Bell
8BUJ, Spencer
8BVP, Falkner
8DRM, Woods
8GPU, Earl
8LNV, Kacsmar
8QNQ, Lowstuter
8ROQ, Robinson
8VIB, Godshalk
8VLS, Bowdon
9EGI, Koth
ex-9EWG, Ritter
ex-9FZI, Wightman
9PBV, Lofgren
9PCO, Gustafson
ex-9QZD, Ray

Western Electric-Hawthorne Plant

ex-4EZI, Mitchell
ex-5FOS, Anderson
ex-9AVF, Musselman
9BOJ, Slezak
ex-9BUS, Stephens
9CQS, Fitch
9ELD, Beringer
9FDA, Bohnstedt
9IKZ, Podliska
9KRU, Berge
9LOP, Witt
9MMV, TerVeen
9MSB, Wilson
9OFZ, Gartsman
9OLJ, Leverette
ex-9OOH, Pruchnick
9RSB, Kuldanek
9UWK, Schwarzenberg
9VH, Booty
9WTA, Weathers
9YJR, Shipinski

Operator's license only:
Peterson

Rutgers University — ESMWT

1AK, Hanchett
ex-1CRA, Carter
2AEA, Beers
2AJA, Kemp
2AMB, Huff
2ASB, Garretson
2CGY, Williams
2CZP, Schadt
2ENZ, Warner
2GJQ, Bjornson
2GNQ, Anderten
2HFX, Hiler
2IHQ, Kovar
2JJI, Thompson
2KMK, Schiffmayer
2LHP, Cohen
2MTV, Koch
2ODZ, McKean
3ABF, Albert
3AZ, Pond
3EWV, Valentin
3FBT, Lippencott
3FMQ, Anderson
3FTU, Boyd

Miss. State College — Vocational War Training Div.

4BYN, Rieben
4FTC, Rebik
4GDS, Hubbard
4IDI, Tally
5AUB, Huffman
5AWP, Essary
5BQD, Loe
5EPY, Lamb
5FO, Harris
5GPH, Westerman
5GXO, Bullock
5HHA, Hickman
5HKJ, Sanders
5HQC, Griffith
5KCU, Anderson
5KPI, Lyman
5MO, Gaddis

Operator's license only:
Dyess

Miscellaneous

7FGZ, Partlow, radio instructor, Great Falls, Mont.
7FHB, Houglum, Eugene Vocational School
7FMF, Brooks, radio technician, Northern Radio Co.
7FOF, Russell, radio instructor, War Training
7FVK, Burdick, foreman, Kaiser Shipbuilding Co.
7GND, Barker, OSRD, Pullman, Wash.

7GVW, Williams, Commercial Iron Works
ex-7GWS, Wood, engineer, Remler Co., Ltd.
7GWU, Hoppe, engineer, Pacific Electronics
7GZB, LaPlante, draftsman, Pacific Electronics
7HBB, Krogman, Portland, Oregon
7HDV, Gray, instructor, Moscow, Idaho
7HLV, Penners, technician, Naval Radio & Sound Lab.
7HMW, Pruess, Commercial Iron Works
7HOK, Clark, mechanic, Radio Specialties Co.
7HRX, Garman, instructor, Snohomish, Wash.
7HSK, Gountanis, tester, Wells Gardner
7HWK, Boden, inspector, Bellevue, Wash.
K7HZT, Ohlsen, observer, Carnegie Institution
7IAC, Boos, Commercial Iron Works, Portland, Ore.
7IKU, Johnston, radio officer, Air Transport Command
7INM, Eden, field engineer, Naval Research Lab.
7IOY, Nelson, radio technician, Northern Radio Co.
7IPF, Mitchell, Commercial Iron Works, Portland, Ore.
7IVC, Daniels, Puget Sound Navy Yard
7IYV, Nye, wireman, Seattle-Tacoma Shipbuilding Corp.
7JBM, Penwell, Northwest Radio Service
7LN, Dana, State College of Washington
ex-8ADO, Kahn, vice president, Transmitter Equipment Mfg. Co.
8AKS, Castor, Amsterdam, N. Y.
ex-8ALL, Chokan, inspector, General Motors
8AVI, Grigg, foreman, Bell Aircraft Corp.
8BKX, Woods, Dept. of Engineering, Univ. of Mich.
8BQA, Troup, foreman, Sparks Withington Co.
8BXX, Williams, technician, Crosley Corp.
8BYR, Scott, foreman, Curtiss-Wright Corp.
8BYV, Edmondson, instructor, War Training Program
8CCS, Bauer, radio technician, Curtiss-Wright Corp.
ex-8CFE, Debberthine, Fisher Scientific Co.
8CIB, Saltmarsh, engineer, Waterbury, Conn.
8CIL, Lindberg, Rudolph Wurlitzer Co.
ex-8CJP, Gasparovitch, tester, International Detrola Corp.
8CN, Wuyckhuyse, chief inspector, Rochester Products Co.
8CNA, Wolfinger, supervisor, Binghamton, N. Y.
8CQS, Biddle, General Motors
ex-8CVM, Miller, Wellman Engineering Co.

In spite of our earnest requests over past months for more listings of Canadian amateurs, our file shows five new names only since the Canadian section appeared in this column in July. That is too small a number to use this month and in lieu thereof we give you L/W Tel. Ramsay, WRCNS, Vancouver, B. C. She holds amateur operator license, issued at the beginning of the war and too late for a station ticket. We believe she is the only YL in the WRCNS to hold a ham license. Stationed at Moncton, N. B., she has volunteered for service in the Pacific.

8CYP, Norton, instructor, Colgate University
8DAH, Booher, electrician, American Shipbuilding Co.
8DYP, Stalker, Chrysler Corp.
8DZJ, Laub, engineer, John Meck Industries
8ECX, Fickel, flight radio operator, Consolidated Airways
8EHA, Freeman, Montana Mines, W. Va.
8EMX, Gardner, trouble shooter, Sparks Withington Co.
8ETH, Cleland, tester, Colonial Radio Corp.
8FBL, Kindl, Hagaman, N. Y.
ex-8FBP, Pulley, radio operator, Curtiss-Wright Corp.
8FF, Baker, Broadalbin, N. Y.
8FHB, Smith, electrician, Mather Spring Co.
8FIG, Eiler, radio operator, Goodyear Aircraft
8FV, Paine, Radio Lab., foreign duty
8FYM, Fischer, purchasing agent, American Steel Package Co.
8GAZ, Fischer, Minaville, N. Y.
ex-8GDY, Clapper, foreman, Hamilton Radio Co.
8GGG, Coleman, technician, Curtiss-Wright Corp.
8GU, Bliley, president, Bliley Electric Co.
8GZE, McClymonds, radio engineer, Sylvania Electric Products Co.
8HTV, Dilliner, mechanic, E. I. DuPont
8IRC, Harris, technician, Bud Radio Inc.
8JAB, Lown, foreman, Gar-Net Co.
8JOH, Dallas, Hickok Electrical Instrument Co.
8JSK, Curtis, foreman, Sparks Withington Co.
8JUB, Rose, engineer, Lear-Avia Radio Inc.
8JYJ, Jenks, instructor, Michigan State Normal College
8KAU, Kryss, Stromberg-Carlson
8KBW, Testut, Stromberg-Carlson
8KPE, Vanator, General Motors
8KXA, Bowman, electrical inspector, Stromberg-Carlson
8LFE, Higgy, instructor, War Training Program
8LIY, Walker, Batavia, N. Y.
8LLL, Olson, flight radio operator, Consolidated Airways
8LPJ, Brearley, coil winder, Line Material Co.
8LQB, Swope, electrical inspector, Line Material Co.
8LSQ, Sauer, electronic specialist, Chrysler Corp.
8MCM, Cawthorne, engineer, Electric Auto-Lite Co.
8MKW, Weiss, Hickok Electrical Instrument Co.
8MRD, Drakeley, Fairchild Camera & Instrument Corp.
8NCY, Durham, Pennsylvania Central Airlines
8NFZ, Dietrich, engineer, Naval Research Lab.
8NJH, Rockafellow, engineer, Flint Mich.
8NJR, Edighoffer, Curtiss-Wright Corp.
ex-8NSM, Murphy, Goodyear Aircraft
8NV, Lister, president, Electronic Research & Mfg. Corp.
8OCA, Fleming, engineer, International Detrola Corp.
8ODM, Dawson, engineer, International Detrola Corp.
ex-8OLO, Holt, instructor, Transcontinental & Western Airlines
8OPT, Tipton, engineer, DuPont Co.
8ORI, Mumma, National Cash Register Co.
8OSA, Edwards, engineer, Cleveland, Ohio
8OZH, Taylor, physicist, Carl L. Norden, Inc.
8PAL, Gross, engineer, Signal-U Mfg. Co.
8PBC, Sherman, radio technician, Crosley Corp.
8PEQ, Linley, engineer, Solar Mfg. Corp.
8PGD, Hendricks, foreman, Ford Motor Co.
8PPA, Hook, technician, Crosley Corp.
8PSP, Painter, General Motors
8PVM, Beenett, Willys Overland Motors
8PWA, Ports, Goodyear Aircraft
8PWK, Thomas, electrician, Lincoln Electric Co.
8PXR, Bell, ground radio operator, Ford Motor Co.
8QBR, Tupancy, inspector, Chrysler Corp.
8QEM, Wood, technician, Transcontinental & Western Airlines
8QMS, Neyer, Curtiss-Wright Corp.
8PXT, Martin, War Production Board
8RNO, Piotrowski, mechanic, All American Aviation
8RQO, Little, Ohio State University

Receiving congratulations from Lt. Col. Wootton, commanding officer of the AACS for the Central Pacific Area, upon his promotion from 1st. lt., Capt. Arthur Monsees, W6HJP, *right*, seems to enjoy the situation thoroughly. He obtained his commission after completing the communications cadet course at Scott Field and is now assigned to the engineering section of the AACS in the CPA.

8RSS, Robertson, technician, Crosley Corp.
ex-8RT, Jezorek, engineer, Bond Equipment Co.
8RWZ, Buchanan, engineer, Steel Products Engineering Co.
8SCS, Rutz, instructor, Dodge Radio Institute
8SDJ, Davidson, engineer, Crosley Corp.
8SDT, Hinzmann, General Motors
8SJO, Heaven, inspector, Lear-Avia Radio Inc.
8SKG, Hilberg, Hickok Electrical Instrument Co.
8SLV, Faussett, General Motors
8SPY, Seibert, instructor, ASTP
8SSS, Schueler, technician, Johns Hopkins Univ.
8SSV, Bien, Republic Steel Co.
8SZX, Wood, Hickok Electrical Instrument Co.
8TIL, Berg, Stromberg-Carlson
8TJU, Snyder, technician, Johns Hopkins Univ.
8TNT, Weaver, radio inspector, Lima, Ohio
8TQC, Johnson, instructor, National Cash Register Co.
8TWI, Walchi, engineer, Oak Ridge, Tenn.
8TXB, Keltz, Stromberg-Carlson
8TYL, Wehner, Stromberg-Carlson
8UOR, Gibson, Oak Ridge, Tenn.
8URP, Starks, Amsterdam, N. Y.
8UWK, Firestone, engineer, OWI
8UYR, Hyre, model maker, Electronic Labs.
8VBJ, Wood, flight radio operator, Navy Lockheed Service Center
8VJK, Snyder, foreman, Collins Bros. Tool & Die Co.
8VQD, Richards, engineer, Weltronic Co.
8VQS, Majewski, Amsterdam, N. Y.
8VTT, Hineline, Sparks Withington Co.
8VVS, Bohlander, instructor, Dodge Radio Institute
8VXX, Moncton, Hygrade Sylvania Corp.
8WAG, Jones, technician, General Motors
8WCY, Fry, engineer, USN Radio & Sound Lab.
8WDV, Schutt, trouble shooter, International Detrola Corp.
8WKE, Ammerman, engineer, Eastman Kodak Co.
8WKJ, Bee, International Detrola Co.
8WLT, Saj, technician, Curtiss-Wright Corp.
8WOB, Smith, foreman, Lima Tank Depot
8WTE, Aley, Stromberg-Carlson
8WTW, Edison, test foreman, Syracuse, N. Y.
8WVC, Medill, Jensen Radio Mfg. Co.
8WWQ, Mack, composite tester, Colonial Radio Corp.
8ZY, Duerk, engineer, American Steel Package Co.
9AEN, Young, engineer, Goodyear Engineering Corp.
9AGD, Rodenburg, supervisor, Midland Radio & Television Schools
9AI, Applebaum, engineer, John Meck Industries

How Microphones Work

A Discussion of Various Types of Voice Pick-Ups

BY ALBERT KAHN,* W9KYM

This article constitutes a discussion of the fundamental principles upon which several of the various types of microphones operate. In addition, some suggestions are given for selecting the proper kind of mike for a given application.

IN OPERATING practice, c.w. and 'phone have a lot in common. In both, signals must be easy and pleasant to listen to; they must get through QRM and QRN; and they should convey not only words but the personality of the operator. In the same manner that an x.p.d.c note with well-spaced characters and a rhythmic swing makes a c.w. station "the one you'd like to sked," a pleasant, well-modulated voice gives a 'phone station that something which makes it stand out from the others on the band as desirable to work. These qualities will, in the final analysis, give a ham a "they-want-to-work-you" signal. Aside from more answers to a CQ, the QSOs will have a better chance of developing into real friendships as a result of putting more personality on the carrier.

Fidelity

It has been said that there is no need for "high fidelity" in an amateur transmitter. "After all, what we need is speech, not music!" Such thinking ignores some pretty important factors. Quality *is* important. Speech is a very complex collection of sounds, and intelligibility may be greatly impaired by loss or over-emphasis or other distortion of some of those sounds. For instance,

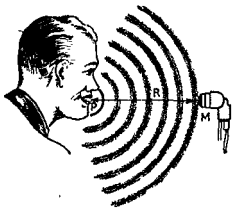


Fig. 1 — Hemispherical pattern set up by sound wave from speaker's voice.

"harmonic distortion," such as frequently appears in common carbon microphones in the form of strong harmonics generated within the microphone itself, produces one of the most unpleasant varieties of distortion. Also, of course, such harmonics are serious wasters of valuable r.f. energy and creators of aggravated sideband interference. The desired objective of an amateur 'phone transmitter is not to put maximum signal strength into a distant receiver but to put in a maximum of *intelligibility*, in a pleasant-to-listen-to voice. Many a low-power 'phone has proved astonishingly effective because its speech quality was extraordinarily good. High intelligibility and a "pleasant" voice often may accomplish more than would a boost in power and this can be achieved only with the aid of a microphone which does a good job on its initial end of the circuit.

Unlike brass pounding, where an operator pounds or wiggles a key, the 'phone ham actually

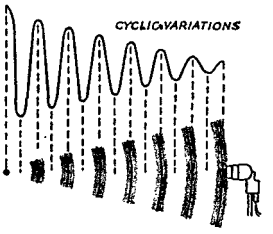


Fig. 2 — Section of sound pattern which actuates the microphone.

does nothing to the microphone. He talks to the air and the air, in turn, actuates the microphone. Accordingly, in any discussion of sound pick-up practice, we must consider the action of a sound wave on the microphone.

Fig. 1 is a picture of the coupling between the sound source, *P* (the ham's mouth), and the microphone, *M*, located at a distance away, *R*. Although the radiated sound is hemispherical, we are concerned only with the segment of sound shown in Fig. 2. The rest is radiated into space or reflected. (If the amount reflected is too great it messes up the calculations as well as the signal on the air.)

Emitted sound expands equally in all directions, decreasing in intensity by the square of

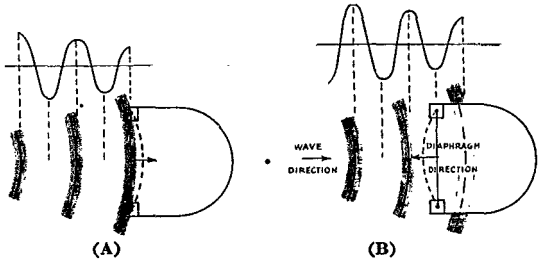


Fig. 3—A—Microphone diaphragm under pressure of sound wave. B — Diaphragm position under a "rarity" or absence of pressure. The shaded dashed line represents the part of the wave which is passing the microphone indicating that the wave direction and direction of diaphragm movement are opposite.

* President, Electrovoice, Inc., South Bend 24, Ind.

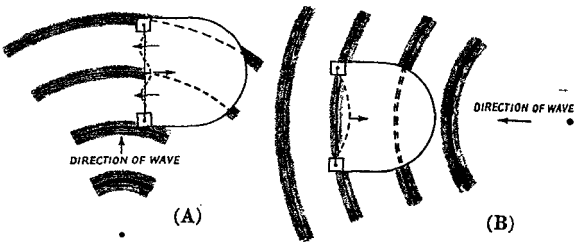


Fig. 4 — A — Diaphragm movement under wave approaching at right angles to plane of diaphragm. B — Wave approaching from the rear of the microphone.

the distance. (For simplicity, we are neglecting losses from absorption, etc.) This means that the voltage output will halve or the level will drop 6 db. every time the distance R is doubled. The increase of R directly increases reverberation pick-up, since there is always an existing ratio of direct-to-reflected-sound. This can be a serious source of distortion despite otherwise excellent audio equipment. The size of the room, the amount of soft material and wall and floor material of course will govern the workable distance to a conventional pressure microphone. Unidirectional or bidirectional microphones will increase this working distance by a factor of 1.7 and will be discussed later.

Pressure Microphones

The pressure type of microphone has the widest use. By definition, it is one which produces voltage directly proportional to the sound pressure applied. The back of the microphone is always closed to prevent the sound from striking the back of the diaphragm in improper phase relationship. Fig. 3-A shows a single-frequency sound wave, with the pressure component leading, striking the diaphragm. This pressure displaces the diaphragm from its normal position to that indicated by the dotted line and this movement is transmitted to a moving coil, crystal, carbon granules, or a condenser plate. At the next half cycle, the diaphragm position is shown by Fig. 3-B. At this instant, the wave has passed on and there is a rarity of pressure in front and the diaphragm springs back, through equilibrium, in the outward position. At the conclusion of the cycle it returns to rest in its normal position.

Since the pressure of a sound wave is equal in all directions, a sound wave from any direction will actuate the diaphragm. Fig. 4-A shows sound originating from the side and exerting side pressure on the diaphragm. Whenever the wavelength of sound from an angle is short compared to the diaphragm width, there are several points of pressure and of rarefication which cause irregular movement of the diaphragm. For highest-fidelity angular pick-up, the diaphragm therefore should be kept small. However, in actual practice too small a diaphragm lowers the output and usually a compromise is made. Fig. 4-B illustrates sound striking the microphone from the rear and energizing the diaphragm. This is true only, however, at the low and middle frequencies; the high frequencies travel in a beam and are accordingly deflected.

An ideal diaphragm is one which follows perfectly, in physical movement, the sound pressure applied and thereby provides an accurate voltage image, as shown in Fig. 5-A. Fig. 5-B illustrates a badly overloaded diaphragm of a moving-coil microphone which reaches its elastic limit before the sound pressure has reached maximum amplitude. Pressure and diaphragm movement start at normal and expand to the elastic limit of the diaphragm. At this point the pressure continues to increase but the diaphragm comes slowly to rest in its displaced position until the sound wave is on the decay side of the cycle and then it returns in phase with it. The electrical output, meanwhile, follows the velocity of the diaphragm or voice coil and, while

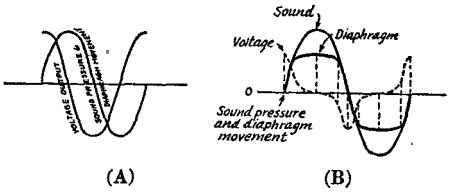


Fig. 5 — A — Curves showing relationship between diaphragm pressure and output for ideal conditions. B — The same for a badly overloaded diaphragm.

the diaphragm is at rest, the voltage drops, approaching zero. As the diaphragm returns at high velocity through equilibrium, an electrical surge is created in reverse polarity and a counterpart of the wave appears on the other half of the cycle. This sort of wave form is extremely abundant in harmonics, more odd than even. This action commonly is known as "blasting" and often results from speaking in too loud a voice directly into the microphone, particularly if it is designed for normal pick-up at, say, six inches to a foot away. Several microphones are commercially made for close work but

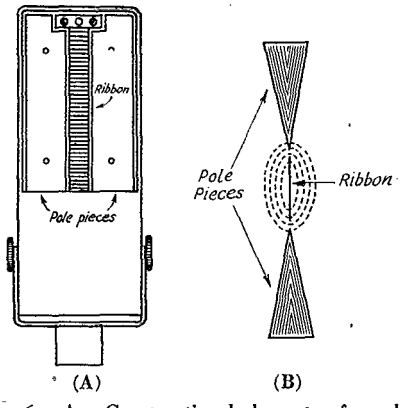


Fig. 6 — A — Constructional elements of a velocity microphone. B — A cross-sectional view of the pole pieces and ribbon as viewed from the top. The dotted lines represent magnetic flux.

few if any can be used for both close and distant pick-up with satisfactory results.

Pressure microphones are the closest approach to an all-around instrument. They maintain their inherent frequency response at various distances from the sound source and they can be built as a dynamic, condenser, crystal, carbon, or a ribbon with a closed back. Since the diaphragm can be made stiff, they are not, as a rule, too susceptible to breath or wind noise. They are semi-non-directional and can be used for group pick-up when room reverberation permits. Relatively high efficiency and excellent frequency characteristics can be secured with correct design.

Velocity Microphones

The velocity microphone is of the type which is responsive to the pressure gradient or the difference between the instantaneous sound pressure on the front and back of the ribbon or diaphragm. Fig. 6-A illustrates a conventional velocity microphone looking directly at the interior assembly. The ribbon is loosely suspended between the pole pieces which also serve as baffles. Variations in sound pressure move it through the magnetic field set up by a permanent magnet attached to the pole pieces, inducing a voltage in the ribbon. Fig. 6-B is a bird's-eye view of the same assembly showing the ribbon, pole pieces, and the magnetic lines.

Fig. 7-A is a picture of the ribbon being actuated by a single sound wave at the top half of the cycle, with the pressure component leading. For simplicity, it has a wavelength of less than one-fourth the distance around the pole pieces. For lower frequencies, actually there is a pressure on both sides of the ribbon and the microphone responds to the difference in pressures, the pressure gradient.

The ribbon moves through the magnetic field, cuts the lines of force, and a voltage is induced in the ribbon which is the electrical image of the sound wave. As the wave progresses a half cycle it passes around the pole pieces and at the instant of passing (Fig. 7-B) there is pressure from the rear and a rarity of air at the front. Since the ribbon is loosely suspended without any inherent spring and resonating below audibility, it floats back, following the difference in pressure between the front and the back — just as simple as that.

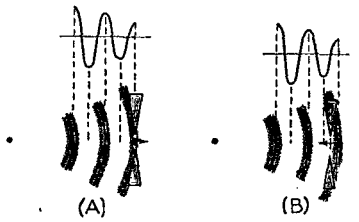


Fig. 7 — Movement of velocity-microphone ribbon in respect to wave direction.

In the design, it is necessary to determine the desired upper-frequency response and make the pole pieces, or baffles, the correct width. There is a direct relationship between baffle width and upper frequency cut-off, since the high frequencies which are physically close together do not have time to get around a wide pole piece before the next one is on its heels. Narrow poles require higher magnetic energization for a given level

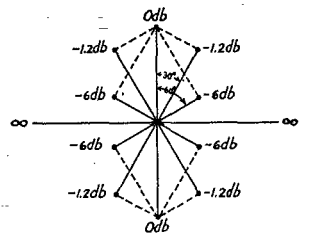


Fig. 8 — Directional characteristics of a velocity microphone.

since there is less collection of sound and therefore less movement of the ribbon. The baffles should be slightly less than one-half wavelength at the highest frequency to be reproduced. Thus you can measure the frequency response of a velocity microphone with a ruler, assuming no introduced distortion by the ribbon, coupling transformer, or sound reflection within the case.

The velocity microphone, it is seen, is bidirectional because if sound enters at the side, there is equal pressure on both sides of the ribbon and therefore no movement can result. Fig. 8 is a picture of the directional characteristics of a velocity microphone. The sound entering directly into the front or back gives maximum output, sound from the side producing zero output. As the sound strikes it from an angle, there is a corresponding decrease in level which may be represented by drawing a line (dotted) from angular to direct sound. If the angle adjoining the top of the angular sound angle is kept a right angle, the output will be graphically represented by the length of the lines, or, if you remember your trig, the output will vary as the cosine of the formed angle. The frequency response for all practical purposes will remain constant at all angles of sound incidence — there will be just a drop in level.

This bidirectivity can be put to work to reduce reverberation since the attenuation at the sides decreases random sound pick-up by 5 db. It can be oriented so that the sides face objectional noise (XYL and jr. ops?). It can be used between two persons and "worked to" from front and back with equal pick-up. As the ribbon in the conventional type is loosely suspended it will follow even extreme sound pressures without blasting and without the harmonic generation shown in Fig. 5.

The velocity microphone must not be worked too close to the sound source since there is a shift in phase between particle velocity and sound pressure at close distance which causes a substantial rise in the low-frequency response. Popular-priced velocity microphones are lower in output than their pressure counterparts and require higher-gain speech amplifiers and better input shielding.

The Differential Microphone

The third type of microphone, the differential, was covered completely in the December, 1943, issue of *QST*.[1] This has proved to be extremely useful for overcoming high ambient noise in nearly all military applications. Already it has been used widely for all types of communication in the aircraft, railroad, industrial, and emergency service fields.

Unidirectional microphones are a fourth type but in reality they are combinations of pressure and velocity elements which are operated together in such phase relationship that sound pressure adds from the front and cancels from the back. This has been done successfully in both dual- and single-head instruments. These provide a 5 db. reduction in random noise and are highly desirable in "live" rooms, especially where the undesired sound strikes the microphone from the rear.

Research has provided a wide choice of microphones and intelligence in selection and use is therefore more necessary than ever. The carbon microphone (pressure or differential type) has been widely used for military application and does provide high articulation. In addition, the modern version is durable and has high output. The chief disadvantage is high harmonic distortion, especially in the single-button variety,

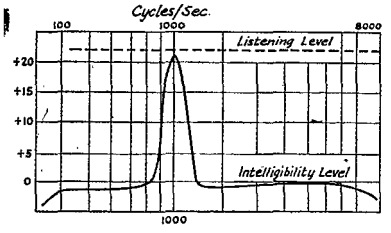


Fig. 9 — A hypothetical curve illustrating how a peak lowers the effective listening level.

which makes it less pleasant to listen to and is not in keeping with modern 'phone-station standards, except possibly in mobile use where high-level signals and light-weight equipment are of extreme importance.

Laboratory articulation tests have proven quite conclusively that a flat response curve between 200 and 4000 c.p.s. is ideal for communication service. Peaks in the frequency response lower the effective intelligibility at the receiving end as indicated by Fig. 9. In this instance the energy in the peak does not represent intelligibility but limits the receiver volume to the point of overload caused by the peak, yet if the peak is removed, the entire spectrum can be substantially raised. This same reasoning also can be applied to the rest of the transmitting and receiving equipment.

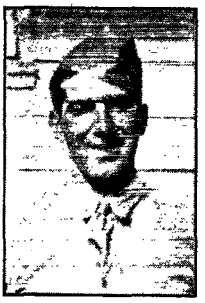
There will be a wide variety of microphones waiting for the radio amateur after the war. Wise choice of the appropriate type and correct use will put new sparkle in the QSO of Tomorrow.

[1] Beekley, "A Differential Microphone," *QST*, Dec. 1943, p. 36.

★ ★ ★ ★ ★ ★ ★ ★

Gold Stars

SGT. FRANK ROGOWIN, W8HFW, was killed at Donauworth, Germany, April 25, 1945, when the tank in which he was serving as radio operator ran over a mine.



Frank had graduated from a school of dentistry shortly before entering service, but his radio knowledge was more valuable to the Army. After receiving training in tank radio maintenance he became an instructor, serving at Fort Knox, Camp Chaffee and Camp Campbell before going overseas. W8HFW held Class A, radio-telephone and telegraph second-class licenses and was a member of the Mike and Key Club of Lorain, Ohio.

SGT. WINSTON V. BRADBURRY, W5CIQ, was killed in action in Germany, December 18, 1944. At the time he was serving as a radio operator with a field artillery battalion.

W5CIQ was a member of the New Orleans Radio Club and the Rag Chewers Club, and held radiotelephone first-class and telegraph second-class licenses. Prior to entering service in December, 1940, he had been an operator with the Mississippi Shipping Co., the Texas Oil Co. and had been employed at station WNOE, New Orleans. Before going overseas he was a radio instructor at Fort Bragg, N. C.

PVT. HENRY FRITSCH, W1NKV, was killed in action in Germany, December 3, 1944, while serving in the infantry.

A member of the Rag Chewers Club, W1NKV operated chiefly on 7 and 14 Mc. Up to the time of being inducted in June, 1944, he was employed by the Van Brode Milling Co., Clinton, Mass., as an electrical engineer. He received basic training at Camp Wheeler and went overseas early in November, 1944.

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PRESIDENT HIRAM PERCY MAXIM has visited the San Francisco Radio Club, the first time a League official has been on the West Coast, and, we read in *QST* for September, 1920, has told them the story of ARRL from the beginning to the present. Reports from the coast indicate that much good was done by the get-together. HPM was much impressed by the SFRC, which not only maintains a large meeting room but has an operating room and a Board room and sustains its activities the year around. While in that city he was also able, through the facilities of Lee deForest, Inc., to address the wireless world of the western United States over the 1-kw. radiophone at the California Theater, extending compliments to the amateurs of California and hoping that it would not be long before amateurs on our two coasts were in direct communication. . . . Mr. Maxim also has an article in this issue of *QST*, "Our Less Experienced Brothers," dealing with the danger that confronts our organization in the tendency of more advanced amateurs to draw apart from the beginners.

Transmitting tubes are soon to be available. Our leading technical article presents "A Few Ideas for Amateur C.W." The article describes and gives some circuits from NSF and 8XK, leading c.w. stations. New ideas presented in *QST* for the first time include the master-oscillator power-amplifier circuit, the a.c. heating of transmitter filaments, and the use of a spark-coil supply for i.c.w. 8XK, the station of Frank Conrad in Pittsburgh, is the subject of the cover illustration and of the station description of the month. He has spark, i.c.w. and 'phone, generally on a wavelength of about 250 meters, and has been one of the best stations in the BuStands-ARRL Fading Tests. . . . S. Kruse, assistant electrical engineer at the Bureau, makes a preliminary report of "Station Performance During the BuStands-ARRL QSS Tests of June–July, 1920," comparing the performance of the various transmitters and receivers which engaged in the work. Fifty of the fifty-one observers used Paragon-type receivers. . . . League and Bureau officials have conferred and arranged further tests which are to be held in October, January and April.

"The Construction of a Two-Step Amplifier" is described by McMurdo Silver in his first *QST* article. "How to Tune the Honeycombs" offers practical-experience instructions on how to get results, by that maestro of the honeycombs, A. L. Groves. "QRU" is the pen name of an unknown contributor who authors "The First Epistle from The Young Squirt to The Old Man," the first of a series of lively exchanges which is to delight amateur radio for years.

KBW, the editor, takes inventory of our progress of the past year since our reopening:

"Technically, our stations have improved in ability beyond anything that the most optimistic of us would have imagined possible a short time ago. All during the past summer it has been an ordinary thing to hear Pittsburgh, Washington, Chicago, New York and Hartford working each other, not to speak of many other equally distant points. And all of this has been done on wavelengths below 250 meters. Continuous wave transmission, both straight and modulated by buzzer, is in nightly use, and it is a rare evening that the human voice and the strains of music do not come in over the air. Messages by the thousands are dispatched every night, and reliable communication over long distances by the ordinary citizen without the assistance of any public equipment or organization is an accomplished fact. This is CITIZEN RADIO as some of us dreamed it years ago. We call it 'amateur' radio, but it is more than that. It really is the first instance of an independent, countrywide, citizen-owned-and-operated utility. Fellows, honestly, it is going some.

"Before the year rolls around we expect to see tremendous improvement in reliability, in distance covered, and in the breadth of our field. We shall see transcontinental messages as common as inter-district messages now are, we shall hear the voice used up to a thousand miles, and we shall see five radio stations where now stands one. It's a great game we are in, fellows. Let's stick and watch ourselves grow."

Strays

A 1915 issue of the New York *Times* carried these headlines: "DeFOREST TO AID AGAINST ZEPPELINS. Will Place His Electric Detector at the Service of the Allies. It Is Expected to Record Airship Propeller's Vibrations and Disclose Their Location." The news item continued: "A middle-aged American inventor [Dr. Lee deForest] with an electric bulb will arrive in London this morning on a hurry-up call from the British Government to show Sir Percy Scott how the British capital may avert danger from Zeppelins. And when the American inventor has done his work in London he will cross the Channel to devise a system of protection from air attack for the treasures and the lives of Paris." Shades of radar!

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We were told recently of a newly announced naval craft: LSC (Large Swivel Chair).

Those Singing Masts

The Story of a Sea-Going Radio Broadcasting Station

BY LT. ANTHONY W. BORGIA,* W6EOU

IN THE past few months feature articles have appeared in such magazines as *Newsweek*, *The Saturday Evening Post* and *Broadcasting* concerning the radio broadcast ship *Apache*. This U. S. Army Signal Corps mobile signal installation has played an important part in the dissemination to the press and radio networks, not only in the United States but in Australia as well, of news of the invasion by U. S. and other Allied forces in the Philippine Islands.

The *Apache* is one of several ships which were released to the U. S. Army Signal Corps for the installation of mobile radio facilities. It is of particular interest since it is the only ship equipped with complete modern broadcast station facilities, and the only one capable of joining moving sea-borne assault forces and providing on-the-spot press and radio news coverage to the millions of radio listeners throughout the world, on both standard broadcast and short-wave frequencies.

In the summer of 1944 the public relations department of the SWPA theater decided that a radio ship was required which could accompany invasion fleets and broadcast on-the-spot news items of general interest to the public, and certain propaganda to the enemy-held islands. The *Apache*, a 500-ton 180-foot former Coast Guard vessel, was the nearest reasonable approach to what was desired from several ships which were available at the time. This good old ship, now over 55 years old, has weathered two battle campaigns, having participated in both the original invasions of Leyte and Luzon.

But these operations were not without incident. On one occasion while we were in convoy and headed for Luzon, salt water somehow managed to get into the ship's fuel supply with the result that the *Apache* fell far behind its convoy position. We knew the deal was going to be a hot one and some of us began to have visions of being left behind and thereby miss out on the invasion landings. The islands which we were passing at the time were within easy sight and were most definitely occupied by the Japs. We had no desire to be left behind. Thanks to our bosom buddies, the U. S. Navy, a tug was sent back to give us a tow and remained with us for nearly two days until the trouble was remedied.

Converting the Apache

To fit it for its purpose the *Apache* had to be radio-equipped. Accordingly, it was sent to Sydney, Australia, to be converted according to a specific plan of alterations. The equipment was to consist of two broadcast-type transmitters, of ten kw. output rating each, a soundproof studio with its associated control room, and two self-contained generators capable of developing 100 kw. of electric power to operate these facilities. A v.h.f. radio installation also was supplied to provide a link to ground positions so as to permit facilities for remote pick-ups, shore communication and teletype service.

Transmitters and generator equipment had to be installed in the number two hold. Since this equipment was quite massive in weight and dimensions, special planning and arrangements were necessary. After the two 50-kw. diesel-engine power units were lowered into the hold, they were slid aft and a steel wall was built across the entire width of the hold, so as to actually divide it into two portions which became the transmitter and generator rooms. These walls had to be soundproofed to obtain minimum noise disturbance from the generator room. After the flooring, walls and interior electrical wiring were partially completed, the transmitter cabinets were moved into their respective positions. Then followed the heavy oil-filled three-phase power

Among the hams serving aboard the broadcast ship *Apache* are, *left to right:* 1st Lt. L. A. Pierce, W9CHO, operations officer, OIC; 2nd Lt. Paul Juengel, W8TED, studio officer; 1st Lt. A. W. Borgia, W6EOU, transmitter officer; Sgt. Vert Mandelstamm, W8VJD, studio NCOIC. *Official U. S. Army Signal Corps photographs.*

*APO 500, c/o Postmaster, San Francisco, Calif.

Lt. Paul J. Juengel, W8TED, at the studio controls of General MacArthur's broadcast ship, *Apache*.

transformers and modulation choke and transformers which comprised the power and Class-B modulation system. Completion of various tasks such as welding and bolting of cabinets, electrical wiring, and carpentry jobs was continued. Simultaneously, the construction of the studio was commenced, and it was placed directly above the hold in which the transmitter equipment was located.

The studio and control rooms were constructed so that in reality they became a floating, rubber-cushioned unit, suspended within the steel-fabricated bulkheads. The studio is completely soundproofed with a special perforated material known as Acoustax. The control room is so designed that the operator views the commentator in the studio through an especially designed window consisting of three individually paralleled lengths of plate glass, with dead air space between each section. Both the transmitter and studio rooms as well as the generator rooms are air cooled by a number of blower and exhaust fans.

After the building and fabrication of the control room and studio had been completed, a six-channel console, two Presto 18-inch turntables, recording equipment, two all-wave receivers, plus an equipment rack which accommodates various amplifiers and power supplies, and a patch panel were installed. This equipment was principally of Australian manufacture. The receivers were especially contracted for in Australia and designed to Signal Corps specifications. They somewhat resemble the old favorite HRO and are used primarily for program cueing and remote pick-up purposes. In view of the fact that the receiving antennas were mounted within fifty feet of the transmitting antennas, reception and service has been remarkably satisfactory under the conditions to which these receivers were subjected.

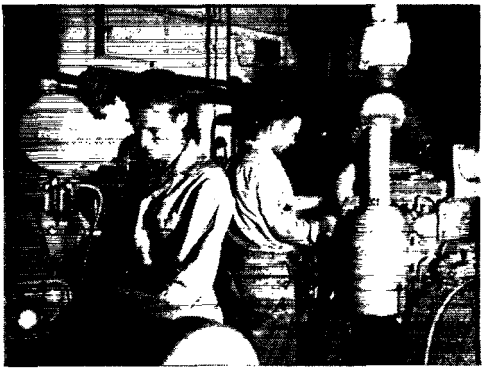
A suitable location for the antenna installation was required and the ship's two masts presented the most logical answer to this problem. Each mast was extended to a height of 54 feet above the main deck, with yard-arms of 5-inch steel pipe firmly secured in place at the top of each. Between these yard-arms were rigged two center-fed Zepp-type antennas for use with the short-wave transmitter, and a quarter-wave Marconi for the medium-wave rig. Since the operating frequencies which had been assigned were not harmonically related, center-fed Zepp antenna systems were decided upon since they could be readily tuned over a wide range of frequencies. Directional systems were out of the question, prevailing tides and winds in the bay usually being such that the azimuthal position of the ship could be controlled only to a limited degree.

A broadcast antenna tuning box was mounted on the foredeck. This was heavily constructed of steel plate, and waterproofed as protection against heavy rains or deck spray. A coaxial-line trunkway provides the necessary lead to the output terminals of the medium-frequency transmitter. An especially designed steel trunkway approximately 30 feet in length was constructed to bring the two 600-ohm open-wire lines leading to the high-frequency antennas directly over the output bowls of the short-wave transmitter.

Four-channel v.h.f. carrier equipment was installed to permit ship-to-shore or ship-to-ship telephone service, remote program pick-ups, and to provide teletype channels. During the entire operations this equipment was in constant use. It proved itself invaluable, since at times noise levels were so high on the regular short-wave receivers that satisfactory transmission of remote broadcasts could be made only by using the v.h.f. system. Unfortunately, security regulations do not permit further discussion of this equipment.

Installation of the equipment had to be completed while the *Apache* was en route from Sydney to New Guinea as insufficient time had been allotted to complete the wiring of the studios and transmitter. It therefore had to be done en route if the *Apache* was to pick up the large staff of war correspondents assigned to it and reach a secret rendezvous in sufficient time to join a waiting convoy.

Truly the *Apache* was a seaworthy ship, but during rough water she rolled so heavily that installation work in the transmitter compartment could be carried on only for short intervals.



T/Sgt. Harold Hendricks (*right*), chief power maintenance man, adjusts one of the two three-phase diesel-engine generators, while Cpl. Wm. Hardin inspects the relief generator. Either one or both power units may be used simultaneously to provide as much as 100 kw. for the transmitting gear aboard the *Apache*.

Only twenty-four hours were available for final tests after the *Apache* reached its New Guinea base. A civilian Australian engineer, who was connected with the firm which constructed the custom-built medium-frequency transmitter, was flown from Sydney to meet the *Apache* for final tests. During this period voice communication with Brisbane, Australia, was established, and a report that we were being heard direct in California was joyous news to our ears.

On to Leyte

After these brief preliminary tests the *Apache* was ordered to take convoy position. It was not many hours later that she was part of a glorious spectacle of hundreds of troop-laden warships headed for the Jap-infested island of Leyte in the Philippines, which at the time only a few knew to be the actual point of destination.

The morning of A-day, October 20, 1944, saw us looking at land for the first time in about a week. It was a beautiful clear day. Shortly after sunrise, which we awaited tensely, we had our first taste of Jap bombers and the suicide planes of the Kamikaze Corps. Our ack-ack fire and our own carrier-based fighters were superb. They kept those sons of heaven out of our hair, while wave after wave of troop-carrying vessels were unloaded and beachheads established. Indeed, we saw the Nips catch hell, but as a reminder — and should any of us forget — we also saw some of our ships and lads go down valiantly as well.

Radio silence had been lifted. Navy warships were tossing heavy caliber shells directly over the *Apache* — and we were on the air. Sound effects were plenty and varied, but certainly not imitated; this was the real stuff! Fortunately our studios and control rooms were effectively soundproofed, so the noises encountered were not loud enough to drown out the commentator's voice. Transmission of on-the-spot news and commentaries continued directly to RCA at San Francisco, whose facilities were the feed-point for radio networks in the U.S.A.

The description of General MacArthur's forces landing on the island of Leyte was rebroadcast on the v.h.f. equipment. In the Luzon operation the v.h.f. equipment was used to handle programs originating at distances of approximately 100 miles. These remote pick-ups were necessarily relayed through intermediate stations at specific points and also over telephone wire circuits during certain portions of the span. All of this was necessary to feed spot news to various radio networks in the U.S.A.

It was at this time that resumption of the previously silenced "voice of freedom" broadcasts were again commenced. Using a frequency of 7795 kc., daily broadcasts were made to all friendly guerrilla and civilian forces summoning them to take up arms against the common enemy. Our coverage of the Philippines was excellent on this frequency. Obviously the Japs were hearing our programs, but it is doubted that they particularly enjoyed hearing them; for one thing, we rather imagined they considered them a bit too close.

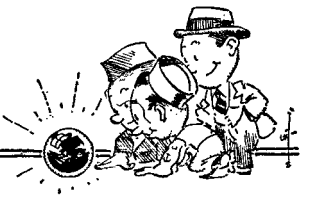
S/Sgt. Mel Gade tunes the 10-kw. h.f. transmitter final. Assistant Operator Pvt. Richard Budde checks the transmitter frequency. Note the spare modulator tube which is a water-cooled 10-kw. type 220-C.

Through grapevine channels information reached us that Americans and Allies held as prisoners of war in Japanese internment camps also were picking up our broadcasts on concealed receivers. Of course the Japs did not permit internees to have receiving equipment of any kind, so someone would mysteriously convert the camp theater sound system into a receiver long enough to pick up the Allied news broadcasts. Just how they did it I have never been told, but we do know that the ingenuity and cunningness of these men managed to solve the impossible. News usually was passed around by word of mouth, but in at least one case a single sheet of news copy was secretly typed and circulated. Even the civilian population was closely watched. No short-wave receivers were permitted, and those receivers containing more than the standard b.c. band had all the short-wave coils removed. This of course limited radio reception to two or three local broadcast stations which were under Jap control. So far as the average Filipino radio fan was concerned, these Jap news broadcasts indicated only how favorably the war against the Americans was being waged and how badly our troops were being annihilated, even to the day that we actually landed on the island of Luzon.

Our equipment permitted operation on either the short-wave or standard b.c. frequency transmitter but both could not be operated at the same time. Due to our position in the Leyte Gulf some 350 miles south of Luzon, it was determined that best coverage would be possible on our 7-Mc. channel. It was not until the *Apache* reached the

(Continued on page 84)

THE CRYSTAL BALL



CONDUCTED BY A. DAVID MIDDELTON,* W2OEN

THIS department gets under way with some lively and interesting discussions on postwar amateur station equipment design, construction and layout. Soon after the announcement appeared in July *QST*, material began to arrive from you boys with the hot ideas! The quality and quantity of the brain storms received shows that much thought and considerable planning has already been devoted to the equipment and layout for those all-important stations to be installed and operated, come VJ + X.

We are pleased to present the following "previews" from the logs of some of the best "crystal gazers" in the business.

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TWO-STAGE TRANSMITTERS

HERBERT S. BRIER, W9EGQ, Indiana's SCM, wants c.w. and 'phone transmitters with at least 200 watts input, using not more than two stages in either the r.f. or a.f. circuits. W9EGQ wants the whole rig to be fed from one power supply. He writes as follows: "An 813 at 1500 volts will permit an input of 225 watts on frequencies up to 30 Mc. The 813's grid-drive requirements (less than half a watt) allow it to be coupled lightly to an 807 oscillator, so that amplifier variations will not affect the frequency. Fundamental crystal operation with low-drift crystals up to 14 Mc. and tripling from a 7-Mc. crystal to 21 Mc. will be easy. For 28-Mc. operation a 14-Mc. crystal will be required, doubling in the oscillator. With crystals as plentiful and cheap as they are expected to be after the war, multifrequency operation can be obtained at low cost. With such simple r.f. gear, separate units may be used for each band.

"A pair of 828s at 1700 volts will produce 300 watts of audio without the grids drawing power. They will loaf along at 100 watts. A single transformer-coupled triode stage between the 828s and a good single-button carbon mike will suffice.

"It would be even simpler if there existed a series of tubes for modulators designed to run at the same voltage as the companion r.f. tubes. Such a twin beam tube could be built into one envelope. Designed for a.f. work only, no compromise would be necessary for r.f. use.

"There's my dream transmitter — 225 watts input, 100 per cent modulated, with a single-unit power supply."

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MODERN FEATURES FOR POSTWAR W3JOP

T/SGT. GLENN W. SMITH, W3JOP, plans the following postwar features for his station:

"*Panoramic reception* — Its advantages are numerous and amateurs are sure to make the fullest use of it.

"*Modulation oscilloscope* — Built into the transmitter rack or cabinet, full information on the percentage of modulation, c.w. characteristics, and harmonics would be available continuously. Not new, but a postwar necessity.

"*Electronic keyer* — I want an electronic keyer that automatically makes dots and dashes depending on the key-arm movement. Contacts would be speeded up, especially with break-in operation.

"*Band-edger*" — For the v.f.o. controlled transmitter, a visual 'band-edger' indicator (to keep the operator from running out of the band when hunting that open spot) would be a great asset. It requires time to set up the conventional frequency meter for each change in frequency. With a 'band-edger' indicator, set to the edge frequencies, the operator would have no fear of stepping on 'forbidden freqs.' Indications could be by tuning-eye, relays, cut-offs, or lamps. The system I have in mind has twin r.f. circuits coupled to a conventional frequency meter with one circuit tuned to the high end and the other to the low end of the band, and with proper tolerances taken into account. Any r.f. passed by the r.f. 'selector' circuit would be automatically meas-

**Assistant Editor, QST.*

September Prize Winners

Contributors to the Crystal Ball Department are awarded monthly prizes consisting of a $25 War Bond as first prize; $10 in War Stamps as second prize, and $5 in War Stamps as third prize. One dollar in War Savings Stamps is awarded the writer of each additional published letter not receiving a major prize.

The most interesting letters are selected by two members of the Headquarters staff: the conductor of this department and a "guest judge." This month's winners, chosen by F. Cheyney Beckley, W1GS (*QST*'s Advertising Manager) and W2QEN, are: Francis K. Campbell, W5IGJ, first prize; T/Sgt. Glenn W. Smith, W3JOP, second prize; Lt. J. C. Phipps, USNR, W8SMH, third prize; Herbert S. Brier, W9EGQ; Henry B. O. Davis, W4HZI; B. F. Davidson, W6RWO; Warren A. Lanfer, Buffalo, N. Y.

ured. The alarm amplifier *output could* be used for relays, lamps, or any other indicator.

"*Plug-in equipment sections* — I'll build my transmitter in a 'rack and panel' or cabinet, with each section or panel removable by just loosening a screw or two and sliding the unit out. All outside connections to the unit will be made through banana-plugs and jacks or similar connectors mounted rigidly on the rack or cabinet body, making it unnecessary to disconnect any wires to remove a section. All inter-section wiring would be mounted permanently in the rack or cabinet. This would quicken tube changes, wiring, checking, cleaning, neutralizing and coil changes.

"'*Visitor' indicator* — Y'ever been interrupted during a good QSO by the doorbell or telephone bell? Why not mount visual indicators (small colored lamps) on the operating table to indicate the presence of a caller rather than allow the bells to be relayed on the air. A switch on the operating table, used to flash on a 'One moment, please' sign, *outside the front and/or rear door*, would give the op time to finish his transmission or reception. A telephone extension should be located near the operating table.

"*Dummy antenna* — A dummy antenna should be built right into the antenna tuner."

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FREQUENCY INDICATORS ON A V.F.O.

WHILE gazing into my Crystal Ball I first saw a pile of quartz crystals being gradually pushed across the table towards the junk box by a really stable v.f.o. unit.

This v.f.o. had a number of little neon bulbs around the edge of the dial. When the dial reading was 7000 kc. the first bulb lit, and, as the dial was rotated across the band the bulbs would glow one after the other until the last bulb was lit. The dial then read 7300 kc. One of the bulbs indicated the frequency (7185 kc.) of a schedule to which my v.f.o. was tuned. (See Fig. 1.)

Upon looking in the v.f.o. cabinet, I discovered my old crystals neatly connected into a buffer amplifier coupled to the oscillator. As the resonant frequency of each crystal was reached in tuning the oscillator, the little 1/25-watt neon bulb for that crystal would glow.

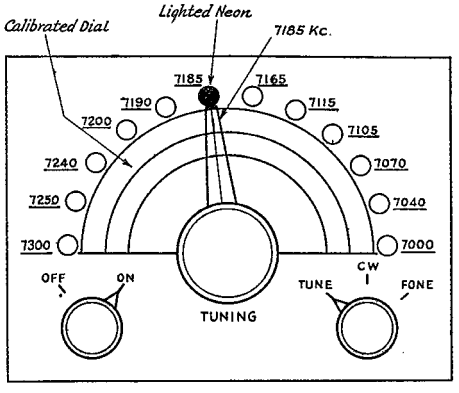

Fig. 1 — Application of crystals (devices formerly used to control transmitter frequency!) as indicators in a v.f.o. When the v.f.o. is tuned to the frequency of one of the crystals the associated neon bulb lights, indicating the location of the variable oscillator. The unit is shown set up for a spot frequency schedule of 7185 kc.

The arrangement appeared very convenient. Besides having v.f.o. operation I had visual indication of where I was located in the band. If the v.f.o. changed calibration for any reason it was immediately apparent. The indication of band limits also was very helpful.

— *Henry B. O. Davis, W4HZI*

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A HAM BUYS A RECEIVER IN 'VJ+1

THE year is 19VJ + 1 and Joe Blow, a ham who patriotically sold his gear to the armed services in 1942, enters Honest Harry's radio store. The clerk approaches and, upon ascertaining that Joe wants an all-wave receiver but only has fifty bucks to spend "right now," leads him over to the counter and points to a neat job that has controls labeled "Crystal Filter," "Noise Silencer," "I.F. Band-Width," "C.W.-'Phone," "Band Change," "Bandspread Tuning," and "A.M.-F.M."

Brother Joe lets out a whoop of joy, but is immediately silenced by the thought that he has but fifty bucks.

"Don't let that worry you," says Honest Harry. "Look inside." The lid is opened and there are all the fixings crowded neatly into the cabinet.

Still the fifty looks very small, but now Honest Harry is pulling out — yes, *pulling* out — most of the gear. When he is finished there remains the front panel with its controls and tuning condensers and band-change switches, the chassis deck filled with tube sockets, and a power transformer. The speaker is separate.

"Now, we begin by plugging in the rectifier tube, the filter condensers and the filter choke into their sockets, one for each item," he announces. The power-output tube goes into its socket, and another square box into an adjacent tube socket. This, the clerk explains, contains all the resistors and condensers used in the power-tube circuits. To service the unit all one does is to remove the box from its socket, remove the cover from the box, and replace the defective part. Indeed, the entire box is available in the store, both on an exchange basis or as an outright purchase.

Next the combination second detector, first audio and a.v.c. tube is plugged in, with its associated little black box, an i.f. transformer, and a jumper box. This permits use of the set without a noise-silencer circuit.

The i.f. stage tube, transformer, etc., are plugged in, and so on until with proper equipment a good receiver is available.

So Joe Blow buys exactly fifty dollars worth of receiver, giving him one stage of r.f., mixer, one i.f., plus detector and a.f. — meanwhile mentally planning on getting a noise silencer as soon as his funds permit. He lets the speaker slide this trip.

It is now 19VJ + 3. The same set purchased two years previously is working. Joe turns off the f.m. broadcast and tunes in 80-meter c.w. The

noise silencer is on, the i.f. band-width "sharp," crystal filter in, and two stages of r.f. and i.f. give all the soup needed. Joe's fifty-dollar basic set is now grown up and doing a real job. And Joe has not lost on his investment at any stage of the game.

— Lt. J. C. Phipps, USNR, W8SMH

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ADVANCED THOUGHTS ON EQUIPMENT PLACEMENT

FRANCIS K. CAMPBELL, W5IGJ, of Houston, Texas, did some serious and intense gazing into his Crystal Ball, and recorded his findings in an epistle from which we quote:

"How fortunate he is whose XYL selected such a beautiful residence — a two-story job on a hill in a diathermy-free region with a master bedroom and clothes closet directly above the combination den, hamshack and closet. An enterprising ham could easily drill a water well through the floor of the shack closet wherein to ground everything. What a set-up the stacked closets offer! An 80-, 40-, 20- and 15-meter band-switching, c.w. and 'phone, 1-kw. rig mounted on an aluminum door with supporting rollers, replacing the regular door. A similar installation directly above, covering the higher bands, all remotely controlled from the operating position. (See Fig. 2.)

"The blessing of my neighbors in general, and my XYL in particular, will be lavished upon my head for eliminating power-line feed-back and unsightly exterior wiring by simply placing the three-wire r.f.-choked 115-volt line *underground*. These blessings may be withdrawn as soon as the necessary antenna array for all the bands appear above our domicile. But what is that I see sprouting from my roof-top? I wonder if I could sell my XYL on the idea that such a beautiful residence should be protected from lightning. I could certainly prove the necessity of having a very high and heavy conductor to carry the discharge direct to ground, and what would be better than to bury the end of a 3-inch pipe in the well below my rig and extend it up through both closets to a point about six feet above the roof, then reduce to 2-inch pipe for ten feet, then add ten feet of 1-inch pipe and ten feet of ½-inch pipe for good measure, so as to provide lightning protection for our good neighbors as well. (See Fig. 3.)

"After I have gone to so much trouble to protect the house (and neighbors) from lightning, I am sure no one would object if I ran a few coaxial cables on the inside of the mast pole to feed a few elements and skirts and things attached to the mast itself. And a half-wave doublet would help steady the mast in a wind, wouldn't it!"

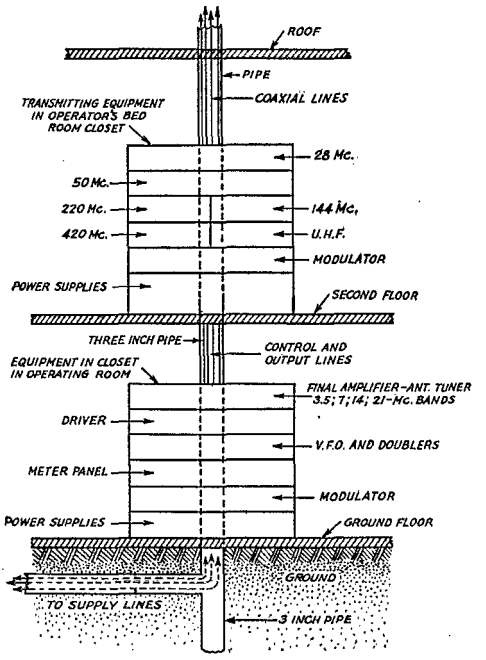


Fig. 2 — Coördinated installation of transmitting equipment in closets on two levels. Supply lines are brought in underground. The 3-inch pipe extends down into a well or other suitable grounding arrangement. This pipe also extends upward through the roof. Equipment control and feed lines are run through the pipe.

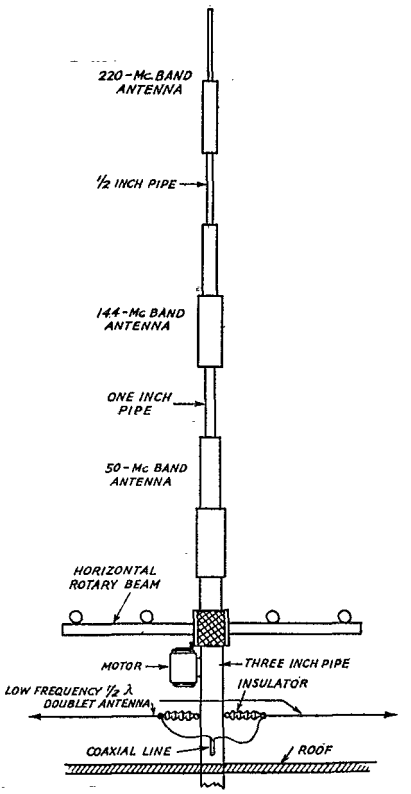


Fig. 3 — Coaxial antenna system proposed by W5IGJ to eliminate unsightly roof-top arrays. Note the rotary beam and the doublet antenna. This system is mounted on an extension of the 3-inch pipe rising from the well or ground under the house. This affords the lightning protection which is the main selling point used in persuading the XYL to allow such a system on a de luxe domicile!

[Just how OM Campbell proposes to feed all those gadgets on the pipe mast — and how well they will work — he sayeth not! But we suppose he will have another vision in his Crystal Ball by the time he gets all that stuff erected. — EDITOR.]

A SIMPLIFIED, LOW-COST TRANSMITTER

THE postwar transmitter design submitted by Warren A. Lanfer, of Buffalo, N. Y., includes several interesting and versatile features:

1) A three-tube r.f. circuit, using 807s, requiring only one 750-volt power supply with suitable taps.

2) Complete front panel band- and frequency-shift, including the antenna tuner.

3) A 50-watt r.f. output on all bands from 3.5 to 28 Mc.

He plans to use low-frequency variable crystals in a Tri-tet giving doubling and quadrupling output to feed the final tube, which is always an amplifier. A third tube will be switched in between the oscillator and the amplifier to furnish additional flexibility for output on 21 and 28 Mc. The transmitter will include a pi-section antenna coupler to which will be connected a 130-foot end-fed antenna.

Variable frequency crystals will give a wide range of output frequencies with a relatively limited number of crystals. High voltages will be eliminated from the coils and tuning condensers through the use of shunt feed.

A few of the possible combinations are as follows:

Tri-tet Oscillator	*Doubler*	*Output Amplifier*
3.5–3.5 Mc.	Not used	3.5 Mc.
3.5–7.0	Not used	7.0
3.5–7.0	7–14.0	14.0
3.5–10.5	10.5–21.0	21.0
3.5–14	14–28.0	28.0

Lanfer plans to build his transmitter and its power supply into a single cabinet to be located right on the operating table, thus providing flexibility and operating convenience.

SPACE-SAVING TECHNIQUE FOR MOBILE GEAR

B. F. DAVIDSON, W6RWO, of Sacramento, Calif., has given considerable thought to postwar mobile and portable equipment design. He suggests:

"Let's build our portable-mobile equipment as compact as possible. Take a look at your automobile and notice the unused space behind and under the front seat. In some cars there is space under the dash and in the corners of the luggage compartment. Suppose you find an odd-shaped space, say three inches high and eight or ten inches wide and deep. Take a 2 × 8 × 10 inch chassis and place subchassis in it for tubes and other components. The tubes can be mounted parallel with the normal top of the chassis. This arrangement will permit the unit to be mounted on the back of the front seat, as in Fig. 4-A, or even under the seat in some installations. With modern components and miniature tubes, proper equipment design will permit strange but efficient form factors. See Fig. 4-B for a sample chassis layout.

"Maybe you don't have space for one unit containing all the necessary elements. Make up two,

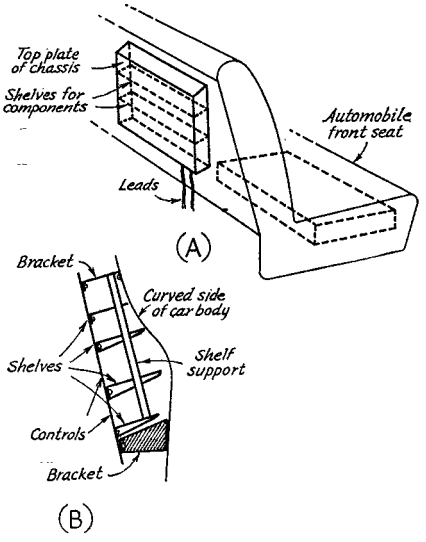


Fig. 4 — **Unconventional but efficient placing of v.h.f. units for mobile operation. Internal shelves in a chassis provide locations for components," as shown at (A). An unusual approach to equipment construction is depicted at (B) where a specially formed chassis and bracket layout utilizes the space in a curved car body.**

three, or even four units, each containing a portion of the gear and mount them where it is convenient and efficient. This has the advantage of placing the r.f. unit as close to the antenna as possible and places the power pack near the battery source, thus shortening the primary leads.

"Just a note on efficiency. Watch your filament load. Why use tubes with 0.3- or 0.7-ampere filaments when 150- to 400-ma. tubes are available. Let's utilize a tube at its maximum efficiency and pick each tube for the job it has to do. Quick-heating tubes in transmitters will save lots of battery current!"

HOW'S YOUR CRYSTAL BALL WORKING, OM?

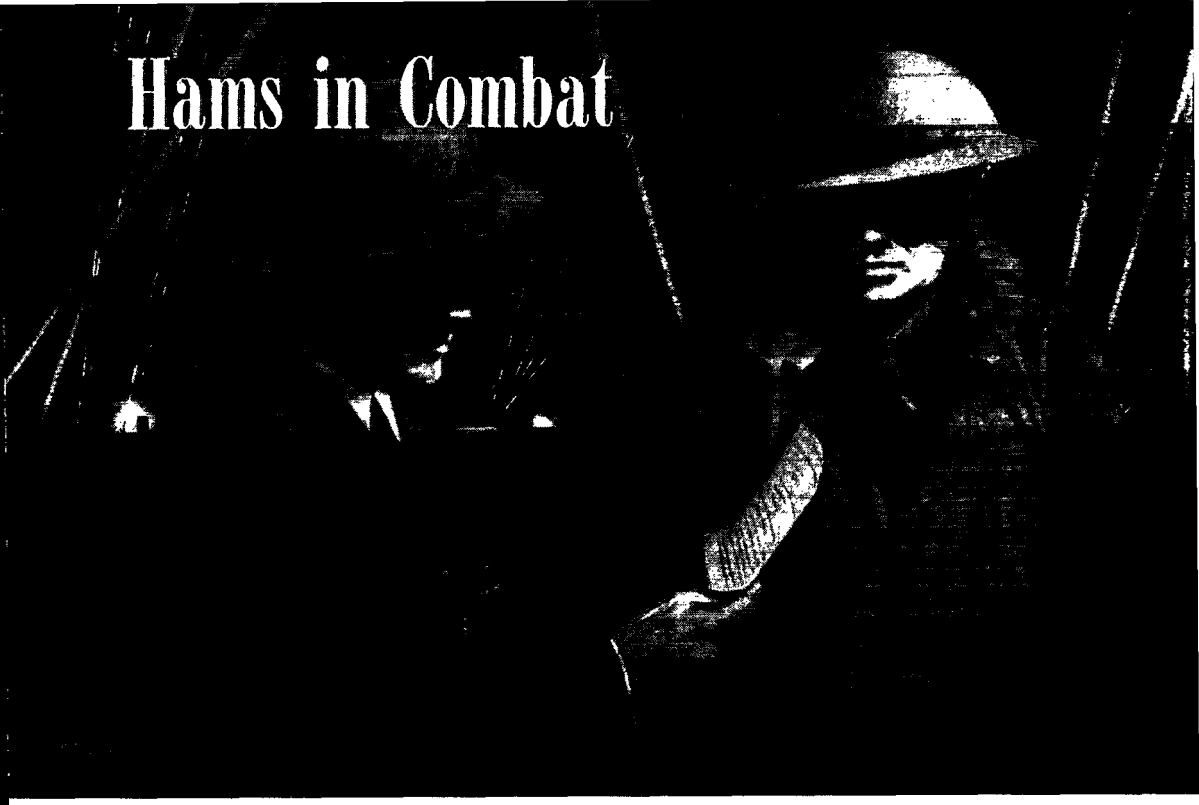
THE Crystal Ball Department solicits letters and sketches describing your postwar plans for that super ham station you have dreamed about for these many long years. Send in your ideas and rough sketches of your plans. We'll pick out the items of most general interest and maybe Harry Hick or Phil Gildersleeve will fix up a drawing or a cartoon from your sketches.

Now is your chance to get your ideas on paper. Maybe *you'll* win a useful prize that will help pay for that new equipment!

Address your contributions to:

The Crystal Ball Department,
American Radio Relay League,
38 LaSalle Road, West Hartford 7, Conn.

Hams in Combat



Last Stand at Calais

BY G5NO*

I WAS stationed in Dover late in May, 1940, carrying out wireless maintenance work on a fleet of minesweepers and patrol ships. Although only a humble telegraphist I had been in radio work during peacetime as well as being an old-time ham, so it was not too remarkable that I should have been given the job.

I had completed the retuning of a converted minesweeper and was about to walk down the gangway when I was met by the chief telegraphist. "Hello, young fellow-me-lad," he greeted me. "I've got some news for you."

"I hope it's good news," I replied.

His head went down. "Um — er — well — you've caught up with a draft!"

Now a draft in the Royal Navy means either a move or a new ship. Naturally, my spirits dropped; I liked my present job. However, the CT went on to explain that this was a special draft which would last only a few days. He ended by telling me to report to the flag officer the following morning for instructions.

On the dot of 0900 this apprehensive telegraphist presented himself to the designated officer. A flag officer is an imposing spectacle, even nowadays, for he is entitled to wear an aiguillette (a twisted gold cord bent around the left shoulder, terminating in two large gold tassels). Never before had I seen splendor from such close range.

*Name and rank withheld by request.

My activity commenced with: "Sparks, here is your first message. Get it off as quickly as possible!"

Naturally, I was impressed — decidedly impressed.

Apparently I was expected. As soon as I had knocked, entered and removed my hat, he greeted me kindly with: "Come in. Sit down and have a cigarette." I had never before been treated in this manner by an officer. Always it had been: "Stand at attention when you speak to an officer — take that grin off your face — put your cap on straight."

I was told that I was to proceed aboard HM Yacht *Censored*, first obtaining all spares, tools and gear that could possibly be required to keep a set going continuously for three or four days. On no account must the apparatus go off the air. I was to keep continuous watch, taking down everything that came in. This seemed like a tall order to one with only ham experience behind him but I had done continuous operating during contests, so why back out now?

The yacht was small, only about 200 tons, with twin diesel engines and a maximum speed of about 14 knots. Her armament consisted of one dummy three-pounder forward and a machine gun amidships.

We sailed from Dover that afternoon under sealed orders — destination unknown, mission unknown. When a certain position was reached, the orders were opened. "Proceed to Calais and contact the sea transport officer." This did not sound very serious. Perhaps it wasn't going to be so much after all.

We slid into Calais harbor a couple of hours later. All was quiet — no guns, no sirens, no planes. In fact, except for the large troop ships unloading tanks, all the world might have been at peace.

After an hour of anxious waiting our commanding officer, who had gone ashore some time earlier, returned with a naval commander and an army colonel. They came straight to the wireless cabin and we heard their story. Fifth column activity had disorganized the French lines and the nation was collapsing rapidly. Our forces could hold out for only a few days, in which time we were to evacuate as many men in uniform as possible. Speed was essential. Our yacht was the only means of communication with England. On no account were we to go off the air!

My activity commenced with: "Sparks, here is your first message. Get it off as quickly as possible!" It was a 200-word message explaining the whole desperate situation to the War Office — at the same time requesting reinforcements, adequate air cover by day, together with transport facilities.

From then on things really began to move!

Darkness was falling fast, and with it came the sound of planes and the French sirens. I was about to experience my first air raid — and I had a 200-word message to send! My hand went to the motor-generator starter, then to the main h.t. switch. I pressed the key with an anxious eye on the hot-wire aerial ammeter. The pointer commenced to move slowly across the scale — one-half, one, two, two and one-half. We were on the air! One short call to the Dover w/t station and back they came with a QSA5 R6 report. I replied immediately, stating that I had an urgent message. This I passed along, swinging into an easy gait of 20 w.p.m. I had always been told that "slow but sure" was the best policy — and, believe me, it pays. On completing the 200 words he came straight back with "UR 2012 R." I sat back with a sigh of relief.

By now the blitz outside had started in earnest. The Germans, too timid to make a low-level attack at specified targets, simply flew over with load upon load of bombs, dropping them from 20,000 feet — too high for our machine guns and antiquated a.a. batteries to touch the planes.

As there were no further messages to keep me occupied, I found myself listening to the bombs and getting more scared as time passed. What was that? There was a long bump which sent the ship rocking. (I learned later that this was my introduction to the famous screaming bomb — Hitler's Secret Weapon No. 1.) Something hard hit the deck forward. I looked out — the whole of the fo'c's'le was illuminated as if a fireworks display was in progress. I heard a shout from the bridge. "Bosun, get that fire out!" Just then the yacht gave a lurch to port from another near miss and the ball of fire rolled off the deck into the water. A near shave!

My stomach was turning all ways. Now I really was scared! But this feeling didn't last long, because just at that moment Dover started calling us — and was he letting it rip! This was no ordinary fist; this bloke was using a bug. Bug keys are forbidden in the service, so naturally I was a little suspicious. I passed the headphones to the chief, saying: "I don't recognize that fist, do you?"

"Here! Get cracking, lad! That's the warrant officer himself," was his curt reply.

I did not like this at all, what with bombs dropping all around us and a bloke calling me up on a bug at 25 w.p.m. Surely this was worse than hell itself! How I managed to take that message with only one repeat I know not to this day. My hand was shaking with excitement, or panic, or whatever you call it. My stomach was turning somersaults and at the best of times I'd always had a job writing at 25 w.p.m.

Next followed the decoding. That wasn't easy, either, although the chief did most of it. I don't remember the exact words, but the gist of it was that we were to proceed with the evacuation of troops with all speed. Air cover would be supplied by day, for three days only, after which we would have to get along the best way we could.

The remainder of the night was uneventful. The raid continued into the small hours of the morning, by which time it seemed as if the whole of Calais were on fire. Lights were unnecessary in the cabin for with the door open one could easily read by the light from the fires. Several ships in the harbor were ablaze, as well as storage houses on the quayside.

Soon after dawn broke two Hurricanes came over. They made short work of the enemy. I saw one tackle three Jerries at once. By now messages were coming in thick and fast — so fast, in fact, that some of the crew had to be called in to assist the chief with the decoding. The day wore on. I was beginning to feel the strain of little food and no sleep. Finally, around 4 P.M., the traffic slackened off. The chief took the cans off my head, saying that he would take a turn. What a relief!

I took a stroll ashore. The place was a heap of burning rubble. I walked into what had been a hotel. Everything was deserted except for

(Continued on page 78)

U. S. War Bonds for Stories of War Service

***QST* wants reports on the experiences of radio hams in active service on the battlefronts — for immediate publication in this section, where feasible, or to be held confidential where security considerations so require.**

Do *you* have a story of war service to tell — either your own or that of someone you know? Then write us a letter giving full details, including photographs, clippings and other substantiating data where available. If your story is published in *QST*, you will receive a $25 U. S. War Bond. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted, or if all information must be held confidential.

"Tom Thumb"

A Combination Single-Tube Transmitter-Receiver Complete with Power Supply

BY PAUL J. PALMER,* W8UGR

"Hi, dere, fellers," said Tuffy 6L6G. "At last dis guy 8UGR gimme a rest wid dis conbinashun oscilliater 'n' reception committee. Boy, shur'sa relief from wot Fred Sutter 'n' sum o' youse guys had me doin'. Dat 8QBW sure boined me up more'n once wid his gestoppo tackicks. Dese lil 79s er 6Y7Gs 'r' sure swell pals — 'n' cheap too. Dey kin woik bote en's agin de mittle widout lettin' ya down. Youse kin use dis lil peewee fer dat State Guard 5-watt eighty meter ban, too, widout no trouble as well as bein' swell fer de emoigency woik when we gits bak on. Well, gang, 'slong 'n' 73. BCNU, I hope."

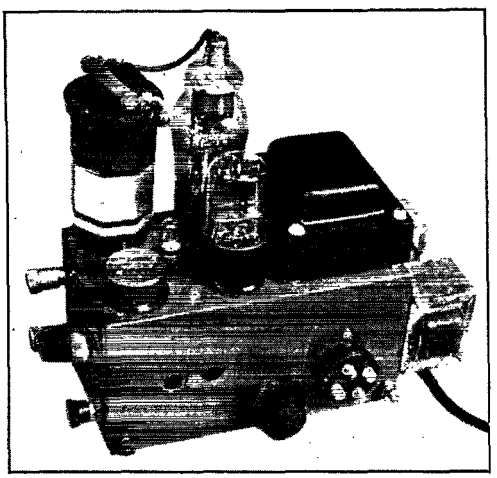
TOM THUMB" is a small, compact, complete little c.w. rig just a mite bigger than the QSL-type rigs. Both transmitter and receiver are mounted on a single chassis, primarily designed for QRP work and AEC emergency service.

The rig is designed primarily for the 40- and 80-meter bands, and while not of high power — around 6 or 7 watts output — it can serve very readily in local emergency service. In fact, it would be very suitable for the recently authorized 3.5-Mc. band State Guard WERS service.

The Circuit

The circuit for "Tom Thumb," shown in Fig. 1, really comprises two separate units. The 79 (or its octal-base counterpart, the 6Y7G) is a twin triode with the grid of one section connected to a cap at the top of the tube. This latter section is used as a detector in a single-tube regenerative circuit, while the other triode section is used as a simple tetrode crystal oscillator.

* 868 Whittier Blvd., Grosse Pointe Park, Detroit, Mich.



Top view of the "Tom Thumb" transmitter-receiver. The 79 tube is in the rear and the 6X6GT in front. Along the front edge are the screwdriver-tuning openings, the regeneration control knob, and the audio-output socket for making connections to an external audio amplifier.

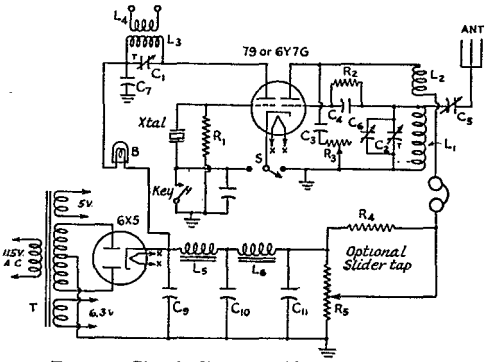


Fig. 1 — Circuit diagram of "Tom Thumb."

C_1, C_2 — 140-$\mu\mu$fd. dual ceramic trimmer.
C_3, C_4, C_7 — 100-$\mu\mu$fd. mica.
C_5 — 3-30-$\mu\mu$fd. trimmer.
C_6 — 100-$\mu\mu$fd. midget variable.
C_8 — 0.01-μfd. tubular, 300 volts.
C_9, C_{10}, C_{11} — 8-μfd. 400-volt electrolytic.
R_1 — 50,000 ohms, 1 watt.
R_2 — 2.5 megohms, ½ watt.
R_3 — 6,000 ohms, wire-wound.
R_4 — 25,000 ohms, 2 watts. (May be replaced by slider on R_5.)
R_5 — 25,000 ohms, wire-wound. (Slider optional.)
L_1, L_2, L_3, L_4 — See coil chart.
L_5, L_6 — 15-h. filter choke.
B — 60-ma. pink-bead dial lamp.
S — S.p.d.t. switch.
T — 450 volts, c.t., 40 ma.; 6.3-volt filament.

Several novel features are provided, being the use of a dual ceramic band-set condenser to tune the tank circuit of the transmitter and the tuning circuit of the receiver. This makes it possible to set the transmitter tuning at the best possible position for the crystal; once adjusted, it is not likely to be jarred off tune by handling. It is possible also to tune very close to the desired frequency for the receiver and then simply use the band-spread condenser for slight variations caused by the antenna or other detuning effects. The dual ceramic condenser has a capacity of 140 $\mu\mu$fd. per section. It is adjusted through small holes in the chassis. This system was adopted to eliminate as many controls as possible, after the style of police and other equipment designed for emergency use.

In lieu of the dual ceramic condenser, small air trimmers could be mounted in the coil forms for band-setting controls. This would simplify considerably the wiring of the coil sockets, and give more flexible control for quick crystal change-over.

Since, in the sort of service in which the rig is designed, long-range reception is not needed, the single-tube regenerative receiver is all that is required. If greater output is wanted for loudspeaker operation, a simple single-tube amplifier, such as the circuit in Fig. 2, should prove adequate. This stage could be built into a small speaker case with filament and plate power supplied from the main rig.

Regeneration for the receiver is controlled by means of the shunt variable-resistor and fixed-condenser method which is very quiet in operation and has a minimum detuning effect.

The grid-leak resistor and condenser for the receiver grid circuit are mounted on the top of the coil with the antenna lead attached through a small 3-30-$\mu\mu$fd. mica trimmer condenser for proper adjustment and elimination of "dead" spots in the tuning range. The transmitting coil also has its antenna connections at the top of the form, thereby avoiding the necessity for feed-through insulators in the chassis.

Because the 79 or 6Y7G tube has a single cathode terminal, a change-over switch is necessary to provide proper operation of either the transmitting or receiving portion of the rig. In the event that 6F8G or 6C8G tubes are used, only a single-pole single-throw switch is necessary instead of the double-throw single-pole type, since in the latter case only a stand-by switch is needed to cut off the plate supply from the receiver when transmitting.

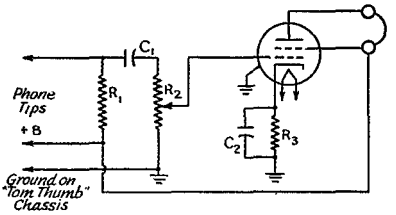
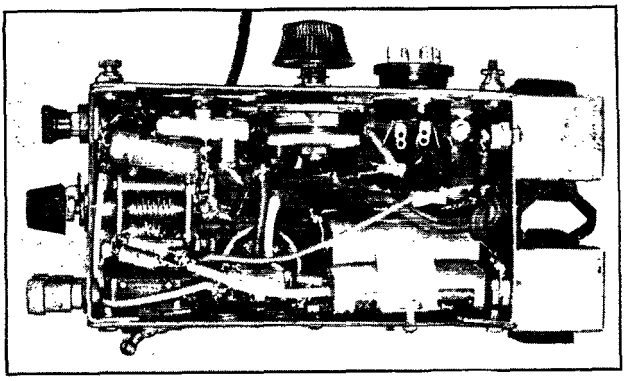


Fig. 2 — Circuit diagram of an audio amplifier for the "Tom Thumb" receiver.
C_1 — 0.01-μfd. paper.
C_2 — 10-μfd. 50-volt electrolytic.
R_1 — 0.25 megohm.
R_2 — 0.5-megohm potentiometer.
R_3 — 400 ohms.

Power Supply

The power supply is of the condenser-input type, with two chokes and three filter condensers to provide sufficient filtering to insure hum-free receiver operation. With the power transformer specified, around 8 watts input power can be had; if the slightly larger Thordarson T-13R11 transformer is used, about twenty-five per cent more input power can be obtained. This latter transformer would take up no more chassis room.



Bottom view of the "Tom Thumb" transmitter-receiver. The filter chokes are fastened outside the right-hand end of the chassis, the filter condensers being mounted inside. The bandspread tuning condenser for the receiver may be seen to the left.

The 6X5 rectifier was selected because of its small size, but an 80 could be used since a 5-volt filament winding is available.

Power for the transmitter is taken off after the first filter condenser, to obtain as high voltage and therefore power input as possible. The writer has found that in c.w. operation such simple filters are ample for a clear signal. This connection also eliminates voltage drop through the filter chokes.

Construction

The chassis is of the QSL type but it is one-half inch longer in order to accommodate the power transformer, the two tubes and the two coil sockets. It is a simple affair bent-up from sheet aluminum in a manner similar to that used in the other recent rigs described by the writer. The template sketch given in Fig. 3 shows the disposition of the various units.

The crystal socket may be of the 5-prong wafer type, mounted on the inside of the left panel with holes drilled ¾-inch apart and of sufficient diameter to clear the crystal plug-in pins. The ceramic condenser is mounted on the right side with a small spacer to insure ample clearance from the

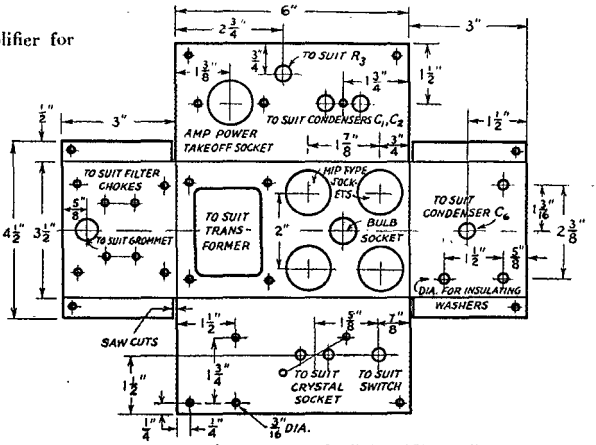


Fig. 3 — Chassis dimensions for the "Tom Thumb" transmitter-receiver showing the location of the various components.

panel. Holes are drilled in proper position for screwdriver adjustment.

The lay-out is such that the right end is really the front of the rig, with the stand-by switch at the left, the regeneration control at the right, and the headphone and key terminals at the left and right of this "front" face, respectively. The receiver bandspread-condenser control also is on this edge. The tubes are mounted nearest the transformer, with the coil sockets at the opposite end from the power transformer.

In the event an amplifier is wanted, the power take-off socket can be mounted as indicated, with suitable connections. A small light could also be furnished for night operation in the field. All other component placing is clearly indicated, and no difficulty should be had in building up "Tom Thumb."

Adjustment

In first adjusting this little outfit, the regeneration control should be manipulated so that the regeneration noise is just starting, since this point is the most sensitive one for c.w. reception. The tuning condenser then is set with the screwdriver adjustment until the desired frequency is found, then the bandspread condenser is adjusted to give the best pitch for clearest copy.

The bleeder-resistor tap should be adjusted so as to give smoothest control of regeneration. Different tubes may require a change in this setting. Experimentation for the proper value of resistor, R_4, for most efficient detector operation may be needed.

In adjusting the transmitter, the plate current at resonance should light the 60-ma. bulb to around medium brightness, since the 79 or 67YG tube draws around 35 ma. However, for short periods and intermittent operation, a higher plate current may be drawn from the transformer without danger of overheating. As previously mentioned, the plate-voltage tap for the transmitter is taken off at the first input condenser of the filter circuit. In the event of a rough signal, this tap may be moved to the second condenser which would then give better filtering, but with a slight reduction in voltage.

It is the hope of the writer that this little outfit will prove to be a useful type for AEC work, since large numbers could be built and tuned to a given net frequency.

COIL TABLE

	Band	L_1	L_2	
Receiver:	1750 kc.	70 turns	20 turns	No. 30 d.s.c. wire on 1½-inch form close-wound
	3500 kc.	35 "	10 "	
	7000 kc.	15 "	6 "	
	14000 kc.	5 "	4 "	
		L_3		
Transmitter:	1750 kc.	49 turns	No. 22 s.c.c.	Spaced to give coil length of 1½ inches
	3500 kc.	28 "	No. 22 s.s.c.	
	7000 kc.	18 "	No. 18 enam.	
	14000 kc.	10 "	No. 18 enam.	

L_4 Number of turns to be determined experimentally to give proper plate current readings when tuning at crystal frequency.

★ SPLATTER ★

OUR COVER

DESPITE a probable first-glance impression of tropical pleasure cruising atmosphere on this month's cover, there is both a radio angle and a serious purpose involved. This is a picture of the radio ship *Apache*. Of particular interest are S/Sgt. Melvin W. Gade adjusting the v.h.f. antenna and the GI helmet used as an improvised corona ring for the medium-frequency broadcast antenna. *Official U. S. Army Signal Corps photo.*

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FOOTNOTES

THE tale of how the veteran *Apache* was converted into a radio ship and the part it played during Allied landings in the Pacific zone is told (p. 39) by **Lt. Anthony W. Borgia, W6EOU.** Lt. Borgia served aboard the *Apache* as transmitter officer during both the Leyte and Luzon invasions. His yarn was written in the Philippines but he returned to the U. S. A. on a 30-day leave just in time to supply the qualifying quota of autobiographical data. In his own words: "I was first licensed in 1928 with the call W6EOU. I was very active on 7-Mc. c.w. handling traffic during the years 1929 to 1933. From 1937 to 1941 did extensive 'phone operation on the 3.5- and 14-Mc. 'phone bands. Made WAC on both 'phone and c.w. Became a member of the Royal Order of the Wouff Hong several years ago. Was one of the first West Coast c.w. amateurs to make contact with WFA — the first Byrd Antarctic Expedition at Little America — using 35 watts input to a pair of '10s in a self-excited rig. Hold first-class radiotelephone and second-class radiotelegraph licenses. Inducted into the infantry in 1941; later transferred to the Signal Corps. Served as enlisted radio operator on an Army transport for about a year. Was sent to Australia in 1943 and saw duty in New Guinea and the Philippines. Received my commission in November of '42 at Fort Monmouth, and by now have served approximately 33 months overseas." . . . **Albert Kahn, W9KYM,** not only is an authority on microphones — he's the founder and for the past fifteen years has been president of Electro-Voice — but is well able to explain in ham language how they work (p. 34). An old-timer in ham radio and a qualified member of the 20-Year Club, Al Kahn used to be steadily active on the air, and will be again when the gong sounds. A c.w. man at heart, he has been ORS through the years and — amazingly enough — only occasionally on 'phone. The answer? Ham radio is a hobby; microphones are a business. The former dates back some 23 years (Al was first licensed in 1922 as 9BBI), but microphones a mere 17. Al, like a lot of others, started with a Ford spark coil, ½-kw. spark, 1-kw. spark, "five-watter," "fifty-watter," et cetera. He has enjoyed all phases of ham activity — traffic, rag-chewing, DX, mobile, an-

(Continued on page 98)

STRAYS

Writing from somewhere in the Pacific, W8MXC recently requested technical dope on a captured Japanese transmitting tube. In closing he remarked: "I'd write the manufacturer but I can't read the language, and anyway I suspect there would be a slight delay in delivery.

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According to information from a Central Pacific base, a small lightweight soldering iron for use in instrument repair work of a delicate nature has been developed. The iron can be brought up to effective temperature in 45 seconds.

The heater assembly consists of a transformer having an output of 6 to 12 volts, with a current capacity of 10 to 30 amperes. Two carbon electrodes from a BA-30 flashlight cell are used, the soldering iron tip being inserted between these two rods. At the point of contact between the iron tip and the carbon rods a high resistance contact results, forming a small electric arc. The heat developed at these points of contact heats the iron.

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P. R. Mallory and Co. have announced the development of a successful radio-frequency ignition system for aircraft which it is claimed has many advantages over conventional methods. Low voltage is generated by a magneto and distributed through shielded leads to the spark plugs. At the manifold ring the low-frequency energy delivered by the magneto is converted to a radio frequency of 2 to 3 Mc.

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Streamlined antennas for vehicular radio installations, developed by the U. S. Army Signal Corps, are not only smaller and lighter than the old type but do not shake and whip when the vehicle traverses rough ground. Nor do they drip water over the mast base onto the radio set.

The spring of the new mast bases consists of a bundle of piano wires enclosed in a flexible metal sheath. These wires are fastened at one end, the other ends being held in a brace which allows free linear movement when the mast is deflected.

Mast sections to go with the new bases are each three feet long (though of different diameters) and are made of lightweight tapered steel tubing, copper plated for surface conductivity and painted for weather resistance. There are two sizes of mast base, the smaller one being used with 6- and 9-foot antennas and the larger with 15-foot antennas.

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According to Dr. Joseph Needham, head of the British Scientific Mission in China, Chinese scientists, working with meager apparatus and under almost unbelievable handicaps, have developed a new type of quartz crystal which is now being used to stabilize radio transmissions.

Foresight? In 1911 the chief engineer of one of the leading American radio companies resigned his position and accepted an executive position with a manufacturer of sewing machines at a reduced salary. In explanation he made the statement which follows:

"Wireless communication has about reached its peak and only a few minor improvements are possible. On the other hand, the sewing machine industry is growing rapidly and within twenty years every household in the world will own its sewing machine."

— *Break-In* (NZART).

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A four-page pamphlet titled "Television as a Career," containing a bibliography of recent literature on television and illustrated with pictures taken at Station WRGB, has been prepared by the transmitter division of the General Electric Company. It is available free on request to the Publicity Section, G. E. Electronics Department, Schenectady, N. Y.

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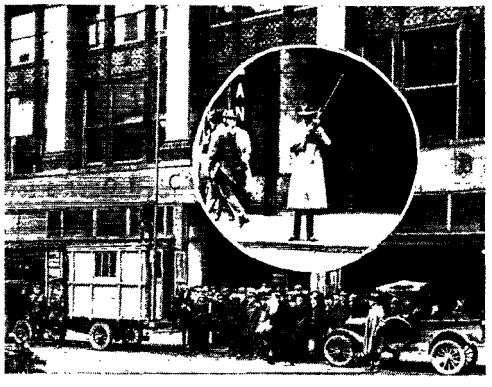
The progress that mobile radio has made in the past twenty-one years is graphically illustrated by the photographs below. The large picture, taken in 1924, shows the cumbersome equipment then necessary for mobile radio transmission. The insert shows a Motorola handie-talkie being used to do the same job today. The 1924 unit was designed by Westinghouse for use in connection with relays to their pioneer radio station, KDKA, in Pittsburgh, Pa. It was comprised of a quarter-kilowatt transmitter mounted in a truck body nine feet long by six feet high. Power was obtained from a 110-volt lighting circuit at the point of program origin. The 33-foot antenna was made of three sections of copper pipe and was stored under the truck when not in use. Today, the same type of work that required over a ton of equipment in 1924 is accomplished by the self-contained 5-pound two-way handie-talkie.



HINTS AND KINKS FOR THE EXPERIMENTER

A CONDENSER CHECKER AND OUTPUT METER

AN EASILY constructed condenser checker and output meter is shown in Fig. 1. I used a 2E5, but a 6U5 or a 6E5 would work just as well. Provision is made for two sets of test prod connections. Prods *A* are used for checking condensers, either paper or electrolytic. Prods *B* serve as an output meter or signal tracer, in the a.f. portion

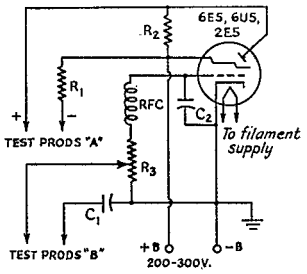


Fig. 1 — Condenser checker and output meter using a "magic eye" tube. R_1 is adjusted until shorted prods *A* will close shadow. R_1 is 3300 ohms in W7FGB's tester. R_3 is a 100,000-ohm potentiometer. C_1 and C_2 are 0.01-μfd. 600-volt paper. The r.f. choke was salvaged from an old b.c. receiver.

of a receiver. The value of R_1 (about 3300 ohms) is adjusted until the shadow just closes with prods *A* shorted. R_3 is a gain control. The condition of condensers can be determined after a little practice. The polarity of the prods should be observed in checking electrolytic condensers. — *L. R. Hecox, W7FGB.*

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BLUEPRINT NAME PLATES

IN Hints and Kinks for April, 1945, Earl Schoenfeld wrote regarding equipment name plates from hand-drawn negatives.

I have used a series of name plates of this general type but made a little differently. I, like many other hams, do not own photographic equipment and would, no doubt, make a mess out of any attempt to handle the stuff.

My name plates are drawn with black drawing ink on pure white paper, then taken to my blueprint maker and photostated. Care must be taken in cleansing the original drawing since the photostat will show dirt marks as well as the drawing. These prints turn out very well and are glued right to the panel with any good grade of glue, or they can be glued to a thin sheet of brass to make the usual type of removable name plate. The background of the print is more gray than black and looks well on either gray or black panels. After the glue has dried, the surface of the print is given a coat of lacquer (clear fingernail polish) and when dry will remain new-looking for a long time.

A word about the cost. An 8½ × 11 inch drawing will hold about 12 switch plates or about 70 small one-line name plates (1½ × ½ inch) and costs 30 cents to photostat.

It pays to *make* your own and have just the wording you want and any design you want. Of course, your own spare time labor comes cheap and a bottle of glue will last a long time.

Hams who do not have a large amount of blueprinting and photostating done may have to pay a little more for their prints, but even so it is worth the additional cost. — *Charles F. McMorrow, W1KLN.*

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A SUBSTITUTE DISCRIMINATOR TRANSFORMER

EXPERIMENTERS constructing f.m. carrier-current receivers usually have difficulty finding a suitable discriminator transformer. I made an excellent transformer from an ordinary 2.5-mh. r.f. choke.

First, disconnect the two middle pi windings as shown in Fig. 2. (A sharply pointed pencil makes a good tool for this job.) Mount the choke on a terminal strip and connect the wires to the terminals as shown at (A). The transformer is then connected into the circuit shown at (B), using

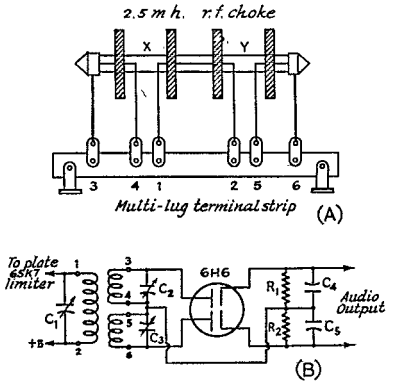

Fig. 2 — Discriminator transformer for l.f. receivers made from a modified 2.5-mh. r.f. choke. (A) shows the operation performed on the choke and the method of mounting (B) shows the numbered connections of the transformer between a limiter and a diode. The values of C_1, C_2 and C_3 will depend on the frequency in use. The values of R_1, R_2, C_4 and C_5 are those normally used in such a circuit.

trimmer condensers of suitable capacity to operate on the frequency desired. In my receiver, I used 360-$\mu\mu$fd. trimmers to cover the range from 69 to 130 kc. The transformer should be mounted adjacent to the trimmers. I cut holes through the chassis to permit adjustment of the variable trimmers. — *G. A. Lyerly, 403 65th St., N. E., Washington 19, D. C.*

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MINIATURE BASS REFLEX CABINET

WHETHER it's a three-, four- or a five-inch speaker on your communications receiver or a midget broadcast receiver, the quality of reproduction will be greatly enhanced by mounting

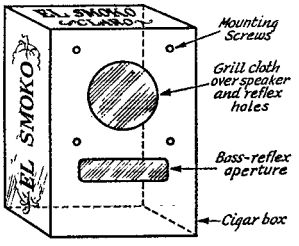

Fig. 3 — Cigar-box bass reflex cabinet for a small speaker. The holes may be covered with cloth.

the speaker in a bass reflex cabinet. A cost-free enclosure can be provided through the use of a cigar box obtained from your friend in the corner store. Cut a round hole of the proper size in the bottom of the box for the speaker as shown in Fig. 3. Then cut a rectangular aperture below the speaker hole. This should have an area approximately one quarter that of the speaker opening. A small notch cut in the lid will permit the entrance of the leads. Then nail the lid tight. The improvement in quality will surprise you! — *M. V. Winston, W2EZC.*

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WIRE-LOOP FORMING TOOL

HERE'S a handy tool for forming loops of wire to fit over meter studs or bolts. Take a screwdriver having a tapered shank and grind or file off the blade or bit of the screwdriver. If the shank is not tapered sufficiently, cut it down until you have a round tool, shown in Fig. 4, slightly larger than the diameter of the studs to be fitted with loops. (A tapered shank permits the forming of various sizes of loops, thus one tool will take the place of several.)

Fig. 4 — An easily made tool for forming wire loops.

Now, by grasping the end of the wire with a pair of long-nose pliers, you can wrap the wire around the tool. A little practice using scrap wire will result in a neat, professional-looking loop. — *Bert Felsburg, W8VD.*

SCOTT SHIPBOARD RECEIVERS

THE c.w. gain of a Scott receiver is greatly improved by connecting the switch contact points marked "Mod" and "C.W." on the reception switch. This is not my brain storm but I have used this set-up for the past eight months and have not had any trouble with this modified arrangement. The modulation gain goes down slightly, but the improved c.w. reception amply compensates for this. — *Irving Landow, RM2/c, Navy 920, FPO, San Francisco.*

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FOX-HOLE RADIO

MANY reports have been circulated concerning the various types of fox-hole radio sets constructed by members of the armed forces throughout the world.

Naturally, tubeless and batteryless radios must be used by most of the boys in the field. Few parts are required for a razor-blade set. The most difficult item to locate is a pair of 'phones. The wire may be hard to obtain, but the rest of the parts usually will be available.

Fig. 5 shows both the schematic and pictorial diagrams of a typical razor-blade set using parts found in most localities.

Armed Forces radio stations up to twenty-five miles away have been heard, using a fairly good antenna and ground. Greater distances have been reported on similar sets. — *Lt. Paul M. Cornell, SC, W8EFW.*

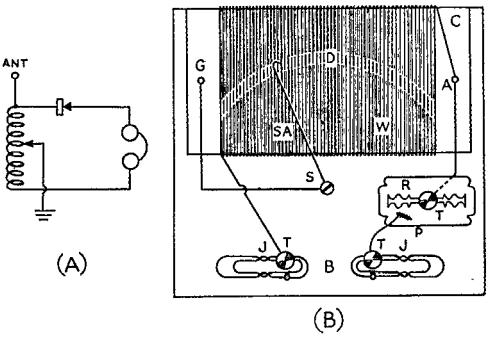

Fig. 5 — Razor-blade radio used by W8EFW in South Pacific. A pictorial layout is shown at (B). The schematic diagram is shown at (A).

A — Antenna connection. This nail also fastens the coil form to the baseboard.
B — Baseboard. 4 inches square, ¼ inch thick.
C — Coil form. Wood block, 3¾ inches long, 2 inches wide and ¼ inch thick.
D — Area of coil scraped clean along arc of switch arm.
G — Ground connection. This nail also fastens coil form to baseboard.
J — Jacks for 'phones. Paper clips held down by tacks.
P — Detector. Pencil lead wrapped with copper wire and resting lightly on razor blade. Some adjustment of the location and pressure of the lead on the blade may be required.
R — Razor blade held down and connected to wire by tack.
S — Screw or nail for pivot of switch arm.
SA — Switch arm made from paper clip.
T — Thumb — or any kind of tack.
W — Coil winding, approximately 175 t. No. 26 insulated wire.

CORRESPONDENCE FROM MEMBERS

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

GI PROCEDURE AND THE HAM

Hq. AAF, Office of the Air Comm. Officer,
Washington 25, D. C.

Editor, *QST:*

I have read with interest the article "Military Radio Operating Procedures," in July *QST* by Lt. Col. Robert Hertzberg, W2DJJ, and I would like to pass on a few comments which I think would be of interest to the ARRL members.

During the past year I have represented Headquarters Army Air Forces in discussions which have taken place concerning postwar allocations of radio frequencies. Throughout this work I have had an opportunity to observe the reactions which various officers of the Army and the Navy, together with other government officials, have towards the radio amateur, and found it interesting to determine just why it was that there was a universal belief that frequencies should be provided for the amateur in the postwar picture. Strange as it may seem, these universal beliefs were not all based upon the same reason. In general, the amateur and his hobby has been accepted as a national requirement for one of the following reasons:

1) He provides a large pool of specially trained technicians who are available as radio operators and maintenance personnel in times of national emergency.

2) He provides a vast network of communications circuits which are available for the public interest during periods of disaster.

3) He develops through his research and experimental work equipment of value to the nation.

4) Frequencies assigned to amateurs form a supply which can be readily tapped in times of emergency for expanding military requirements.

It goes without saying that the first reason is most predominant. However, I was quite surprised to find that there are a few officials who, if it were not for the last reason, would look with disfavor on allocating to the amateur these much sought-after frequencies. These officials unfortunately passed judgment from swivel chairs in Washington and have not had the opportunity to obtain first-hand observations of the magnificent work accomplished by the amateurs in the field. Although they are in a distinct minority there are others who are concerned over the fact that many amateurs now in the military services continue to use informal procedures and ham expressions at variance with those approved in the various Joint and Combined Communications Board publications. The reason for this use of improper operating procedures obviously is the result of habits built up during many years of peacetime operations using informal procedures.

Some may wonder what difference it makes whether we use "DE" or "V," why we shouldn't end our transmissions with "CU" and what harm would be caused by a little friendly rag-chew when the circuit is not too busy. Suffice to say that there are definite reasons why these things should not be done and that strict compliance with the approved military procedures and instructions is absolutely necessary. Naturally, it is no one's wish to prohibit the amateur during peacetime from using such expressions as OM, XYL, GN, etc. However, in that portion of our hobby where we intend to have some form of operating procedure for our traffic, I think it behooves us all to attempt to model that procedure along official military lines and not after some independent procedure which builds up habits and customs difficult to overcome.

I therefore definitely recommend that the League attempt, where possible, to popularize the official military procedures and to push for their universal use throughout the amateur fraternity.

— *Lt. Col. Henry R. Pemberton, AC, W3DPU*

Co. C. 33, Sig. Tng. Bn., Camp Crowder, Mo.

Editor, *QST:*

. . . Come the day W6PZW fires up the old rig again, there will be no corporals, sergeants or colonels ramming *anything* down my throat — particularly GI procedure.

It behooves all hams to use any doggone procedure that pleases them.

— *H. R. Stewart, Pvt., W6PZW*

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229 Broadway Ave., Toronto, Ont., Canada

Editor, *QST:*

It certainly would be a grand idea to streamline amateur procedure to include the best parts of the system as now set up by the Combined Communications Board.

Military procedure as a whole cannot be used for amateur operating because it is constructed to serve one purpose — *security*. It is designed to cover the following: concealment from the enemy of names of formations, probable strength of formations, locations of formations, besides many other reasons too numerous to mention.

Many amateurs and potential amateurs in the Allied forces have been taught military procedure, and I believe a good deal of it will be carried into amateur radio.

Lt. Col. Hertzberg states that the Army and Navy would like to see military procedure used in peacetime as this would provide many partly trained operators in an emergency. Military

procedure would have to be modified to serve amateur requirements. I suggest that a start could be made with the Army message form, leaving the spaces as they are but changing the components. By making these changes every amateur operator would learn the sequence of the message form and could readily change over to the military form.

Some day the go-ahead signal will be given, but in the meantime a good deal of thought could be given to improvements in operating.

— *A. J. Vivian, Sgt., RCCS, VE3YY*

ASC, MOMU, 1848 SCU, Camp Hood, Texas
Editor, *QST:*

No, no a thousand times, no! Please leave the Army out of our great hobby. I don't think there are very many hams who will agree with W2DJJ's article. I think W2DJJ has been in the Army too long. We hams had our own way of getting along before the war and we sure can do it after the war. We who have been in the Army want to forget it.

— *G. J. Chandler, Pfc., W1MMN*

3329 Abner Pl., St. Louis, Mo
Editor, *QST:*

Lt. Col. Hertzberg's article was very fine and to the point. For a long time I have been wanting to suggest that amateur radio operating procedure should be revised for use after the war. I would not urge hams to adopt military procedure *in toto*, but there are several advantages and improvements over the procedure we used before the war. In fact, military procedure seems to me to be just amateur procedure revised and improved.

We say, "Well, we did understand each other," but some of us will have to admit that we did some bluffing and many a message was answered with an "R" that should not have been receipted. I have told many a man I was an XYL and had him come back with "OK, OM, CUL." No harm done, and I probably did worse, and it was only rag-chewing anyway, but when it comes to handling messages I think a more exact procedure would give us a greater feeling of satisfaction, and much time could be saved in emergencies.

We waste too many IMIs, have too many different ways of ending transmissions, and we are too indefinite in message handling. Our voice procedure is sloppy and requires many repeats when QRM is bad. We should adopt the INT for questioning. I do not find it hard to use. In fact, it commands attention and prepares one for what follows. We could make good use of "B," meaning more to follow. A more definite way of handling third party messages could be worked out.

Someone with military as well as amateur background should be appointed to revise our procedure, so that it would be simple and yet definite.

Some may say procedure is overemphasized. But if you have ever had the experience of seeing men who knew their code (but who did not know what to do with it) progress in a few weeks so that they could relay form messages, answer all "Q" signals, messages, authenticate, obtain verifications and repeats with a minimum amount of time, you could appreciate a good clear procedure. I am an instructor at Scott Field and have watched just such progress.

As for voice procedure, perhaps we can get along just as well without changes. However, I can think of no better endings than "over" or "out." We should definitely adopt the standard phonetic alphabet used by the military. We merely confuse ourselves trying to think up new words all the time. The more of our transmissions we make standard the more attention the operator can give to the message itself. Many hams hear only what they expect to hear.

I am not knocking hams. The Army has learned a lot from us. The amateurs have done a wonderful job for the military, but I think most of us who have anything to do with the military way of handling traffic will admit that it does have its advantages.

— *Leta Bush, W9DBD*

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446 N. W. 15th St., Brownsville, Texas
Editor, *QST:*

. . . Regarding postwar operating procedure for ham work. . . . I say leave it as we all formerly knew it. I am pleased to note that the airline for which I work just recently issued a bulletin eliminating all this GI palaver and is going back to snappy procedure like all airlines used prior to the war.

— *W. O. Porter, W5FAH*

APO 255, c/o Postmaster, New York City
Editor, *QST:*

I note with interest the proposal for an adoption of a standard list of words for the phonetic alphabet. Such procedure should be in effect.

. . . C.w. procedure could also be improved. The Army uses certain procedure that is better than ours — such as the use of "AR" and "K," the use of INT preceding a "Q" signal to make it a question, a more sensible method of counting groups, and other items.

— *Merton T. Meade, W9KXL*

USNAS, Peru, Ind.
Editor, *QST:*

In prewar days one of the few and slight differences of opinion which I had with the League was on the question of using English on 'phone. It was common practice for *QST* to advocate the use of long and tedious sentence formation to substitute for "Q" signals and ham slang on radiotelephone. Undoubtedly, ham slang was, and always will be, overdone, but, I still maintain that we are amateurs for our own enjoyment and it is not necessary for us to make an effort to please the SWLs, or others.

To my mind, the question of military operating procedure parallels this "old stand-by." And as a former AARS and present military operator and

technician, I wish to vote an emphatic *no* to the use of GI procedure.

— *L. W. Parsons, USNAS, W7HLU, CRT*

THE HAMS' OWN PHONETICS

PAAB, TAU. P. O. 6695, Pueblo, Colo.

Editor, *QST:*

Orchids to W6HG, W9JCJ, W9ZYJ, W4HMQ, ex-W9CKR and Abner Sokum for their disapproval of the suggested word list. Some are apparently forgetting just what the word *amateur* means. *Amateur* radio is for enjoyment. I wonder if W2DJJ has forgotten that?

I agree that some sort of standard procedure could be established. But when we get out of this Army and Navy, let's not play like we're still in it by using that CCBP.

I have been an instructor in the AAFTTC school for a long while and at present am working as a ground radio operator at an AAF station. The farther from Army procedure I can get when this is over the better I'll like it.

CQ de W9LTL (incidentally, it's DE — not V) is what I'm waiting for and expecting to enjoy as a postwar ham operator. If I want to work Army procedure and use the Army phonetic word list I would be better off to refuse my discharge. Let page 33 in the July issue of *QST* slip away into obscurity with respect to *amateur* radio.

— *J. F. Reynolds, Pfc., W9LTL*

Fort Knox, Ky.

Editor, *QST:*

Register my hearty protest against the use of the Army phonetic alphabet in ham radio, as suggested in July *QST*. Don't tell me good old ham radio is turning GI!

I'm not going to say "Hello Charlie Queen — this is William Three Jig Easy Item — Over" after I get back on the air. Let the guys use it who want to, but don't put that bug in the FCC's ear to make it compulsory.

Let's leave all that stuff in the Army where it belongs; don't bring it into our hobby.

— *Hank Hatton, T/5, W3JEI*

Lake Arthur, La.

Editor, *QST:*

. . . I agree with the Army men as to adopting a phonetic alphabet, but why not compile an alphabet *by the amateur and for the amateur?* I don't think that we have to copy any present list, but we should agree on one list and urge its international use. Why don't you ask the readers of *QST* to compile their favorite words into a list and then ARRL could take the most popular and make a master list. I'm sure that amateurs can think up a list that is distinctive to amateur radio. . . .

— *Lloyd J. Lasserre, W5HSM*

72 Bowler St., East Lynn, Mass.

Editor, *QST:*

Various opinions expressed in *QST* in letters and articles on the phonetic alphabet prompts the writer to offer the following list of words for amateur use.

Experience has proven the use of phonetics necessary in radiotelephone communication, but why the obsolete lists? They are a disconnected jumble concocted in the dark ages and unrelated to radio. Why not the hams' own list?

A — Auto	N — Negat
B — Band	O — Oxide
C — Carbon	P — Plate
D — Delta	Q — Quartz
E — Eddy	R — Radio
F — Farad	S — Sign
G — Grid	T — Tank
H — Hydro	U — Ultra
I — Image	V — Volt
J — Jam	W — Wire
K — Kilo	X — X-ray
L — Log	Y — Yoke
M — Micro	Z — Zero

— *Harold W. Ryall, W1NKW*

AMATEUR RADIO IN HOLLAND

H. Smitstraat 41, Hilversum, Holland

Editor, *QST:*

When the Jerries occupied Holland in 1940, they took our radio amateur league under their control. Transmitting was forbidden, of course, and as a matter of fact all members left the NVIR (Dutch section IARU) so that it no longer existed. Our transmitters were picked up and moved to Germany. Twice we were promised to get money for our rigs, but they never paid, as usual. So, when we will be allowed to go on the air again, most of us will have to begin entirely anew.

At present we are establishing one new amateur league here in Holland (prewar there were three and we are now joining them together). No doubt you will soon hear more about it.

I am living in West Holland so I was very, very hungry for food last winter; but at present I am very hungry for *QST* and a new *Handbook*, as I did not see them during the last five years. I hope to receive them very soon.

* Let me not forget to tell you that I hooked up here with VE5EE and VE3OB. They visit my home frequently and are my best friends. They are quite well and send 73 to their parents, YLs and friends.

73, and cheerio!

— *M. J. Hoogland, PAØXAD*

RESEAU BELGE

32, rue Capitaine Crespel, Brussels, Belgium

Secretary, IARU:

In a previous letter I wrote about the resistance movements in Belgium, saying, "Most important of these is the Armee Secrete." This statement is, of course, incorrect and unfair. Every resistance movement is equal because they ran the same dangers and worked and fought for the same cause. I should have written, "One of these resistance movements is the Armee Secrete."

— *L. Richard, ON4UF*

OPERATING NEWS

LEROY T. WAGGONER, W9YMV
Acting Communications Manager

LILLIAN M. SALTER
Asst. Communications Manager

Now Is The Time: To look over your old QSL cards to find out whether or not you are eligible for WAS, 20-Year Club, DX Century Club, etc. We still award certificates of merit for certain of the achievements, as in the past, and now is a good time to check up on your qualifications! We would like to urge service men home on leave to do this, also — a shiny new certificate, which will make a nice addition to that postwar shack you're planning, awaits those who have the proof to show for their efforts.

The WAS (Worked All States) award is available to amateurs everywhere in the world who can show proof of two-way communication with amateurs in all forty-eight states, having used any or all amateur bands over any period of years. (The District of Columbia also counts for Maryland.) The only stipulation is that all contacts must have been made from one location — defined as any place or places within a twenty-five-mile radius. Check your cards and send them in to us with sufficient postage for their return. This is a certificate of outstanding operating proficiency and one you will be proud to own, if qualified!

The 20-Year Club does not have a certificate, but lists of newly accredited members, such as the one appearing on this page, are published in *QST* from time to time. To be eligible for listing, an amateur must have held an amateur operator license for the past twenty or more *consecutive* years and must be a licensed amateur at the present time. It is only necessary that you send us information concerning amateur licenses you have held, including the date of issuance of each one.

The DX Century Club award is granted those amateurs submitting written confirmation of communication with 100 or more different countries, according to the official ARRL list. DX CC listings have been discontinued until further notice, but certificates will be issued to those meeting the announced requirements. Amateurs are invited to start submitting proof to ARRL when they have confirmations from seventy-five countries. Start adding your countries, and work for this highest DX operating achievement award! All contacts must have been with stations working in the authorized amateur bands using amateur calls. All stations contacted must have been "land stations" — contacts with ships, anchored or otherwise, cannot be counted. Contacts may have been made over any period of years, provided they were made from the same state or call area (or country, where no call areas exist) and by the same station licensee. Confirmations submitted should be accompanied by a list of claimed countries and stations representing each country to aid in checking. Complete information and detailed rules were given on page 74 of January, 1940, *QST*.

WAC certificates formerly were issued by the headquarters of the IARU, but since this organization is inactive for the duration of the war the awarding of these certificates has been discontinued until such time as IARU is reactivated.

Still More Changes. It is our regretful duty to report the resignation of Acting Communications Manager and Assistant Secretary Charles Service, W4IE, who leaves on August 15th to return to his home and business in Florida. His departure will be keenly felt by this department. His successor, LeRoy T. Waggoner, W9YMV, is well qualified to conduct CD affairs, having held the post of SCM together with various other appointments for several years in Indiana. We wish both the best of luck in their new endeavors.

— *L. M. S.*

20-Year Club

Listed below is the complete roll of amateurs who are members of the 20-Year Club. Anyone holding an amateur operator license at the present time and having held one for the past twenty or more consecutive years is eligible for membership in this club. If you think you can qualify, please send a brief chronology of your ham career to this department, including the date you started in amateur radio, the call and date on your first amateur license and any other calls you have held. If you meet these requirements, your call will be included in the next published roster of 20-Year Club members.

W1ACV AGM AHI AHY AJ ALP APA AR AZW BB BDI BFT BNL BPN BSJ BVR BXC BYG CJA DMF DMP EAO EH ES FA FJE FKS FMP FMV FOI GCX GDY GS HGX HXQ JFN LZ MD MLT NF PG QH QR RP TP UP WR ZL W2ADW AOS AOT APJ AX BLD BO BS BYW CJJ CJX CMX DI DIH DYT DZA EC ELN EMV EY GC GP GVU GVZ HCO HP HTU IMF IP IW IZ JF JN JRG KU MIL NWE OEN PF PL VY/6 W3ABF ACX ALE AVJ BEI BO BYR BZ CA DRO EUY FLH GJ GLH GPA GQL HWO JL KT NT QJ RR WS WU VT ZI W4BZ CNZ DIN EY IE RM WD/5FSI W5ACY AJG AQD CVQ DZA EOW ERJ NT NW W6AM ANM/GVU AVC AWN BAW BUK BUX BVM CAN CFN/CVC CIS CMP CPG EA EY GM GS HG IT IWU IX KA KMA KTQ LM MMB MSN NPD OCH OCZ OJY OVK PH PKX QKI QOJ SIG SN TI TNH TS VU W7AZX BG COH DVY EMT ER GCO QP W8AL AMS APD AQ AVH AYS BCA BKM BOA BXY BWP BYM CBN/SG CHU CMH CNX DOX FRY GU GYR IGT IIO JDV KHM ND OA OFO OXH QAN RN SDR SIX SQE SQW TGX TO UGR VZ WGE ZS ZY W9AA AB AED ANB AWP BAZ BEN BRX CA CAA CCD CCE CDE CS CSZ CVU CX DAX DDF DGM DHJ DHM DI DZG EL ESA EVG EW FRC GTR KWY NZ NZZ OSQ RRC RWF SJ SP VD VFW VKF VS VV WIN WTE WZE YNQ G5BY GI6WG K4KD K6ONM QYI VE3RB UX VE4BM VE5GA.

Each month under the accompanying heading we shall publish the story of an outstanding WERS organization as an item of general interest to all WERS participants. Contributions are solicited from any radio aide or WERS participant, whether he be an amateur or a WERS permittee. Descriptions of organizations which have already been featured in *QST* articles will not be considered. The story may describe the organization in general, how it came into being, how it was set up and how it operates; or it may describe some particular phase of the organization which makes it unusual or unique. Contributions should be brief (two or three typewritten pages, double-spaced, is maximum) and may include photographs if desired, although only one photograph will be printed with each story. Each story must be released for publication by the radio aide of the licensee, in writing. Address your contribution to the Communications Department, ARRL, and mark it: "For WERS of the Month."

WERS of the Month

Burleigh County, N. Dak.

PRELIMINARY plans to organize WERS were conceived when Major L. Silverborg, AUS, communications officer of the 7th Civilian Defense Region, contacted state and local OCD to establish a secondary communications system to function in the event that existing facilities failed or were deemed inadequate.

The management of local broadcasting station KFYR deserves much of the credit for the success of the initial meeting. One of its large offices was provided and an invitation was extended to radio operators and other interested persons to meet there on the evening of February 7, 1944. At this meeting, presided over by Major Silverborg, seventeen volunteers were enrolled and a tentative radio aide selected. It was planned to incorporate Burleigh, Morton, and other interested counties under one license, but this plan presented difficulties and group licensing has not been accomplished as yet. The situation was unique inasmuch as OCD was not officially represented at this meeting. This area had no industries directly affiliated with the war effort other than the food-producing agricultural activities which had been so long established. However, Bob Kyllingstad was able to convince the county commissioners that this vicinity had many vital strategic installations.

On April 5, 1944, the board passed an elaborate resolution empowering E. A. Greenwood, deputy sheriff, to execute the necessary documents and make application to FCC for a WERS license. John S. Glass, W9SSW, was approved as radio aide and the project finally was under way.

Then a problem which seemed unsolvable presented itself. Just prior to, and during the early part of the war, a federal project in conjunction with the local high school had canvassed this vicinity and the potential junk parts supply seemed hopelessly depleted. Most of the suitable ham gear had been sold or was being used by the armed forces. Exerting the much-publicized ham ingenuity the situation was soon in hand. Borrowing, swapping, begging, and much midnight designing (the last word can be taken literally) finally resulted in parts for five transmitter-receivers, one transmitter, and one receiver. Acknowledgment is due Air Raid Warden Burl Knutson for his fine tool lathe work which produced a number of the small capacity variable condensers.

The coveted license and radio aide certification were received on May 29, 1944. Forthwith the old tinning block and soldering iron were resurrected and more "designing" was indulged in. Now another obstacle loomed. Operators were conspicuous by their scarcity — only seven were available. Permits for them were received on July 20th.

One of the problems causing considerable exasperation was the old band-spotting procedure. For those of you who used Lecher wires to spot oscillators without dragging the frequencies over four other bands, no details need be recorded. This haphazard system was replaced by a reliable frequency meter, designed and built by Ole Orson, W9GJJ, and calibrated by a staff comprised of Birch, Gorder, Barnett, and Orson. The harmonics of an oscillator on 28 to 29 Mc. made the frequency problem nonexistent. The CAA has since established a channel on 116.1 Mc. which helps us to keep our hand in on spotting the frequencies.

The honor of first receiving a station unit signal goes to Ernie Benham, W9DXC, while the credit for the first successful transmission goes to the acting control station, operated at the time by the radio aide.

During the 1945 spring break-up of the Missouri River, KHIU units and operators were ordered on the alert, but no emergency operation was necessary.

The mobile units have proved surprisingly efficient, considering the low power and height of antennas employed. During allotted test periods successful operation has been conducted with the mobiles 7½ to 11 miles. Simple half-wave verticals only have been used and the highest control station antenna tried was about 24 feet above ground. Since the terrain is somewhat rolling, reflection and direction by natural visual obstructions have been noted. At some points, having the mobile unit at the highest point has not always proved the most advantageous. It has been found that moving to a certain point on the upgrade, or even to a point on the opposite side of the hill, at times results in better operation to and from a given point.

The present status of Burleigh County WERS is as follows: KHIU–1, control station — portable in charge of radio aide. Nos. 2, 4, and 5, portable-mobile — installed as mobile. Nos. 3 and 6, portable-mobile — used as portable. Operating personnel consists of John S. Glass, W9SSW, radio aide; Ole Orson, W9GJJ; Robert Kyllingstad; Don Birch; Ray V. Barnett, W9EVP; Ernest R. Benham, W9DXC; Wilfred H. Rova, W9KZL; and J. Roland Gorder.

As more experience is acquired and components can be obtained it becomes apparent that it is desirable to replace some of the original circuits. Plans are under way to license more units and it is hoped that an intercounty agreement can be worked out to cover Morton County.

— *John S. Glass, W9SSW,*
Radio Aide, KHIU

BRIEF

The WJBB net has a new and tested procedure for local drills and statewide tests, where the net serves as a vital relay point. Copies of the procedure can be had by any radio aide upon request to Clarence Margerum, W1AQM, 15 Knowlton Ave., Shrewsbury, Mass., radio aide of the Worcester net.

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This picture was taken by G5KT at an informal RSGB meeting, which took place at Taunton, Somerset, England. *Left to right, front row:* G4OM, W6JXG, W9AMQ, W3JJB and W1JFG. *Back row:* G6LY, 2DRW, G5GT, G5AK, G5LM, G4BN and GW3CR.

The Month in Canada

MARITIME—VE1

From E. S. MacLaughlin, VE1JH:

THE Halifax Amateur Radio Club recently held their closing supper meeting for the summer months, with hams from all over the Dominion in attendance, all branches of the services were represented. One of Halifax's leading manufacturers donated their cafeteria and recreation hall to the club for the occasion. Highlights were the splendid meal, motion pictures, sing-song and the piano playing by Ken Warren of the Royal Canadian Navy. Hams in attendance were: 5AJU, M. Purvis; 5AJV, A. Baxter; 4OE, A. J. Neilson; 4UH, Stewart; 4UB, M. Prior; 4ABU, R. O'Connell; 4AFG, C. Underwood; 3HS, C. Ames; 3WL, C. Wigle; 3ANW, G. O'Leregue; 1AG, N. Mac Keigan; 1BC, W. S. Bligh; 1DB, F. Webb; 1EK, W. Street; 1ET, W. Wooding; 1EV, G. Brown; 1EY, W. MacLean; 1HP, M. Fitzgerald; 1JK, F. Totten; 1JS, C. Kenny; 1KB, H. Scott; 1KY, F. Higgins; 1LZ, D. Bain; 1MZ, R. Hart; 1NE, J. Burke; 1NO, D. Coppe; 1NP, W. Robinson; 1NQ, E. Harrington; 1NW, G. Cooke; 1OB, H. Bishop; 1OK, J. Whitely; 1JH, E. MacLaughlin. Also others who will be joining the ham fraternity when the bands are opened again. The lecture and demonstration on antennas by 5IN, Lt. Brown, RCNVR, captured the attention of all at the April meeting of the club, and was declared the best ever put on in this area.

1KG, Gordon Phalen, has resigned his rank in the Navy and has moved his family to Montreal. Probably will be a new VE2. 1EY, Bill MacLean (formerly traffic network man in Charlottetown, P.E.I.) now of the Royal Canadian Navy, has been assigned to a destroyer. 4OE, A. J. Neilson has received his discharge from the RCAF and has left for his home in Alberta, followed by the good wishes of all his friends in the HARC. 1BZ, Capt. Walter Hyndman has taken his discharge from Headquarters Staff M.D. No. 6, and has returned to his former business in Charlottetown, P.E.I. He is anxious to get on the air and talk with all the friends he made in Halifax.

QUEBEC—VE2

From Lt, L. G. Morris, VE2CO:

GORDON YULL, 2GE, back from overseas, is trying to arrange a passage for his bride. Sid Chapman, 2LV, passed through Ottawa while on furlough and dropped in at Naval Service Headquarters for a brief rag-chew with 2EE, 2LC, 2DR and 2CO. He expects to be back in civilian life before long, having been with the RCAF on foreign duty for four years. Gord Storey, 2FI, is with the Aluminum Company of Canada at Kingston. Val Sharp, 2CR, a sergeant in the reserve army, met several hams during his two weeks' summer training period at Petawawa Camp. 2CO is back in Montreal busily looking for a place to live — any leads, fellows? Sorry to hear that Lyle Ward, 2HF, has been ill. Lyle gave up his position at Research Enterprises, Toronto, and returned to Montreal last October. Best wishes for a complete recovery, OM. Bill Skarstedt, 2DR, has been promoted to the rank of A/Commander (SB) RCNVR. Major Colin Dumbrille, 2BK, is back home after completing a staff course at Kingston.

ONTARIO—VE3

From L. W. Mitchell, VE3AZ:

FLOYD GRIFFEN 3LR, after three years temporary residence in Montreal doing VE2GE's work while he fought in Europe, has received a promotion and announces that he will take up permanent residence in VE2. 3MI in Toronto, who was doing 3LR's work temporarily, is now permanently on the job, all three with the CBC. LR says his absence will make some Toronto BCLs happy. 3SE, P/O Ron Harris of Toronto was last reported at Halifax airport doing air traffic control work. 3LS, Sgt. "Mait" Wilson of Galt, is still radio maintenance man at Charlottetown RCAF station. 3XR, "Doc" Cummings, formerly of Toronto and now of Galt, is back with the Westinghouse Tube Lab. in Hamilton after teaching RCAF fledglings radio in Galt Wireless School. 3AGB, Tommy Bilesko, has been home on leave with YF and daughter in Toronto from White Hourse, Y.T., RCAF station. 3LR would like to know: 1) How come VE3 district, with the most hams, has only one representative on CRTPB committee representing Canadian hams at Ottawa when VE2 has four or five? 2) If our chances of getting back "on" prove good, will we have election for CGM and SCM's?

As most of the panel meetings of the CRTPB in which amateurs are interested are held in Montreal, it is more convenient and less expensive for Montreal amateurs to attend. When meetings are held in Toronto they are usually attended by Toronto amateurs. Elections for CGM and SCM's will be held as soon as it is possible to hold them after the cessation of hostilities.

(*Continued on page 74*)

The Halifax Amateur Radio Club supper meeting held recently was attended by, *left to right, front row:* A. J. Neilson, VE4OE; Don Bain, 1LZ. *Second row:* D. Coppe, 1NO; C. Underwood, 4AFG; W. Robinson, 1NP; Ken Warren; W. Street, 1EK; E. MacLaughlin, 1JH; N. MacKeigan, 1AG; M. Purvis, 5AJU; M. Koz; Cpl. Ames, 3HS; M. Fitzgerald, 1HP; R. Hart, 1MZ. *Third row:* Stewart, 4UH; R. O'Connell, 4ABU; N. Looker; G. Brown, 1EV; M. Prior, 4UB; F. Higgins, 1KY; G. Cooke, 1NW; E. Harrington, 1NQ; Sgt. Patterson; Sgt. Duvar; M. Armstrong. *Fourth row:* S. Mendlesohn; O. Sandoz; W. Bligh, 1BC; E. Schaffer; H. Yeadon; Cpl. North; Cpl. O'Donnell; R. Morrison; C. Wigle, 3WL; J. Whitely, 1OK; Sgt. Cann; M. Pearce. *Fifth row:* F. Totten, 1JK; C. Kenny, 1JS; J. Burke, 1NE; Len Foster; F. Webb, 1DB; W. MacLean, 1EY; H. Bishop, 1OB. Members of the club missing from the picture are A. Baxter, 5AJV; Les Peppin; W. Wooding, 1ET.

AMATEUR ACTIVITIES

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — We regret to report the untimely death of 3DVE. 3CL is back in the States. 3DMQ has been visiting in VU and VK. 3JB is operating WPFQ, the Swarthmore police station, during July and August. A recent letter from 3HQE stated he was OK. 3EKK has been assigned to foreign duty with the Hazeltine Corp. 3IXN is refinishing his new shack. 3HFD has a new QTH three doors away from the old one. 3EOZ expects to move to New York City in the near future. 3GHM is now T/5. 3JBC is teaching radio in Germany. 3IGK expects to leave New York City for duty in the Far East. 3FWH has shipped out on foreign duty. 3JLE is back temporarily and reports meeting 3EFH and PAØ in Africa. We are sorry to hear that the 95 points collected by 3GYV will not bring him home yet. A visitor, 4BOW, expects that there will be plenty of activity in Western Florida to help the Sweepstakes lads. 3BYS, former EC for Philadelphia, is established in Florida with the Eastern Air Lines. Two genemotors have been added to the Frankford Radio Club's field day equipment. 73, *Jerry.*

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ — Civilian Defense was terminated as of June 30, 1945 and at the same time WERS for the District of Columbia, for which they were the sponsors, was discontinued. However, the active members of the WERS expect to continue their activities as a group. The Washington Radio Club's picnic was a howling success with forty picnickers on hand and a power amplifier and a TR-4. On June 3rd the Maryland WERS gang had an alert in the form of a field day and picnic which was held in Gambrill State Park, about six miles west of Frederick. There were fifty present, including several from WJDC. Messers Dawkins, Sugar, and Tynan got WJDC-1 on the air around 5 P.M. and were heard by WJDC-2 with great success. GQM was married in Forestville, Calif., on May 20th to Miss Beverly Ann Arnett and they will reside in Bremerton, Wash. HMX was best man.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU — Asst. SCM, Ed G. Raser, W3ZI; Regional EC for So. N. J., Technical Radio Adviser for N. J. State Defense Council, N. J. State Radio Aide for WERS, and Radio Aide for Hamilton Twp. WERS, ASQ; EC for Somerville and vicinity, including Southbranch, and Radio Aide for Hillsboro/Branchburg Twps. WERS, ABS; Asst. Radio Aide for Hillsboro/Branchburg Twps. WERS, ACC. N. J. State Aide reports the annexation of two townships adjacent to Hamilton Twp. These two municipalities will, upon completion of licensing procedure, become operative under the Hamilton Twp. WERS organization. Several examinations have been held to obtain the necessary WERS operator permit, and more are scheduled for the near future. AXU has been appointed radio aide for this new set-up, and is busily engaged with the lining up and construction of equipment to be utilized. Fixed units will be placed in local fire houses and other strategic locations within the new territory. CFB is very active in this new network, having advised us that he has an MRT-3 ready to go to town as soon as official word is received from FCC. Regular tests and drills are being held on Monday evenings throughout the Hamilton Twp. network, WKPX, and there have been quite a few simulated drills during which a good bit of activity was evidenced involving all units. These drills were formulated and conducted under the direction of Mr. Archie Smith, chairman of our operations committee. Great interest has been shown by all on these drills, and on one Mr. Smith took over and conducted the entire drill under very adverse weather conditions, spending the whole evening out in the field in the pouring rain with a DK-2 under his fireman's raincoat. Orders were relayed through mobile unit No. 26 from the field control unit to WKPX-1 at main control, who relayed word to all units as they became involved. Mobile units participating in this drill were Nos. 10, 26, 13, and 3. The DK-2 operated as control under unit No. 4. The regular monthly meeting of the Hamilton Twp. WERS Operators' Club was held on July 16th at Hamilton Twp. Police Headquarters. A brand-new t.r.f. receiver was demonstrated by State Aide ASQ, after which said receiver was very closely examined by several members. Radio Aide ABS reports that the walkie-talkie unit has been adapted for a 350 volt M.G. set and is being installed in the car of one of the new operators at WKXQ. Stan tells us that the WKXQ network has been operating and concentrating most of its activity within its own net and is set for any emergency. EED, operator in the merchant marine, has reported back after spending several days at home following his return from a cruise which took in Casablanca and Cadiz, Spain. While there he witnessed a bull fight but says he would rather go to the movies at home even if he had to sit through one of the horse operas or "who-dunnits" that are the mainstay of the emporium where GCU officiates as No. 1 film-bender. JAG, also an operator in the merchant marine, has signed up and shipped on a Pacific run. GRW has been reported as having signed with the Roundtree Line and is en route to Europe. JOL and IUQ have just returned from a brasspounding run to Marseilles and have been reported on the way to Cuba. CCC has been discharged from Unk Sam's Navy, where he served two and one-half years as radio operator at the DF station on Amagansette, L. I., and was later transferred to duty at a large Naval station in Puerto Rico. The regular July meeting of the South Jersey Radio Association was held at the Hotel Walt Whitman, Camden, on July 19th, at which time a detailed discussion of our postwar frequencies was held, including the reading of a special communication from headquarters dealing with this subject. Attendance was above par, including several visitors. The SJRA seems to have been bitten with the club-house bug, too, as quite a discussion was held as to what would best suit its needs in this respect. The July issue of the *SJRA News* carries a very interesting article by JNZ entitled "Amateur Intolerance." Bob Haworth writes he is doing service work on radar fighting gear and, although Bob is a confirmed medium-frequency advocate, he really is in love with this gear. The radio equipment owned by the late FAL is being disposed of and anyone interested may obtain a list with prices by writing Mr. George Matthias, 513 Fourth Avenue, Haddon Heights, N. J. No doubt lots of you guys have seen the full page announcement on the new postwar idea department known as the "Crystal Ball" in July *QST*. If you have any ideas up there in your storage vault about what you think will be a swell layout, put it on paper and send it in. Word has been received that EEQ has just returned from Manila. Russ is with IBM and did installation and maintenance on high speed IBM equipment while in the Pacific area. The regular July meeting of the Delaware Valley Radio Association was held in the Chamber of Commerce Room at the Stacy-Trent Hotel on July 11th. Reports on the DVRA Bond Wagon were gratifying with the Red Team holding the helm. A very interesting talk was rendered by Wilton DeMarco, former director of DVRA, now sports and news editor of b.c. station KUTA in Salt Lake City, Utah, an affiliate of the American Broadcasting Co. 73, *Ray.*

WESTERN NEW YORK — SCM, William F. Bellor, W8MC — The RARA finished another successful season with a final meeting on June 22nd. After the meeting the club en masse, was conducted on a tour through WHEC and WHEF, where NCM, the chief operator, gave out with the dope on the high-frequency 4-kw. f.m. job of WHEF. The Western New York WERS emergency net is developing fine with mobile 112 Mc. units of Buffalo, Rochester, Syracuse, Utica, and Rome effecting cross-state tie-ups with some DX jumps up to 85 miles. QQE has moved back to Rochester from Detroit. Tex has developed several hi-fi audio systems. 73, *Bill.*

WESTERN PENNSYLVANIA — SCM, R. R. Rosenberg, W8NCJ — We are glad to hear that MCX is back in the States after 2½ years in Europe and Africa. Bill, who expects to be sent to Ft. Knox, Ky., mentions that ham radio was a great help to him in the Army. S1c WJF, now in boot training at Great Lakes, Ill., reports that someone broke into his ham shack back home and stole much valuable radio equipment, including plate transformers, crystals, electric motor, etc. Sgt. TVA, with the AACS since leaving the U. S. in 1942, writes another interesting letter from Fortaleza, Brazil, and says he is really looking forward to the day when he can set foot in the good ole U. S. A.! NUH finally got around to sending in those forty-eight QSL cards and has received WAS certificate No. 1689. Art thinks ARRL has done a swell job in getting the amateurs generous allotments on high frequencies. RM1c WRK, USCG, who

has been in the services for over three years, feels that his amateur experience has paid big dividends. UVD, who is very busy with farming these days, is constructing a code practice oscillator to run off a.c. as batteries are unobtainable. We are sorry to hear that VYU's father is seriously ill and that she will not be able to resume studies at Carnegie Tech this semester. From PER we learn that CPO FPH is home on a thirty-day leave, after two years overseas duty in North Africa, Sicily and Italy. Sgt. NHD, returning home after duty in Panama, gave an interesting talk on his Army radio experiences to the members of the Radio Association of Erie at a recent meeting. Sgt. Shaner is spending a furlough with his family at Erie prior to reassignment. Word has been received that SIH of Ridgway is home on a 45-day furlough after spending three years in the Pacific area. QXF, now employed in Philadelphia, appreciates information on the fellows which appears in *QST*. M/Sgt. 3GJY dropped a card from the West Coast. Jack has been in the Army Signal Corps since before Pearl Harbor and has married a YL from Western Pennsylvania, so expects to settle down in this section after the war. RM1c WRK just announced the arrival on July 11th of twin sons. The SCM and XYL stopped in to visit DXN while in the Northeast and looked over his swell seventy-foot wood, lattice-type, antenna tower. DXN has been active in Erie County WERS and puts a strong signal into the City of Erie, a distance of about sixteen miles, with his four-element beam antenna. Erie WERS, WJWE, drills each Monday evening, according to BHN. The Radio Association of Erie is proceeding with plans to raise funds to secure permanent headquarters. Substantial contributions have been received and the subscription campaign is meeting with favorable local response. Members and friends of the Association are invited to attend regular meetings held on the first and third Tuesdays of each month at 133 West Seventh Street, Erie, Pa. 73, *Ray*.

CENTRAL DIVISION

ILLINOIS — SCM, David E. Blake, II, W9NUX — TLQ is now a major in the CAP, communications officer, Illinois Wing. T/5 MZW writes from the Bavarian Alps of the battles of the Roer, Rhine at Remagen, Ruhr Pocket, and the Redoubt (the four "Rs"), and the battle of the English pubs. He wants to attend RCA after V-J Day. Other hams in his company are 8NGL and K6DTR. He would like to hear from BYZ. A note came through from IAT with the following news: The Quad City Amateur Radio Club reorganized on V-E Day. The WERS section of the club is going strong with field days, hidden transmitter hunts, much doing about antennas, rigs, and what have you. WHHI, Chicago, FM comes in regularly. AKO, who was in the So. Pacific for two years, is getting a medical discharge from the Seabees. His boy, in the Army in the Philippines, got the Silver Star for bravery. MSQ is working for the United Air Lines at Moline Airport. CUV is a lt. in Italy. AARS: SXL/WLTH says the gang in the Bloomington neighborhood are not dead by a long shot and gives the following information: QKL is on his way home to the States. Corny picked up a bit of Nazi iron and spent quite a bit of time in the hospital. JPR, in the merchant marine, was home for a breathing spell. When last heard of PRV still was with Oil-O-Matic. The big surprise of the month was when MIN walked in from down Kansas City way, where he is an instructor in meteorology and airline radio procedure at Central Radio and Television Schools. John came through with the information that ODX is roosting behind an engineer's desk out on the West Coast around Seattle, Wash. TAQ and MBH are somewhere on the East Coast. Most of the rest of the gang are either in the Army or the Navy, but there are possibly a half dozen left at home out of about fifty that the club boasted as members. According to a recent issue of *QST*, BRD and ALU have the same APO address and they may get a chance to meet and have a gabfest. JLK is helping to keep them rolling on the Alton R.R. and SXL/WLTH still is shoving out Whizan Pecan Petes at Blicks. Let's hear from more of our AARS gang. Here are a few words just received from 9ALU, in Luzon, P. I.: "Lt. H. L. Christ, APO 70, c/o Postmaster, San Francisco, Calif., says activity on Luzon has lessened to that stage where ham radio could be enjoyed again. *QST* comes regularly, although a month or two late, and receives priority over all other mail. ALU's brother-in-law, GVP, is at Mindanao. JAU and WQB are on Luzon. There are four hams in our area: 3BYF, 7HDM/8NCQ, REJ, and WQB. We see the ARRL *Handbook* on every operating table and every test bench. I haven't listened on 10 meters for over a year, but while in Fiji I heard a few commercial harmonics. I get the iron out occasionally; the old urge is still there after four years in the services and the latest project is a 6K8 converter." Thanks to ALU from NUX for his QSL made on a Japanese government bill. It's the oddest received and it sure will have a prominent place in the shack. 73, *Dave*.

INDIANA — SCM, Herbert S. Brier, W9EGQ — EGV won first prize and 8CBI won second prize for the best letters about postwar receivers. AB has a victory garden so far from his home that it takes the gas he would like to use for visiting hams to reach it. S2c ONB is completing a course to become an ARM for the Navy. MKM is married; his new wife wants to become a ham. HUV is building an SS super. NXU is in Texas. CRZ, after three years in the Pacific, is resting in Miami. EGV is combining his recent studies of photoelectric cells with his continuing study of women UCT has a 12-tube German receiver he hopes he can keep. EHT is dreaming of catching some "small" fish in the lakes around Seattle. YWE runs a telephone request program over WHOT, South Bend. KMY wants a car and a 250-watt rig as soon as he gets out of the Army. FDS is experimenting with high-fidelity b.c. tuners. IFU does field inspection work for the Navy. PUB, home from the Navy on leave, got a job repairing "juke boxes." SNF is stationed in Texas. His postwar plans include a buffalo farm in Michigan. DQK visited some of the hams while home. MBM added a hydraulic press to his basement workshop. KYK and EBQ were judges at Gary's radio picnic. DUT, operating WKMR-10 portable-mobile, has a reliable range of over fifteen miles to control. UZW is stationed in North Carolina. LVT is now a member of the CAP and operates WKVY-45. HBD spent a night with him; they talked about radio! QEL is home from the Army on points. The frequency allocation news woke up NGS; he reported for the first time in three years. He tested the old rig and found it still works. WVP did the same with his. UMK has been on Hawaii, Canton I., Tarawa, Guadalcanal, Biak, Palau I., Leyte, Mindoro, Luzon, Palawan, etc. ZNC is running a radio repair shop in Karbach, Germany. LMO is opening a radio shop in Munster. PLW recently was married. MJH has a portable-mobile transmitter-receiver for WERS work almost completed. MTL is very busy working with CAP-WERS. MVZ was home from work for a week with a sprained ankle. 73, *Herb*.

MICHIGAN — SCM, Harold C. Bird, W8DPE — The hamfest has been set for October 7th at Pontiac, Mich., under the sponsorship of DARA and the Pontiac WERS Club. We would like each amateur returning from the services to send his address to the SCM. 9GQF reports that 9OXE/8RLM, who was with NCB for eight years, is at present RM1c in the U. S. Navy. Leo was in every mission from Midway to Okinawa, seeing all this action from aboard a light cruiser, and has thirteen battle stars to his credit. T/Sgt. 9ZRK of the Marine Corps, who worked on the 7-Mc. band mostly, was home on furlough. The following send greetings to you fellows and your SCM: W9PDE, 9EVI, 9YYA, 9QIK, and 1st Lt. 9CGR, who is in England with the AAF. M. J. Finjawa, who wanted to contact 8VIV, thanks us for the swell copy of the *DARA Bulletin* and thinks that at one time he worked several of the fellows that were mentioned in the *Bulletin*. 8WCT sends us a very interesting letter from Germany and says he is going to spend more time on antennas when he gets back. Francis X. Martin writes us from Florida that he was home but did not have time to get around to see us. 8NOH writes us from the So. Pacific, where he is seeing plenty of action, that he is interested in the postwar frequencies and what is going on here. After reading the *Bulletin* he sends it to 8MTE. Rus Sakkers likes to dream about the good old days and hopes he soon will be back making QSL cards for you fellows. 8UXS, of Lansing, writes from New Orleans, where he was waiting for another ship as his had been taken over by the armed forces. Tom has visited the Panama Canal from one end to the other. 8ROV thanks us for the *DARA Bulletin* and reports he is pounding brass in China. 8UGR is working out some schemes for the Red Cross network he proposed sometime ago. 8SSY says his XYL is learning the code and expects to have a license soon. His new address is 5312 Oregon, Detroit, Mich.; he is doing research work for Industrial Electronics, Inc., and working as operator for WWJ. IHN thanks Ken for the swell write-up in the *Bulletin*. KNP reports the Texas weather is very hot and he is sweating out

assignments on 25 Mc. OCC is very busy getting his new factory lined up for business. FWU got a long-wave converter that extends the receiver range from 44 Mc. to 95 kc. 9YNY still is pounding brass in the Army and sweating out the point system. FX, our good secretary, complains that the work eats into his spare time. He is beginning to draw on paper the postwar FX 3663. The DARA held its monthly meeting July 12th at the home of Charles Wycoff in Royal Oak. On July 22nd a picnic was held at the home of Eddie and Joe Gocha in Berkley and an interesting tour of the hall of science and grounds of the Crambrook Foundation was made. The line-up on WERS in the State is as follows: Center Line, discontinuing; Detroit, not certain; Flint, Grand Rapids, Lansing, Muskegon, and Pontiac, continuing. The Pontiac WERS unit is thinking of being relicensed as an emergency network to cover the entire county. This would give contact with Flint and Detroit, and possibly Lansing, in case of an emergency. The Pontiac Club recently made a very interesting test with a portable job and found that its coverage to the north extends beyond their expectations. Don't forget to send in your cards re the Oct. 7th hamfest. 73, *Hal.*

OHIO — SCM, Carl F. Wiehe, W8MFP — TQS reports that Cincinnati WKHO has resumed hidden transmitter activities after an FCC "no objections" verdict was rendered following a thorough investigation of practices and procedures. FCC says, "Obey all WERS regulations." The best time for finding a unit hidden in a several-hundred-square-mile area was twenty-five minutes by MEU. Directional equipment developed for the hunts was used to great advantage at Cincinnati during the last Ohio River flood. PZA reports an attendance of 110 at the Cleveland CRA meeting in July. A two-hour demonstration and lecture on transmission lines was the highlight of the meeting. DS and JNF were elected president and vice-president of CRA. QYO recently renewed acquaintance with PZA by letter. QYO lists ten prominent radio stations, including WAR, that he has worked at during his five-year hitch in the Army. Both PZA and Lt. QYO would like to hear from any of the 3780 kc. AARS gang of '37 and '40 vintage. His QTH is 514 E. Alexandria Ave., Alexandria, Va. QV amazed the young squirts of CRA with a demonstration of his ancient rock crusher. NV is the proud papa of a brand new lady. Lt. UCY spent a few days in town. PKS is stationed in Washington, D. C., for the present. M/Sgt. LZE is back from England waiting for British regulations to permit his English WAAF wife to join him. 2nd Lt. EFW V-mailed that he is just two hours from Tokyo and he has met lots of hams out there. Lt. Comdr. BAH writes that he met EFW recently. WJJH did an outstanding job on the most recent county-wide paper salvage drive. The Toledo Radio Club's *News and Views*, an FB bulletin, lists Sgt. SUD, Lt. EVV and QOU as being in town on furlough as was also RT1c TLF, who is expecting to be shipped out soon. An epidemic of crystal-controlled units has broken out in Toledo along with a campaign to reduce radiation from superregenerative receivers. WERS non-ham operators have been reminded that now is a good time to prepare for their ham tickets. While in a St. Louis night spot, RHH saw a mind reading act and thought he'd have some fun stumping the Magi. He asked him to have his assistant describe RHH's call-letter pin. She did. Then the Magi stuck out his hand in the best ham manner and said, "Glad to meet you, fella. I am W9IGJ." CBI reports QID back from the Pacific and stationed in Washington, D. C. ENH likes his job as instructor at the Navy Radio School in Michigan City. VAY lost his ham ticket and WERS permit in San Francisco. LJ was a spectator at the PGA Golf Tournament in Dayton. SID is hospitalized for an operation and would like to hear from the gang. RHG visited Columbus recently and operated in the WERS net there. NSS operates in the Piqua WERS net occasionally. Dayton WERS continues normal with RHH batting for CBI as radio aide because of the press of business and much travel for the latter. VUV V-mails that his wounds are healed and that he is rarin' to go again. QQ reports that Columbus CAP and WERS activities are running as per their usual schedule. Local radio men are forming a sub-chapter of the Dayton I.R.E. branch. 73, *Carl.*

WISCONSIN — SCM, Emil Felber, jr., W9RH — Sgt. KZO sends the following news from Burma: BKS moved from Beloit to Milwaukee with his XYL after graduating from the U. of Wis. NVC is with an AAF band in Idaho. TJM, from Sharon, when last heard from was in a hospital, recovering from a piece of mortar shell he collected in his back while in France. He hears from PCN right along. EWY, of La Crosse, is in China. He heard from HGE, who is in the Philippines and has been away from the U. S. for over three years. KZO states that he has been to China a couple of times himself and has a collection of 510Bs, a husky pentode, and other Jap receiving tubes. M/Sgt. HEK, located in New Guinea, reports that he receives *QST* every month and would like to hear more about the Madison gang. CJN, a radar sgt. located in Germany, is looking forward to operating his ham rig when he returns to the U.S.A. Charlie Brown, of Radio Parts Co., informed HRM that his son Stanley is somewhere in the Pacific. Lt. ex-BDD, USNR, is located in Washington, D. C., where his job is terminating Navy contracts. Pvt. Paul Ripple, in Germany, expects to travel to the Pacific war area soon. Capt. Rolland Rahr V-mailed from the ETO that he expects to be shifted. Capt. JWT, USMCR, wrote from Peleliu that he's very busy but still takes time to nurse his garden. S1c Ed Thornley is at Great Lakes going to primary radio school for a 12-week course. Lt. (jg) Geo. Pfister, USNR, was on a trip aboard ship. Lt. ANA, USNR, is established in a Quonset hut on Luzon and reports conditions are improving. T/4 ANK is in Oslo, Norway, and reports his brother is a CRM in the USCG. Cpl. John Holmes finally met Ray Charney down in Australia. Cpl. Waldemar Heinrich V-mailed that he's 180 degrees to the west from the Marianas. Comdr. DTK, USNR, now is located on Saipan. Pvt. UNY is at present in Wm. Beaumont General Hospital at El Paso, Tex. but expects to be shipped out soon. Lt. Sid Rose still is on the staff of *The Roundup*, the India-Burma Theater newspaper. SYT and OBZ are building new portable WERS rigs. The WMFI gang voted not to hold WERS drills until September but to concentrate on tests with the new mobile rigs that have been built. 73, *Emil.*

DAKOTA DIVISION

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — ZBU failed to report this month for, I believe, the first time since I took over as SCM. SBF wrote me a very interesting letter from Germany and enclosed a couple of pictures of one of the German receivers, which evidently is a copy of our own HRO. He sends his best regards to all of the gang and is looking for a copy of the "Lonely Hearts" column. AZO was married at Pierre on June 13th. He now is at sea as CRT, in charge of radio and radar.

NORTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — PDN, with Northwestern Airlines, was transferred to Fargo. His brother RPM is a flying operator based at Hawaii and makes trips over to the Islands to evacuate the wounded. KHF, who used to be active on 80 and 160, is stationed at Missoula, Mont. RM2c TEF writes from Alaska that he ran into TED, CRT, working in a radio lab up there. A couple of stacked four-element coaxial antennas are on their way up at MTH's and BHY's. They will be used for field tests with CAP planes. RPT is building an m.o.p.a. job for CAP-WERS, using a pair of 75s. FUZ is on his way back to Bemidji, and can't wait to get the old fishing tackle out again. BHY is scheduled to be one of the first visitors. Too bad ZWW can't be there also, to be chastised by the OW for keeping the rest of us up all night. BMX was observed gazing at some expensive commodities in a store window the other day. Never hear from some of the older men such as JIE or TLE. 73, *Army.*

HUDSON DIVISION

NEW YORK CITY AND LONG ISLAND — SCM, Charles Ham, jr., W2KDC — The big news of the month is the reactivation of the New York City WERS under a tie-up with the Red Cross to be known as "Volunteer Radio Service of the City of New York." Tentative plans call for a census of equipment and operators with operations starting about September 1st. All are urged not to scrap 112-Mc. equipment but to join with the new group. LIW is reported as having joined the married ranks. The "Major Ranvier" reported in "Hams in Combat" April *QST* is none other than BNQ of these parts. Commander BEG, former ARRL Director and now communications officer aboard one of our larger battleships, has seen much service in all theaters. GTZ reports back to "civilization," after thirteen months in Mexico City, and misses daily steaks. He puts in eight hours a day for Western Electric, and may assist in WERS again. DOG, Riverhead, reports activity in Suffolk WERS under the call WLSB, with eight units licensed. He needs units toward Smithtown and further west to round out the service. Those active include ADW, CKU, NMP, NMZ, and DOG. GDF and FJE are

majors in the Pacific area. Lt. Col. PF is returning to civilian life and the telephone company. Capt. JCA, back temporarily, has been all over the world on an inspection tour. KDC is hot and bothered. Upon the demise of WERS he tore down the complete boro control station and returned the material to ten or twelve donors. Now he must rebuild completely for new service in thirty days. LUW is getting pop-eyed looking for a decent used receiver. MHF and others had a swell time batting the breeze during a personal hamfest in Jamaica. MYE is reported still honeymooning. OKX and APJ talked over old times on the subway.

NORTHERN NEW JERSEY — SCM, Winfield G. Beck, W2CQD — A postcard from Danny Dinzik tells us that he's leaving for RT boot camp in the Navy. A letter was received from RM3c Nick Camenares, who says he's hoping for a leave in September. He has looked over Armed Forces radio station WXLD at Saipan, picked up some souvenirs, including an insulator, off of a Jap landing barge, and bounced around on a destroyer in a typhoon. He visited Saipan, Tinian, Guam, Uluthi, Palau, the Philippines, Formosa, and Honshu, and also made a little trip to pick up a couple of pilots in a spot near Tokyo Bay. We still are looking for a letter from NBJ. 73, *"Win."*

MIDWEST DIVISION

KANSAS — SCM, Alvin B. Unruh, W9AWP — CHU, an ensign, is studying radar at M. I. T. AVV is working in the television department of RCA in New York City. Lt. EEB, in the Signal Corps, expects duty in the Pacific theater. IVO is a lieutenant in the Signal Corps, instructing in radio at Ft. Monmouth officers' school; he is getting married in August. GSW has constructed a voltage-regulated power supply, electronic keyer, speech amplifier, and other items. OZN, with the Signal Corps in Europe, has been promoted to sergeant. NLM was in Dayton, Ohio recently while on business to Wright Field. 73, *Abie.*

MISSOURI — SCM, Mrs. Letha A. Dangerfield, W9OUD — KPM still is on Okinawa — he went ashore on the first day of the invasion — and is the only ham in his battalion. VWN, in Cordova, Alaska, wrote us about the CAA set-up there and we sympathize with him when a breakdown occurs at 3 A.M. with those various transmitters, receivers, frequencies, antennas, and so forth. BIU has been in China and India, and along the Ledo Road also. 8NYP who often had articles in *QST* has just joined the outfit there. FIR/FOR wrote from Belgium that he did not get our letter with the dope about BAA and TWP soon enough. The brothers were in the same town with John, but left before he knew it. His new address is c/o San Francisco instead of New York. Our brother, 4HLN, seems to have undergone a similar change of address. Both are in the merchant marine, and ZAO is with the same branch around the Philippines. TGN had a nine-day leave in June. BMS wants to take the antenna down from the roof but it is too hot now. OUD is checking canning supplies and ration points with a slightly confused air.

NEBRASKA — SCM, Arthur R. Gaeth, W9FQB — CAP has received the call of KCHK and has three units on the air so far. KHBW-1, ROE at the mike, is doing FB into Omaha. GEU, KHKN-37, is located in the Elks Club with a HY75/829 m.o.p.a. rig which Henry Peterson, KHKN-43, is admiring. UFD, KHKN-31, is the proud possessor of YL jr. operator No. 2. UEV, KHKN-30, is house hunting and disposing of surplus equipment. Cliff Allwine, KHKN-39, reports that he has put his soldering iron away as his HY75 finally gave up the ghost via the gas route. EKK, KHKN-2, reports that Fremont is about to activate under WERS with the call of KGLZ; also that the late WOA's XYL visited with him and says that the gang in Lincoln bought Art's equipment and plan activity on 2½ meters. The Ak-Sar-Ben Radio Club was favored with a nice turnout for their picnic July 8. Many fine contests and prizes were available. ZPZ and XYL, YMU, and FQB were the committee-in-charge; ZPZ, VHS, ZZG, YMU, and FQB were on the contest and games committee; and YDC and XYL, UEV and YL, made up the welcome committee. EEK furnished gobs of ice cream. Capt. HTE reports his XYL suffered a fractured kneecap when involved in an auto accident. Warrant Officer DYG was home on a 14-day leave from Fort McPherson, Ga. Capt. BZV discovered ex-4CMX and HRN in his outfit. He has built an electric refrigerator that really works. GRT1c, UPC reports a new XYL as of a year ago; also the OM, SYM/ex-DUH, is back in Omaha. Cpl. ZFC was home on a 19-day furlough and reported via a personal visit. IJF is building a de luxe amplifier with four input channels. T/3 GAS reports from a stone's throw from Tokyo and says he got hold of April *QST* and enjoyed reading about the gang. He built a little one-tube regenerative receiver made from American and Jap parts and copies press c.w. from Frisco on it. He would like to hear from some of the gang and asks the whereabouts of "Gaddis" from Grand Island. "Cellophane" (LSPH) is a sgt. in WLA and is dishing out the horse liniment. 73, *Art.*

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — WERS News: CTI writes that WJQA, Stamford district, ceased operation as of July 15th by order of EER, district radio aide, and the licensee, the Town of Stamford. Waterbury: Carl Weyand, operator of WKWG-70, reports working WKHM-3, New Brunswick, N. J.; WJXW-8, Verona, N. J.; WKAE-3, Mt. Clair, N. J.; and WKHF-52, portable-mobile of Ware, Mass., during the July 4th test period. WJBB-3, of Worcester, Mass., was heard but no contact was made. New Haven: FMV, IGT, IND, MVH, Ed Bates (LSPH), and Jack Harper have been busy removing WJLH units and installing them in new locations. Katharine Jackson, chief operator at WJLH-1, has left for her summer home at Amagansett, L. I., where she hopes to visit WLSB units in that area. Geraldine Desmond and Betty Doyle, operators of WJLH-23 and 6 respectively, are also vacationing. Middletown: Your SCM, vacationing and writing this report from East Hampton, has visited several units in the WKNQ district. Earl Hitchcock, operator of WKNQ-7, is located in East Hampton, 600 feet above sea level. Norwich units WKOB-14, New London; WKWG-70, Prospect; WMHC-20, West Hartford; and Middletown units Nos. 1, 4, 5, 19, 25, and 29. Earle is studying for an amateur license. We were very pleased with the operation of the Middletown network. 73, *Ed.*

MAINE — SCM, G. C. Brown, W1AQL — MGP writes from Atlantic City that he has an XYL. Sam is back after being in Africa and Italy almost three years. IQJ was in Bangor recently. Ex-ALZ spent his vacation at his summer home on Pushaw Lake. EAH has moved from Presque Isle to the West Coast. MN has returned to duty after a shore leave. DZM is doing radio work in the So. Pacific. BPX is putting in his spare time playing baseball. BX was in town recently. Any of the Maine gang interested in radar work should drop your SCM a line for information on how to sign up. The age limit is thirty to forty-five. 73, *"GC."*

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — EU writes that the M.A.K. Radio Club, founded in 1931, is going strong with ARN, BAQ, BRI, BSA, CB, CZV, EU, GAW, SS, and UX present at the last meeting. 9GDQ writes from Wisconsin that he is married. KJD says that his brother, LZB, has been discharged from the Army and is home in Weymouth. LNX has moved to Watertown. NVI is working at M.I.T. JYA, still with the Signal Corps in Boston, says that MVF is RM2c and is out in the Pacific area. KMY returns to the Pacific area about July 1st as a civilian engineer for Raytheon. The South Shore Amateur Radio Club held its regular meeting with the following present: CT, LZW, HCL, MMH, AKY, KJD, ALP, IS, IHI, KXN, 3IOK/2ONY, and the Mugford twins. The T9 Club, a 100% ARRL club, with sixteen members, all hams, held its regular monthly meeting in June. Those present were ITJ, ISX, CVM, BVL, IPK, ALB, and 8BBQ. IBF was in Washington, D. C. IZT received his discharge from the Navy (retired as ensign) and now is a lt. (jg) in the Maritime Service stationed at Gallups Island. RM2c NJV, in the Navy for 2½ years, writes from Panama, where he has been for a year. NFZ worked for a while in production test at Raytheon and has returned to Northeastern U. He was an operator at KBN before the war. AHP says that those of the WERS that are left have joined the State Guard. He will be a sgt. technician in charge of the local set-up. MPP says she has disbanded her shack. ZZC hopes to be home from Germany soon. HWE has four baby woodchucks. LTR is in the Western Pacific. MQE sent HWE two .01 Jap bonds from the Pacific. JFR is the dad of a baby YL. AAT is in the Navy in the Pacific area. Ex-AFF is back from two weeks in Vermont on Lake Champlain. NVB hopes that 2½ opens soon. MQO, CRT USCG, now is serving in the Central Pacific area.

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — Last month's write-up was missing for the simple reason that the mailbag contained nary a report.

Dick Atwood reports again for WJBB, Worcester. KJG has left the WJBB net because of a transfer to the I.B.M. laboratory in Endicott, N. Y. The Worcester gang will take part in the weather bureau's plan if enough other licensees coöperate. WJBB-3, which acts as State Relay for the net, now has schedules every other Sunday with the following networks: WJQH, WKKW, WLSO, WJPY, WLDM, WLDC, and WKHF. Other nets desiring to tie in can make arrangements with Dick Atwood, 24 Baker St., Worcester 3. Several of the Worcester units report success with polyethylene coaxial cable, 2/10-inch o.d. in lengths up to 20 feet. IJT reports that he is now in the Army and would like to hear from the gang. His address is Pvt. C. R. Bordeau, 4th ETC Ordnance School, Aberdeen Prov. Grounds, Md. Gerry Sheehan reports for the Pittsfield gang. NFF, a Marine pfc., is stationed on Okinawa at the communications center. Bob Scace has passed radar tests for the Navy and is awaiting call. WHKW units are continuing drills on Monday nights. AZW and IFE are fathers, IFE for the second time and Prent for the third. JHP, of Needham, recently visited AZW. The Pittsfield Radio Club held its annual picnic, July 15th, and for the benefit of relatives and friends of members, staged an hour-long drill during which the control station despatched mobile units to various spots with instructions for action on arrival. Operators participating included LUD, IZN, IFE, LKO, BKG, AZW, and Bob Scace.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ/4 — MMG sends a letter containing interesting dope on what he's been doing. GKE writes us of the arrival of a daughter, while ATE advises of the birth of a second son. CFG now is communications officer and chief censor aboard a newly-commissioned hospital ship. BFT has returned from a week's trip to Washington, where he had a nice chat with JFN. LVG is in Arizona hard at work on B-29s.

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — In a V-mail letter from Milan, Italy, Lt. KZN writes that he is sharing a room with bath in the Hotel Continental with another officer. He says they are in charge of signal detachment operations and it keeps them very busy. Write the SCM for his complete address. A land-line QSO with KQY was the extent of my activities, which must have been greater than the activities of the rest of the gang, judging from the lack of reports.

VERMONT — SCM, Burtis W. Dean, W1NLO — MJU is coauthor of an article on "Supersonic Bias for Magnetic Recording" in the July issue of *Electronics*. Don is with the Research Dept., Stromberg Carlson Co., Rochester, N. Y. KXP was home recently and got a few pointers from LWN on how to build audio amplifiers. GAN and family spent ten days vacationing at Lake St. Catherine. The BARC is sponsoring a hamfestette in coöperation with the UVM EE Dept., Friday, November 9th, at the Waterman Bldg. There will be speakers, movies, and an ARRL Club Award Code Contest. 73, *Burt.*

NORTHWESTERN DIVISION

IDAHO — SCM, Don D. Oberbillig, W7AVP — The Idaho State Guard signal communications sections have been assigned the call KIAP and a frequency of 3825 kc. for emergency radiotelephone communication in connection with their activities in coöperating with state and governmental agencies. Walkie-talkie units have been issued to the Guard and active operation is in progress according to WERS procedure. The units are SCR 511, manufactured by Galvin, and are operated from either a dry battery or wet cell and vibrator. Communication has been established up to five miles, using approximately 0.5 watt into a whip antenna. For information regarding Idaho State Guard, amateurs are asked to contact Capt. D. D. Oberbillig, Signal Corps, Idaho State Guard, Box 486, Boise, Idaho.

OREGON — SCM, Carl Austin, W7GNJ — Don Stewart, ARM1c, used his eight-day leave to visit his wife's folks and his brother GVC. He mentioned that AIG has rebuilt his rig and is all set for 14-Mc. c.w. Your SCM and HHH called on BUH at Tillamook and dug out the following dope: CN has an FB radio shop at Eugene; HSL was home on leave, and now is chief on a cruiser; IKB is a radar man on an LC; HCM is in radio work on a new ship; Sid Warner is RI at Venice, Calif.; IDP and HCN are doing local work; BUH has closed his radio shop for the duration and is rebuilding b.c. sets at home. Paul mentioned that after a winter of beachcombing he and his XYL have collected over a hundred Jap glass balls (fish-net floats). HLF, of Medford, reports a meeting and rag-chew at HWH's shack. Present were DBZ, HLF, HWH, WERS operators, would-be hams and their XYLs. Dwight says FYF is raising chicks in his ham shack. 73, *Carl.*

WASHINGTON — SCM, O. U. Tatro, W7FWD — "Six Everett youths, all under 18, were charged with illegally transmitting short-wave radio communications in complaints filed by district monitoring officer, RID, FCC." This will probably clear up the QRM suffered for a long time by KFNV. The WERS offered, through IOQ, its services to the Red Cross. The offer was accepted after a practical demonstration and the former aircraft warning service's 12 by 12 glass-enclosed quarters on top of the Medical Dental Bldg., was provided for its new home. A test for distance was made from Lake Kelcema and KFIQ, 120 miles to the south, tried to monitor the signals. DYD has just finished a new 2½-meter receiver. Jim Hall, KFNV-6, has left for Navy boot training. He has a 2nd-class radiotelephone license and is going after a ham ticket as soon as his code speed is acquired. HCE, EC, says ALH is trying to improve his VFO. ETX is home for a visit. CAM is building a cabinet for the all-wave receiver just completed. Mrs. GMC may bring news of Dick on her coming visit. The YARC is organizing a picnic and HCE's new signal tracer is homemade. BG, ARRL Director, is home from the Board Meeting and reports KA1HR is out of the Army and in Spokane. RM1c BTV is in Tacoma on a short leave from the USM. IHJ is out of the services and is living in Portland with his XYL, IHK, while taking a refresher course at a dental college. Ken Hager (LSPH), reported in this column as missing in action in Belgium, was a recent visitor. He was a WP in Germany for four months, and is now on 60-day leave. HXK is roaming the high seas in the merchant marine as CRO. HML was home on a short furlough and served as 4th cook on the train coming up. He still is teaching at TI. KFIQ has had its WERS license renewed. 73, *Tate.*

PACIFIC DIVISION

EAST BAY — SCM, Horace R. Greer, W6TI — EC QDE; EC v.h.f., FKQ; Asst. EC v.h.f., OJU; 00 v.h.f., ZM. All dressed up in Coast Guard Blue and reporting for duty on a recent Saturday evening, EY, Pacific Division Director, took one step off the pier to the deck of the boat that patrols the bay, failed to reach the deck, and fell into the bay head first. Everyone was glad to hear that Mac was saved from a terrible death by his fellow workmen and from the latest reports everything now is under control. On July 19th, at the Oakland City Hall, the regular WERS meeting was held. An FB talk on radio-controlled model planes and some fine movies rounded out the evening. OCZ was a surprise visitor to the East Bay recently. NWB died on June 24th. AER took unto himself a wife and his new QRA is San Carlos. IMA is out of the Army and is back at work with the Pac. Tel. & Tel. Co. BGY is teaching school (conference leadership) with the Pac. Tel. & Tel. BUY likes his new job as supervising plant foreman at the Berkeley office, Pac. Tel. & Tel. GPY will be home from New York soon. "Another day closer to victory." *TI.*

SAN FRANCISCO — SCM, William A. Ladley, W6RBQ — Phone RA. 8340. ECs, DOT and KZP. 00 for u.h.f., NJW. Chief Warrant Officer CIS, in the Philippines, is doing a grand job for the Navy constructing radio stations and installing their new gear. BP, of KRM traffic fame, is back at his old brasspounding job after a trip to Australia with the merchant marine. Capt. HJP sends news from Guam, where he now is stationed. RM1c 7BIK writes in from sea and sends the SCM a nice photo. Jerry, RBQ's son, is home with the Purple Heart after eighteen months in the Pacific area. Bob still is in the Western Pacific area. LFZ, still with Wells Mfg. Co., paid a visit to the SCM. 9VND is held over at San Diego for Raytheon. RAH is at Culver City and is busy on radar engineering for Raytheon. 4GDH wants to hear from other hams interested in wired wireless. His address is 3326 16th St., San Francisco, Calif. 5KHB is standing by at T. I. for overseas assignment with the Navy. DOT has been appointed a first lt. and second in command of the communications det. for the California State Guard in San Francisco. PGB, field engineer for the Army Signal Corps, finds time to serve with the police department and to take his radiotelephone 1st-class exam. Rex advises he recently met UGA, of Reno, Nevada, at the Florence prisoner of war camp and that WLXA/K6DV is serving at Camp Crowder, Miss., along with PZW, who recently was married. WERS at State Guard headquarters in San Francisco

(Continued on page 66)

★ ★ ★

EACH TIME that this series on phonograph reproduction seems to be finished, we discover another point that deserves mention. This one relates to the effect of frequency response compensation on distortion.

Any device which raises high frequency response will increase the harmonic distortion of the signal supplied to it. This is basic, and has nothing to do with the circuit used.

It works out this way. Suppose an amplifier is designed to have a rising frequency characteristic of 6 db per octave. Suppose this amplifier is perfectly free from distortion in other respects: — all it does is increase the highs. If the input signal has 5% second harmonic and 5% third harmonic, the output will have 10% second harmonic and 20% third harmonic.

The reason for this is quite clear. Since the second harmonic is twice the frequency of the fundamental, it will be amplified twice as much (6 db) as the fundamental. Two × 5% = 10%. The third harmonic is three times the frequency of the fundamental. This is two octaves higher, so the amplifier will give it 12 db more gain. Simple arithmetic makes the output harmonic 5% × 3.98 = 20% (approximately). Similarly, a 1% fifth harmonic would jump to about 30%.

This same effect operates in reverse, of course. An amplifier having a falling characteristic, with the gain becoming less as the frequency increases, will reduce the harmonic content of the signal.

As a practical matter, the pickup used should have sufficient high-frequency response. Any attempt to improve the high-frequency response of a cheap pickup by compensation usually results in pretty awful distortion.

On a phonograph record, the velocity of the needle point is proportional to the amplitude multiplied by the frequency. Thus a perfect velocity type pickup has about 6 db more gain per octave than a perfect amplitude type pickup. This is why magnetic or moving coil pickups (velocity) require bass boosting, while crystal pickups (amplitude) require boosting of the highs. This seems to us to be an inherent advantage in favor of the former type, and it is one of the reasons why we prefer pickups of the velocity type.

If the compensation required by a crystal pickup is located immediately after the pickup itself, only the distortion in the crystal head itself is increased by the compensation, and results are good. However, sometimes in cheap outfits the compensation is accomplished in the output stage. This is convenient because a pentode driving a speaker gives a rising characteristic automatically, due to the inductance of the speaker and output transformer. In such a case, the compensation magnifies the distortion in the pentode output stage and the entire amplifier as well as the pickup. This explains why some of those cheap jobs sound the way they do.

WILLIAM A. READY

(Continued from page 64)

is rolling along in good shape. T/Sgt. CVP is conducting a code class for all interested Guard members and expects to follow with a class in radio theory. DOT received his commission in the Guard as a first lt. JKN was appointed to the rank of t/sgt. and Russ Sorensen to corporal. Sgt. LFZ is vacationing near Ukiah with his family. Sgt. IPH returned home for the first time in over thirty months, most of which was spent with the Air Forces in Italy and Corsica, where he has done much flying and radio operating. Comdr. 9FA is stationed in Guam while his family reside in Denver. LLW is busy with his lettuce crop and sends the following dope from T/Sgt. NNL/WLV, who is stationed in Manila, P. I. It is rumored that 9EKY will soon take over all coast personnel for Raytheon and reside in San Francisco. News comes from 9ILH that Sgt. 9ICN is serving with the USMC on Okinawa. S/Sgt. JWF arrived home from England after a long stay and expects to serve in the Pacific area. 73, *Bill.*

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, H. F. Hekel, W9VGC — FQT was found running around on the streets of Denver recently. WYX took out after him and finally ran him down. It seems FQT bought a new peach orchard out on RFD 1, near Grand Junction and was celebrating. MGX was acting as his pilot, and being an old-style railroader Herb can turn corners on two wheels. GMB is located in San Francisco. Sewing on buttons got to be quite a job for him and he got married last spring. GDC has not grown a bit; he is still 6′ 5″ in his bare feet. He bought another coal mine; he expects next winter to be another tough one and he is not going to get caught with an empty coal hod. Here is the pay-off from the western slope: Everyone is getting along with little meat and no butter, saving waste paper, and turning in waste fats, in order to help this country win the war, and GLT steps up and gets himself listed with the Bureau of Vital Statistics as the proud father of twins. Just shows you what some folks will do for two extra ration books. JB took his vacation before the hot weather got too hot and now the rest of the Denver police radio personnel are free to enjoy the hot weather in the shade. One of the Johnson boys now is night desk sergeant with the Englewood Police Department. He used to have a rig on the air. Jim Lindsey, USN, Chicago, was home for a short stay and expects to be in Gulfport, Miss. with his sidekick, Bob Perske, as soon as the weather gets cooler down there. Capt. EHC still is in bed. You can find him in Ward 2, Old Cantonment Hospital, Mitchel Field, N. Y. The next big noise of the month was the day JBI landed in town. Uncle Sammy told Bill that the North Atlantic had been cleared of all hostilities and was back to its old status as a fishing hole for the Eskimos and he could go back home and live the life of Riley. The big event of the summer was the Pajama Parade of the Radio Widows Club. They made their annual pilgrimage to the hills to enjoy a real outing, climbing mountains, roasting weiners, playing in the sand — and mud — and to get a sun tan (who ever heard of getting sun-tanned by moonlight). They also claim they had an egg-frying contest. And here is the pay-off on that bunch of "saucepan-swingin' Susies": At one time during the party the neighbors reported hearing loud noises such as one might expect to hear around a couple of hot checker games. Just to prove that parties can be done up right, the Electron Club put on a Welcome Home party for Bill Latchford at The Country Kitchen. We did not resort to any wild checker games nor did we play in the mud, and we got home before — well, it wasn't too late. The AAROD elected new officers a short time ago and two members tried to lay claim to one office. When the votes were counted John Weber won hands down. Weber's opponent had voted for Weber but who did Weber vote for? At the investigation Weber claimed he had to vote for himself to make it unanimous. 73, by *Heck.*

UTAH-WYOMING — SCM, Victor Drabble, W6LLH — 6QAN is doing active duty for the U. S. Navy in radio. 6DTB invites the gang to hunt pheasants this fall from his new farm in northern Utah. 6LQT tries his hand at electrical contracting in SLC. 6QAM was last reported as being in the Panama Canal Zone; he is an engineer in civil service work. 6PVK is on detached duty at the San Bernardino Air Depot. 7EID is another "hill fielder" who is doing a good job to "keep 'em flying." 6UOM got himself a nice HQ-120-X receiver and is looking for some husky filter condensers. 6IWY supplements photography for his favorite hobby. Charles K. Kramer, operator license only, will change his QTH to Sand Point, Idaho. 6NPU/W4IHV

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(*Continued from page 66*)

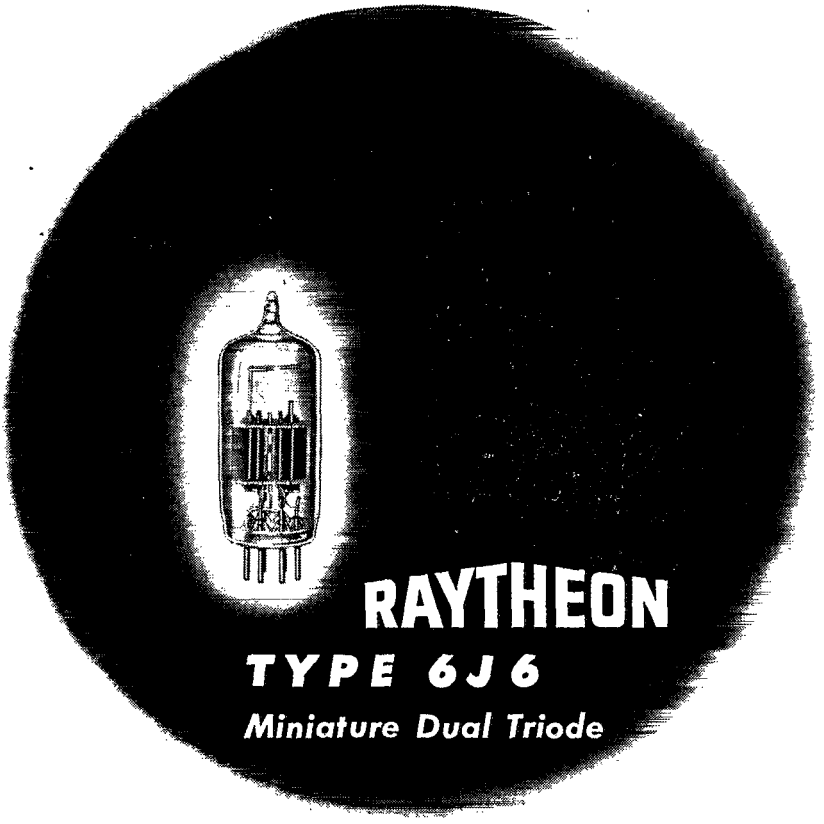
wants to reorganize the local ham club and get things ready for the "new" band allocations. 6LLH would like the boys and gals to send in their ideas and plans so he could have more information to make up these reports. 73, *Vic.*

SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — IDZ, of Montgomery, sped through the RM course at Truax Field in one week and took his place as No. 5 on the list of the week's graduates. GWH is stationed at the Naval Air Station in Norfolk. GVC reports that Key West is full of hams at RMO. FIG, a newly-made CPO, is in Waverly, R. I. FKG is in the Signal Corps somewhere in Italy. FCI also is in Key West. GOX is in Frankfurt, Germany. The rest of this column was sent in by DGS, our former SCM. HNG, after a year in England, France, and Germany, and six months in Washington with the Signal Corps, was put aboard a C-54 for China recently by DGS. RTlc DMZ, in the Navy, is attending the Navy Radio Matériel School in Washington. EBZ mooched an NC-200 receiver from a Navy lieutenant and from his post in Kandy, Ceylon, listens in on the U. S. A. stations. DAU, a lieutenant in the Signal Corps, travels out of Washington. AJY is Navy ensign with air coördinating group in Navy Bureau of Aeronautics. AGI, a Marine major, and DGS lunch together often in D. C. APJ has been sent out to the Pacific Islands by Raytheon. CNY and BMF are doing excellent radar design work in Boston. DRZ and DGS work in adjoining offices. DRZ is Navy lieutenant. Lt. (jg) DUM is Naval inspector in Jersey. CMD travels between Dayton and New York handling Army Air Corps business. 73, *Larry.*

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — On one of his Pacific journeys BXL contacted the ship next to his via blinker and asked if there were any radio operators aboard. The answer was, "Three, which one do you want?" "Put the ham on." The answer came back, "No one here by that name, what is his first name?" Canfield wishes to be remembered to BYF, CFC, JO, EH, BQR, DER, BDD, and others. Your SCM will gladly furnish his address to anyone who wishes to write him. Two ex-operators of AWO and commercial WOE, Geo. Aldrich and Jim Exline, are district managers in Wilmington, Calif. and Mobile, Ala., respectively for the RMCA. Correspondence is invited. ES has been named to the Dade County Planning Board; he also is very active as vice-president of the Coconut Grove Civic Club. Ens. B. M. McNamara has travelled 100,000 miles and now is back in the U. S. A. and has been stationed in Jax. 1JMZ, from Framingham and Gloucester, Mass., is our new addition to the PAA Line Radio Crew Shop coming up from Dinner, Key GAJ seems to have settled down in Halle, Germany. He has acquired eighty-two points and was made s/sgt. on V-E Day. Holland will take all the letters and cards you fellows can send him. The SCM has his address. EYI is holding down the fort in St. Pete and would appreciate some rag-chewing from some of the ole gang now overseas. EWS was home on a short leave after a year of sea duty and now is based in New Smyrna. BYF and GJI had a powwow in Palm Beach about organizing a 2½-meter group in the county up there. BYF sees no reason why it shouldn't work direct to Miami for we have heard the field at Morrison on several occasions. The local 2½-meter boys are going through a complete reorganization, and the license is being modified to cover 75 stations instead of 45. Things are sure becoming crowded. There are 86 names attached to a list hanging in the control station and you figure out how we are going to get them in on a 75-station permit. The old Dade County Radio Club with the American Red Cross behind it and BYF as radio aide will see that things work out in the best possible way. For those "Doubting Thomases" in and around Miami who doubt that we have contacted Homestead, EFZ set up his rig in his store and definitely worked into the control station with the help of WKNW-14. Bumpus went down there one Sunday and set up the station, your SCM, W4IP-WKNW-7, operated at the control station and not only worked Homestead but heard No. 14 in and around Homestead. 73, *Merf.*

WESTERN FLORIDA — SCM, Lt. Edward J. Collins, W4MS — Thanks for the job, gang, and I hope I can do as well as AXP has. AXP wishes to thank the Western Florida hams for their fine coöperation which made the news summary possible every month. 5BRR was a visitor to the section. The second operator of 7CHU is with us and likes the area FB. EAD writes that he would like to hear from the gang and is itching to get on the air again. He ex-



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The precise manufacturing techniques which must be maintained are obvious when the physical structure of this tube is considered. Two high transconductance triodes are obtained from a single relatively large flat cathode, which also acts as a shield to prevent interaction between two separate half-grids. These are wound with extremely fine wire and are accurately spaced a few thousandths of an inch on either side of the cathode. Two individual half-plates complete the tube.

Applications utilizing Raytheon Type 6J6 are varied and numerous, ranging from a diode detector to an ultra high frequency push-pull oscillator capable of producing useful energy at frequencies of several hundred megacycles. Its unique construction lends itself to connection as a high permeance diode, a single very high transconductance triode, or a dual triode with a common cathode. The 6J6 is also used in cathode follower service and high frequency mixer applications.

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Maximum Seated Height	1⅞	inches
Maximum Diameter	¾	inches
RATINGS:		
Heater Voltage	6.3	volts
Heater Current	0.45	amperes
Maximum Plate Voltage	300	volts
Maximum Plate Dissipation (per unit)	1.5	watts
DIRECT INTERELECTRODE CAPACITANCES (Approx. for each unit) — Unshielded:		
Grid to Plate	1.6	μμf
Input	2.2	μμf
Output	0.4	μμf
CLASS A, CHARACTERISTICS (Each triode):		
Plate Voltage	100	volts
Cathode Bias Resistor — Both units operating	50	ohms
Plate Current	8.5	ma
Transconductance	5300	μmhos
Amplification Factor	38	
Plate Resistance (Approx.)	7100	ohms

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(*Continued from page 68*)

pects to be a Ø from Minnesota after the war. EQR has an FB new location for his rig. DAO has his new shack ready and has already moved the transmitter in. He is rebuilding with p.p. T55s in the final. 5AX has been in our midst but is returning to Washington soon. 6PNI is working hard on a receiver for our new u.h.f. allocations. ACB, in Tallahassee, is raring to get going again. BJF is very busy with FNG work but dreams of ham days. KB is busy with construction work but is looking forward to getting back on 75-meter 'phone. UC paid the SCM a visit and we find he has some nice DX cards in the QSL Manager's file. I still have approximately 4000 DX QSL cards for which you fellows haven't sent in envelopes. I am saving the DX cards for you fellows overseas and I'll have them for you when you come home. VR is rebuilding the rig. EPT is still in K6-land and wants to build a receiver out there. GBM has been transferred but we will hear him on the air comes The Day. 7IQJ plans a big rig when he gets home again. DMW is working on a super-duper receiver for the rig. 7EHB says his rig is all torn down but will go together fast the day we get the word. 5KIQ/W2JLM is leaving our midst for a trip out K6 way. 9EMI was home on a visit. MS has a new rig on paper and as soon as a shop is located will start work on it. RS, a captain in the Air Corps, was a visitor. COG, in the Air Corps, was home. UW is making plans also. EZT was a visitor and had a reunion with his brother, who had been a prisoner of war. FHQ is around but quiet. Ex-EK is a captain in the Air Corps. QK is planning a new transmitter and is working on a new final tuning condenser. ECT has a nice SX-28 that should pull in signals FB for him. FJR has plans for the same receiver. AXF says her RME-69 needs realigning after ten years of service. BKQ is raising chickens. DXZ is busy at the movie house. DXQ sees the gang now and then and is awaiting The Day. BFD wonders if he can renew his operator license which he let expire. BGA's XYL was a visitor to Pensy. HJA wants an entire new station for his new shack.

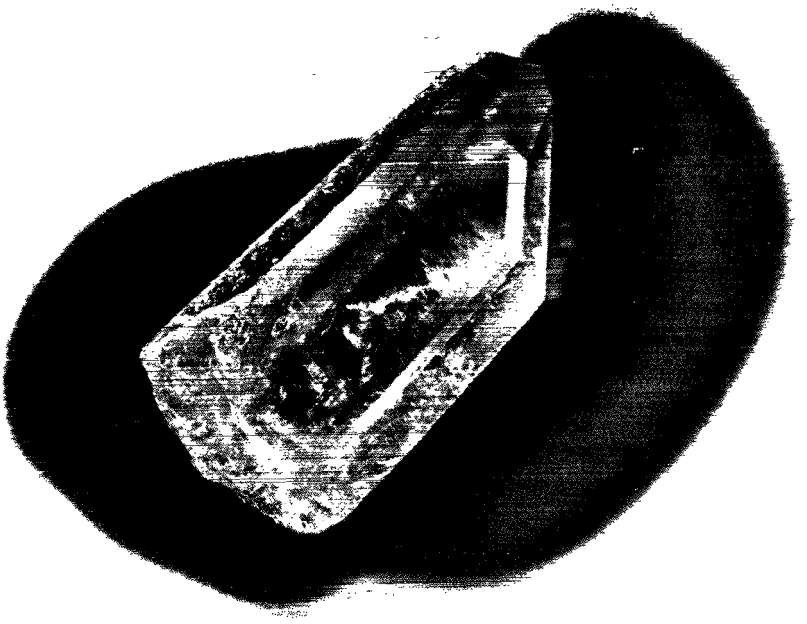
SOUTHWESTERN DIVISION

ARIZONA — SCM, Douglas Aitken, W6RWW — Doug still is in the hospital, so MLL is subbing for him. NRP is back in the States from the Philippines. KFC is studying radio for the CAA in Bay Shore, N. Y. MLL visited OAS in Phoenix. Phoenix WERS is functioning well and has had good turnouts for drills. REJ is a sergeant in the So. Pacific. RJN is with the PAA out of Miami, Fla. RXQ is home on furlough in Prescott and has been stationed in the Aleutians, where he is chief radio technician. RCT is laid up in the Naval Hospital in Corpus Christi and would like to hear from the Phoenix gang. KWJ is principal of Gila Bend schools. TDT is a monitoring officer with FCC's RID in Washington. Charlie Wazlo has a Navy civilian job in Oakland. The 25 Club at Tucson had fifteen out for the last meeting. GS claims he can copy 20 w.p.m. in code classes but OZM has to be shown. Plans for WERS in Tucson are going forward with papers about ready to be sent in. PDA is on the immigration patrol at Nogales. PQG and OZM have opened a store in El Paso. SGG has moved to Maine. Doug and I hope to have a proposed copy of a State organization constitution around to you soon. 73, *G. C.*

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — Asst. SCM, Gordon W. Brown, W6APG. The Helix Radio Club held a meeting on August 3rd at 8 P.M. at the home of MMV. LYY is recovering nicely. JRM completed an FB p.a. system, including a turntable and record player, and presented it to Bethel Lodge Jobs Daughters for their parties and dances. ACW still is in San Diego. EPW, radar engineer, is in San Diego for a short visit and expects to go to the So. Pacific soon. KW was a recent visitor in San Diego. On July 18th the WERS gang put on a special drill for our sponsors, the Police Department. Chief of Police Peterson and his friend, HHU, of Long Beach, Radio Aide NDD, and RGY were at the home of OIN, acting net control station. The drill was very FB, and publicity for WERS was obtained when two reporters from the S. D. Union were present. Eight new applications have been filed, all from local licensed amateurs. 73, *Ralph.*

WEST GULF DIVISION

NORTHERN TEXAS — SCM, Jack T. Moore, W5ALA — FVE was en route to his ship when the shore patrol located him and advised that he had a family at home. After a wild dash to the telephone, Bill was advised that "the family" consisted of a boy and a girl. GLD is chief engineer of KBIX at Muskogee. JJK has left Lockheed to



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(Continued from page 70)

return to the University of Texas to complete her work towards her degree. IVM reports that he is ACRT with a carrier-based dive bomber outfit. He says that his biggest thrill came last year when ILR hooked a ride on his carrier. Seth would like the QTHs of IZO and IXS. IXM reports that things have been really popping fast at NRL in Washington. David sends the following news: Nelson M. Cooke, world famous author of mathematic books on radio, is an executive officer at NRL and was recently promoted to lieutenant commander; KKP, who is an ensign and chief radio technician, and FUZ recently were back home for a visit; EEW recently increased the Dallas population by one; IJC is an ensign stationed at the Naval Base at Solomons, Md.; HXA is an ensign aboard a sub; IPC is doing all the good at S.M.U.; IVG reports that he is chief radioman and that he has been in the Navy since the spring of 1942, during which time he was in the Solomons push; IVG says that he has encountered hundreds of hams in the Navy and that they are the best operators and technicians afloat. FPH advises that his present QTH is Kermit, Texas, where he is working for the Magnolia Petroleum Company. Bob would like the QTHs of HVV and IZO. Bob sends along the following dope: IMQ is in the So. Pacific, and JQH was last reported in Oklahoma City. BNQ says that IMH is back home after serving a hitch in the Navy. ICB has his eye on a windmill tower so it looks like Zeke will soon have a beam antenna for the neighbors to wonder about. ILJ reports from the Philippines, where he is pounding brass. Joe says that IWE is also on Luzon after spending a lot of time in Australia, and that HTH is in the Dutch East Indies. HHR was home on a 30-day leave, awaiting reassignment, after two years in Iceland, England, and North Africa. Jim is ACRT and says that NY is a "big shot" juke box operator. CF says he has a new rig ready to go and that his son, GKA, recently was home on his vacation. JIG is in the AACS and for the past year has been stationed in Wales along with 9MUW. Maurice recently spent a week visiting in Belfast, Northern Ireland, where he met 2FOC, who took him to visit the Belfast YMCA Radio Club, GI6YM, where he also met EI9F. He says that *QST* has a wide circulation in Ireland and is well read. Maurice also advises that JFW is a 1st lt. in the Marines and is "somewhere in the Pacific." PU is looking for radar men for Western Electric. If any of you fellows are interested, please contact the SCM. 73, *Jack.*

SOUTHERN TEXAS — SCM, James B. Rives, W5JC — AQK reports the following for Corpus Christi: EPB and Joe Woods are with Central Power & Light, IFU and EEY are in civil service with the Navy, IPE is working with Schlumberger Company, BOY is projectionist at one of the C.C. theaters. HP is making plans for postwar u.h.f., and is building antenna rotating equipment for his beam. BGR is in the Army. JAU is with Standard Parts Company in San Antonio. HUB is in the Army and is stationed in Hawaii. EYV is at Refugio doing a good job keeping civilian radios going. FH, of Taft, is radar instructor at M.I.T., Boston. DPX is running his airport at Beeville teaching the Navy enlisted personnel to fly airplanes. TO is doing civil service work on the East Coast. EBI has completed his Navy duty as instructor at Ward Island and has gone to sea. FYB is in the Army and is stationed at New York. CDD and AQN are holding things under control at Galveston; AQN just received his commission as officer in U. S. Public Health Service. Ens. KEM is busy with radio and radar in Brooklyn. JPC is in Kilgore on a well-earned furlough. He passed the 1st-class radiotelegraph exam while at home. FGT has shipped out to Pearl Harbor as RM1c. ILN is on Tinian. IYŏ is EM3c at San Diego. EIS is on a Pacific isle and has been transferred out of radar to communications officer. 73, *Jim.*

NEW MEXICO — SCM, J. G. Hancock, W5HJF — HWG reports from the Philippines and says he hopes to get home soon. ZA's YL operator, Eunice, reports that Louis is radio and physics instructor at N.M.M.I. How many remember W4CA-5 who pounded brass around Pecos and Santa Fe back in 1934 and 1935? Mid, now 2OEN, is assistant editor of *QST* but reads this column and dreams of the days in New Mexico. Attention 9DDU, my letter to you in Germany was returned. If you will drop me another note giving your new address I should like to try again. HJF is longing for the good old firecracker days. This year he tried to get the same results (and did) by measuring an unknown power transformer. Yep, the 5000-volt meter he was using wouldn't take it. Any tips on how to revive a good a.c. meter? 73, *Jake.*

COLLINS 32RA RADIO TRANSMITTER*

A deservedly popular 50 watter....

THE COLLINS 32RA* was introduced in 1939 as a quality designed, quality built radio communication transmitter, broadly adapted to most applications within its power and frequency scope.

It, or its d-c version—the 32RB†—was immediately put into service by airlines for control towers, by oil pipelines for emergency systems, by fishing companies for fleet control, and by other widely different types of industrial users.

It was found to be rugged, simple to operate, easy to service, and so thoroughly and universally satisfactory that a rising commercial demand was halted only by the war. During the entire war the Armed Forces have employed thousands of these transmitters. A typical use has been that of control towers on air training fields throughout the country.

Of the several up-to-the-minute transmitters which Collins has ready for its civilian customers as Government requirements are cut back, this one represents a type of which limited quantities are now being manufactured for essential civilian uses. If you would like specifications and design data, write us for new, illustrated bulletin. Collins Radio Company, Cedar Rapids, Iowa; 11 West 42nd Street, New York 18, N. Y.

*COLLINS 32RA—Power source: 115 volts *alternating current*. Power output, 50 watts phone; 75 watt CW. Frequency range, 1.5 to 15 mc. Four frequencies instantly selected by panel control.

†COLLINS 32RB—Power source: 12, 24, 32 or 110 volts *direct current*. Dynamotor, self contained. Otherwise identical with 32RA.

ARMY-NAVY "E"

IN RADIO COMMUNICATIONS, IT'S...

COLLINS

The Month in Canada

(*Continued from page 59*)

ALBERTA—VE4

From W. W. Butchart, VE4LQ:

WELL, Pete Fair, 4YD, Peace River, breezed into Edmonton a week or so ago and at that time was heading north again to P.R. on his two weeks' annual furlough. Upon completion of the holidays he will return to Calgary to pick up his discharge from the RCAF. By the way, boys, in case you haven't been advised, Pete is a flight lieuy! As for postwar plans, YD says that he has quite a range in choice of his new QTH. The Canadian Bank of Commerce gave him a good choice in that respect. See you in civvies soon, Pete!.By the way, YD has placed an order for parts for his postwar rig with Radio Supply Co., Ltd., 4BW. Grapevine telegraph tells us that Slim Marsden is considering opening up a radio service shop in Sylvan Lake. How about that, Slim? A letter from 4AEV, Norm Lockhart, Vulcan, refreshes our memory this month on the progress of "Alberta's Envious Villain." Norm states that he is looking forward to a discharge one of these days, and has been sizing up the situation as to where to locate in business. (He's a live-wire grocery man, boys.) To date he has several "irons in the fire," but he will not be setting up in his old QTH, Vulcan, again. 4XE, Dick Bannard, of Edmonton, is at Sarcee Camp in charge of Signals, etc., for the army cadets encamped there. Incidentally, he is the R.S.M. (W.O. 1) at that camp. 4AAD, Jack Freeman, Edmonton, District Signal Officer, M.D. 13, will be camp signal officer for the Reserve Army camp in July. 4EA, Roy Usher, of Edmonton, inspects the new CKUA studios in the Provincial Building, Edmonton, daily, keeping tabs on wiring details in particular. 4HM has received word from his son, Roger, telling of his safe arrival in England, where he has started training as a member of the Fleet Air Arm, and notes in his letter that he is attending schools on naval tradition and discipline. Roger's sister, Betty, has volunteered for Pacific duty with the WRENS, and is now taking a course at St. Hyacinthe, Que.

The Bulletin of the RSGB carries an announcement asking that all former hams who wish to renew their experimental licenses get their applications in to the G.P.O. London, and while the announcement notes that this is not an indication of the lifting of the ban, it would seem to indicate that the British hams may now begin to prepare for the opening of activity. The announcement also notes that equipment impounded since the beginning of the war will be released. 4BW, Ted Sacker, of Edmonton, genial proprietor of Radio Supply is already making big plans for catering to the ham trade after the war. The Reserve Army went to camp at Sarcee this week minus yours truly, who, up until two days before departure was all set to go. Business interfered, however, and I'm going to miss a good camp. I'll surely miss seeing 4GD, Jim Smalley; Sam Litchinsky, 4CY, etc., of Calgary, as all had a good time last year fooling around with "wireless" sets.

We have wondered for quite some time just what had happened to 4AC, Frank Meadows, of Brandon, Winnipeg and Calgary; and not until the night before last (July 11th) were we wised up on the situation, when Frank broke his long silence with a telephone call. It appears that he has been traveling around Alberta and B.C. in the execution of his job selling McQuay-Norris products. 4AC kicked through with a nice little slice of news concerning some of the Brandon and Winnipeg gang, and also some of the VE4s in Alberta. Herewith are Frank's comments: 4DO, Sid Williams, Brandon, was recently discharged from his duties as flight sergeant in the RCAF and has been employed as a technician with TCA, working, we understand, in the same department as 4MK, Harold Cahoon, of Brandon, headquartered in Winnipeg. If we overlooked it before, here it is now: The Great Cahoon, 4MK, has fallen. He took unto himself a wife last October. We hope MK's XYL will be another candidate for the ranks of hamdom, and we wish them both the best of all good things. What's happened to Kayo, 4FY? He was a fine correspondent while overseas, but since returning home seems to have developed a bad case of "wristocramposis!" When last heard of 4FV, Allan King, was with Ferry Command. 4AU, Les Sedore, of Brandon, another of the B.B.H. (Brandon Batchelor Hams), is still with the RCAF overseas.

One of the finest gabfests held for many a moon began on Saturday morning, July 7th, in Calgary, upon the arrival

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- 7½ amp. 115 V. 60 cycle A. C.
- Voltage breakdown 2500 V to ground D. C.
- Solid silver contacts
- 25,000 cycles of operation without contact failure
- Fixed stops to limit rotation
- 20° indexing

Centralab medium duty power switches are now available for transmitters (has been used up to 20 megacycles) power supply converters and for certain industrial and electronic uses.

It is indicated in applications where the average Selector Switch is not of sufficient accuracy or power rating. Its accuracy of contact is gained by a square shaft, sleeve fit rotor, and individually aligned and adjusted contacts. It is assembled in multiple gangs with shorting or non-shorting contacts. Torque can be adjusted to suit individual requirements. Furnished in 1 pole . . . 2 to 17 positions (with 18th position continuous rotation with 18th position as "off"); and 2 or 3 pole . . . 2 to 6 position including "off".

Centralab

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PRODUCERS OF Variable Resistors • Selector Switches • Ceramic Capacitors • Fixed and Variable • Steatite Insulators and Silver Mica Capacitors

(Continued from page 74)

from Burma, of Squadron Leader J. A. (Jimmie) Elliott. 4IF, of Brandon, along with Gert, 4AMS, his XYL, and the jr. op, Peggy, met at the C.P.R. Depot by 4AC, Frank Meadows, and only one of his jr. ops (he has four of 'em, fellas), they quickly and none too quietly melted out of the crowd and home to AC's suburban home. After the usual preliminaries, 4AHZ, Glen Phillips of Chancellor, and Maudie, 4APA, same QTH, and incidentally Alberta's unofficial Chamber of Commerce, were QSO'd by land line and convinced that it would be a good idea to drive into Calgary and meet personally the folks with whom they had rag-chewed so often but never met. They arrived Sunday and a real good old fashioned hamfest ensued. Glen finally convinced Maudie to sign off at ten-thirty as they had the sixty mile drive back to Chancellor to make before hitting the hay. Jim, Gert and Peggy departed for points west on the Monday morning to visit their respective parents who live at the coast. AHZ convinced Gert that she will be courting trouble to return east again without at least a one-week stopover at Chancellor. Jim will return to Winnipeg to get his discharge from the RCAF, after which he will return to his former duties as principal of the Brandon Tech. School. We wish him every success, and may the day roll round rapidly when we shall hear that sonorous (so help me, Gert, that's what Frank has written down here), voice of Gert's singing out, "This is VE4IF. COME IN SUMBUDDY PUH LEEZE!"

That, gang, ends Frank's report, and I have these few words to tack on. 4AC is constantly covering the provinces of Alberta and B.C., and on many occasions could spare a half hour or so to visit hams in the various parts of these two provinces. Frank notes that in five years of traveling here he has met exactly six hams. Of course we must consider the fact that his traveling has been done during war years, but any of you chaps who can contact Frank, or who would care to let him know where you are and what you do, can drop a line to Frank Meadows, VE4AC, 1708 6th Ave., N.W., Calgary, Alberta. While spending the evening with LQ, Frank showed genuine interest in my dual turntable and p.a. system, and it would seem to indicate that he intends to build up a similar outfit.

We'll be seeing you next month.

MANITOBA—VE4

From A. W. Morley, VE4AAW:

AT PRESENT 4TX is in Winnipeg taking a course at TCA. 4QG is on leave and passed through Wpg. on his way east. Bill is back on the west coast with the RCAF. 4ALE is with the Army Sigs and is somewhere in Australia. 4AHE is still on the farm. Harold was supposed to have caught some nice fish on a recent fishing trip to Kenora. (Is this another fish story?) 4AAI and 4ADC are in Toronto doing war work with Research Enterprises Ltd. There might be something else to report fellows but I don't know about it. With holidays, etc., pickings are very slim so if there is nothing in this column, remember the news comes from *you*. 73.

MAILBAG

From PO Tel. D. Scholes, VE5DY, comes the following:

NOW A few notes on doings around Victoria. 5PX is building a home for himself directly across the street from 5EZ, the V.S.W.C. station and clubhouse. 5EC is also building himself a home in the Gorge district, and at present is residing next door to 4MN's home in Victoria. 5ACE has returned to Canada, and at present is awaiting discharge at an RCAF station at Vancouver after a long spell overseas in Britain, Ceylon, India and Burma. He hopes his wife, whom he married in England en route home, will join him in Victoria soon. Now a correction: the address of 5HP, listed in July *QST* as Victoria, should be Vancouver. He hails from Victoria, and operated his station there prewar. Just before leaving St. Hyacinthe I met 5RB who was there for a course of instruction — the first time I had met him since 1939 or so. He, too, is from Victoria. En route home via CNR I called on 4GP in Jasper, Alberta. Hams passing through should ask for Mr. Sullivan at the Government Building near the station. The train stops for ten minutes or so. My only QSO with him was in 1937 when on a survey trip in the coast range, but I recalled that he was in Jasper, and probably the only ham there.

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ARMY E NAVY

THE NEED IS STILL URGENT . . . DONATE A PINT OF YOUR BLOOD TO THE RED CROSS

Hams in Combat

(Continued from page 47)

one corner of a large room. There I found my shipmates — helping themselves to a case of champagne! They handed me three bottles. One for the CO, one for the chief, and the other for me.

At dusk the Hurricanes left us. Within a half hour the sirens sounded and again the fun started. This happened with the regularity of clockwork for the next two days. By the third day the enemy was within three miles of the city. It seemed as though the RAF had deserted us; not only were we being bombed and machine-gunned but we came near to being shelled by long-range guns. This shelling was not so funny, for we seemed to be tied up right in the middle of the enemy's range. Following one near miss the captain moved the ship further up the quay. But Jerry must have spotted our move, for immediately he started ranging on us. Again we moved, but this time right to the harbor entrance, where we found a destroyer standing by. We tied up alongside. This was fine for me because she carried four operators. Upon hearing my story, they immediately took over the watch.

No sooner had I rested my head on the deck than I was fast asleep. This, however, was too good to last. Orders were received to proceed to Dunkirk, and soon we were on our own again.

We tied up alongside the "harbor defense" battery, consisting of one 16-inch gun mounted at the end of the harbor entrance. Each time that gun fired my receiver was rendered insensitive by the shock. I remember taking down an important message and having to ask for one four-letter group to be repeated no less than six times! Each time Dover w/t started to send the four letters I needed this confounded gun would spout flame and shake the whole ship.

On the morning of the fourth day the enemy had taken one side of the harbor completely. Again we found ourselves parked in the wrong place, for he started to range his guns on the shore battery against which we were moored. This proved to be too much for our CO. He gave orders to move outside the entrance, but no sooner had we started to move than the Germans tried to range on us! I suspect they had taken d/f bearings on my transmissions and, even if they had not broken down the code, had at least become suspicious.

However, we managed to get out of range and I was told to send a signal requesting that we might return to Dover, to be replaced by a fleet of destroyers. The reply came back almost immediately: "Return to Calais; assistance will be sent. . . ." We returned, staying long enough to pick up two hundred high-ranking officers.

In due course two very old destroyers arrived. They sailed straight into the harbor, guns ablaze. Later we heard that they had orders to retake Calais. Whether this was true or not I do not know, for no one ever saw them again.

So we returned to our base, tired and hungry. Twenty-four hours later we received sailing orders for Dunkirk. But that is another story. . . .

TWO NEW GASEOUS VOLTAGE REGULATORS *In Miniature*

The list of Hytron's customers for the standard OC3/VR105 and OD3/VR150 reads like the social register of electronics. Proved quality products, these Hytron tubes are found literally by the millions in military radar, communications, and electronic equipment.

Now in space-saving miniature bulbs, the new Hytron OA2 and OB2 offer the same careful engineering design, rigid control of processing and assembly, and adherence to tight factory specifications which have made the standard Hytron regulators famous. Life and performance of the miniature OA2 and OB2 equal those of the standard tubes, except that maximum operating current is 30 ma. for the miniatures. Construction is both simple and rugged. Note, for example, use of both top and bottom mica supports and the heavy stem leads. Compare the characteristic data given. Consider the possible space economies. Order your Hytron OA2 and OB2 tubes from your jobber today.

COMPARATIVE DATA

HYTRON MINIATURE AND STANDARD GASEOUS VOLTAGE REGULATOR TUBES

TYPE	PHYSICAL CHARACTERISTICS				AVERAGE OPERATING CONDITIONS			
	Max. Length (inches)	Max. Diam. (inches)	Bulb	Base	Supply Voltage† (min.)	Operating Voltage (approx.)	Regulation $E_{30}-E_5$‡ (volts)	Operating Current* (ma.)
OA2	2 5/8	3/4	T-5½	7-pin Min.	185	150	2	5–30
OD3/VR150	4 1/8	1 9/16	ST-12	6-pin Octal				5–40
OB2	2 5/8	3/4	T-5½	7-pin Min.	133	108	1	5–30
OC3/VR105	4 1/8	1 9/16	ST-12	6-pin Octal				5–40

†Sufficient resistance must always be used in series with the tube to limit current through it as follows: OA2 and OB2, 30 ma.; OD3/VR150 and OC3/VR105, 40 ma.
‡Regulation (either positive or negative polarity) is defined as the difference in voltage when the current is varied from 5 ma. to 30 ma.
*Operation for extended periods of time at low current will temporarily increase regulation of tube.

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MAIN OFFICE: SALEM, MASSACHUSETTS
PLANTS: SALEM, NEWBURYPORT, BEVERLY & LAWRENCE

Choosing U.H.F. Sites

(Continued from page 19)

last of three relays between Hartford and New Haven. The first is shown in (K), and the second is shown in (P). Signal strengths from Prospect to New Haven should be very good and they are, usually, S8 to S9. They would be better, however, if it were not for the north end of West Rock Ridge blocking the line-of-sight path. That they could be better is borne out by WKNQ-25's ability to "suppress" WKWG-70's signal when transmitting over a 3¼-mile greater distance and a 400-foot lower altitude on Buckwheat Hill in Meriden, but with a line-of-sight path, as shown in (H).

(S) shows an alternate relay route into Haddam via Portland. Signals over this route are about the same as those over (D). The advantage gained by the ground falling away directly in front of WKNQ-12 as compared to the rising ground in front of WKNQ-1 is offset by the slightly higher hills in between. (T) shows the only path over which we have been able to establish direct communication from the city of Middletown to the city of New Haven. It was found quite by accident in a rather low part of the city while cruising around one drill period. Signal strengths are of the order of S3 to S4 and the only reason they are that good is probably because of ground falling away into the marshy stream bed at the Middletown end. The signal goes over the top of the Three Notches at the 700-foot elevation which is 100 feet higher than the path shown in (J) with the remaining terrain approximately equal in both contour strips.

Conclusion

In general when selecting a v.h.f. or u.h.f. location, bear the following in mind:

1) The best possible path will be a visual one.

2) If there must be hills in between have them as far away from you as possible, preferably midway between you and the other station.

3) A lower location off to one side is better than a higher one that shoots right into the side of a near-by hill.

4) Signals will be stronger at a greater distance if the more distant location is more nearly in the clear.

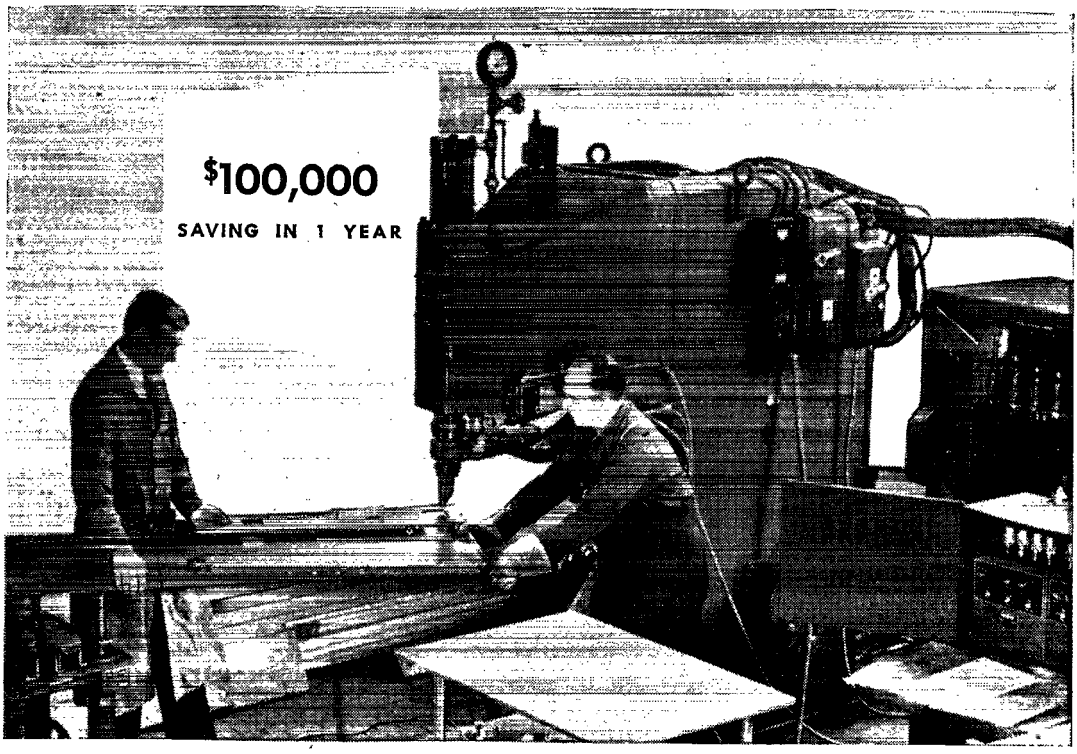
5) Be sure the ground slopes down from you towards the other station or at least that it is level. Rising ground directly in front of your station is bad, and at both ends of the circuit it is very bad.

6) Avoid locations near busy highways since the spark-plug interference will be unbearable.

7) Keep a good distance from manufacturing plants which might use induction heat treating at some later date even if they are not at present doing so. (A plant about four blocks away practically ruins our f.m. receiver as well as our 112-Mc receiver at WKNQ-1.)

8) Be sure there is plenty of room for a couple

(Continued on page 82)



here's what came out . . . when electronics went in

A manufacturer of metal cabinets recently installed resistance welding with electronic control—to replace other forms of fabrication.

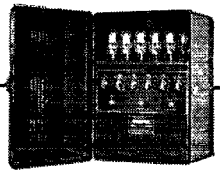
Here's what came *out* of his fabrication costs in one year: *600 tons of steel, 10,000 man-hours of labor, 3,000 pounds of welding rod.* The total saving amounted to $100,000.

The reasons? Resistance welding with precision electronic control permitted use of lighter gauge stock in the whole structure—with strength and tolerances maintained. This, in turn, permitted better-planned shearing that greatly reduced scrap losses.

Resistance welding control is but one of the many ways electronics is serving industry as a production tool —speeding fabrication, cutting costs, improving products.

For full information on electronic applications for your industry, consult your nearest Westinghouse office. Electronic Specialists are ready to help with your application problems. Or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-91080-A



ELECTRONIC CONTROL for resistance welding equipment provides accurate control of weld time, heat and timing sequence. Through the precision of electronic tubes, accurately controlled current may be sent stabbing through metal as many as 1,800 times per minute.

Westinghouse *Electronics at Work*

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

ELECTRONIC EQUIPMENT FOR INDUSTRY AND HOME • ELECTRONIC TUBES • RADIO AND TELEVISION

(Continued from page 80)

of towers out back for the lower frequencies and a signal squirter or two.

9) Lack of near-by neighbors also would be a distinct help for BCL trouble. (You can still have BCL trouble on u.h.f.)

10) Be sure you are not surrounded by steel-framed brick buildings or your signals will probably just bounce back and hit you in the face. WKNQ-1 has four- or five-story buildings on two sides and they distinctly do not help.

11) If you build a new house make provision to run a short direct feed line from your transmitter to your antenna in your building plans and see to it that there is a special a.c. line from your meter to your shack.

12) If you use concentric cable for a feed line to the antenna, as may be necessary, remember that 75 feet of the best Army-Navy stuff will cut your power output in half at 112 Mc. and 25 feet of it will do the same thing at 1200 Mc.; so make your feeders short.

Postwar Station Calls

(Continued from page 20)

This revised plan has now been approved by the League's Board and sent to FCC. No further changes are contemplated, as there is a definite need for the Commission's early action to implement arrangements for the resumption of licensing. Further alterations would not only upset the balance between call areas but would cause months of delay at a time when it cannot be afforded.

"Bismarck"

(Continued from page 29)

left of Bismarck was a few charred wires and parts in the r.f. can.

"We buried his remains quietly at dawn the next day. It was a brief ceremony. He received full military honors. His casket was an empty beer can. We enclosed his history — written in fourteen foreign languages, including English — inscribed on a bit of stainless steel." He showed me a card:

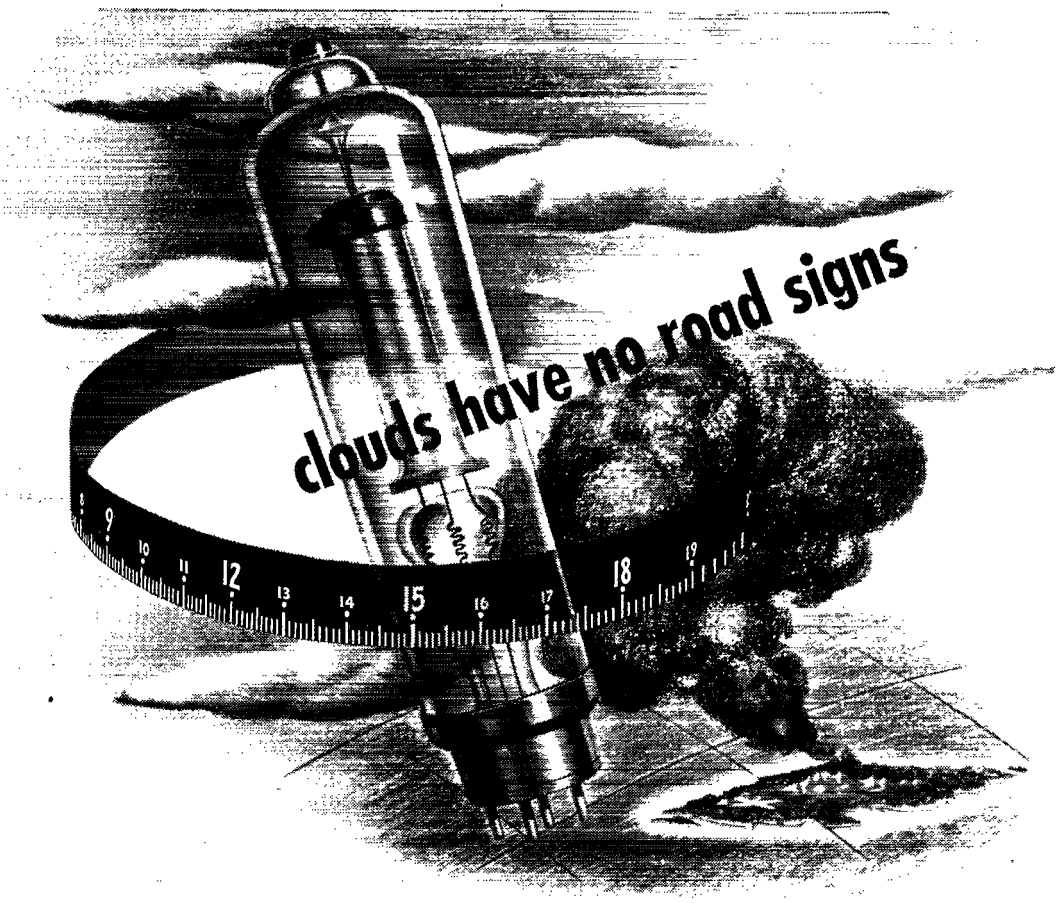
Bismarck	
Born	60 cycles a.c.
Died	3,000,000 Mc.

By this time we were both in tears, so Joe brought us another beer.

(*Author's Note:* Due to military secrecy there will be no further information on this subject until restrictions are lifted.)

Strays

The name of the Westinghouse Electric and Manufacturing Company has been changed to Westinghouse Electric Corporation.



Up where there are no tracks or signposts, bombers wing faultlessly to their target—a tiny speck on the map half-a-thousand miles away. Helping to guide them to their objective are Delco Radio products that harness the magic of high-frequency waves to the functions of communication, navigation, detection and ranging. From compact radio sets to highly intricate radar equipment, these products represent Delco Radio's effective combination of engineering vision—manufacturing precision.

Keep Buying
More War Bonds

Delco Radio
DIVISION OF
GENERAL MOTORS

Those Singing Masts

(Continued from page 41)

principal island of Luzon where Manila, one time pearl of the orient is located, that the standard b.c. frequency transmitter was put into service.

Hams to the Fore

Construction and installation of the radio facilities was engineered and performed by Signal Corps personnel. Once again the amateurs were represented. Of the four officers connected with this project, all are hams. They were 1st Lt. Sanford T. Terry, W3AGH, previously with WRVA, Richmond, Va., who handled the engineering problems on this project. 1st Lt. Luther A. Pierce, jr., W9CHO, acted as OIC and operations officer. Before entering the Army he was part of the staff of WABC, New York. Lt. Paul H. Juengel, jr., W8TED, was designated studio officer and was formerly with WBCM, Bay City, Mich. The writer, W6EOU, was with the police radio system KNGF of Sacramento, and served in the capacity of transmitter officer on the ship. Five enlisted men also were assigned to the project and among these was Sergeant Vert Mandelstamm, W8VJD. He also was previously employed by WBCM of Bay City, Mich. W8VJD was one of our busiest men, his job being to handle studio programs and also work RCA San Francisco direct to maintain a program-cueing circuit with them.

Due to time differences between here and the U.S.A., many of our transmissions necessarily originate in the early morning and late evening hours. Sleep is to be had if and when one can get it, especially during our busy periods.

Tokyo evidently had no trouble picking up our transmissions as we have heard Tokyo radio reporters refer to "The enemy propaganda broadcasts from Leyte" in many of their news commentaries. At times we were thoroughly convinced that they were gunning for us, as no doubt they would have liked to silence our installation. Even Tokyo Rose was reported as having said in one of her broadcasts, "Look out, *Apache*, we know where you are" — and at times we found ourselves inclined to believe just that!

A constant stream of listener reports have been received through mail channels from Australia and New Zealand. Reception reports also have been received from Borneo and New Guinea. Some of the Armed Forces radio stations have even rebroadcast our transmissions on a scheduled basis to the local GIs. The ten kilowatts of power which we were putting into our limited antenna facilities were giving us very satisfactory results. Daily schedules and thousands of words of press have been handled with San Francisco with minor interruptions from QRM or QRN.

The *Apache* was the origin of practically all radio network broadcasts during the early phases of the Philippine campaign. If you heard some of them, as you probably have, then that was the *Apache*. Keep listening and looking for us as we are still going strong — and we hope to be seeing you from other places soon!

G-E Cathode-Ray Tubes range from 2 inches in screen diameter to 12 inches—are available in different fluorescent screens and characteristics to match all needs—constitute *a complete line* of service-proved tubes for home television, oscilloscopes, and other applications.

General Electric leads in cathode-ray tube design and manufacture, as it leads in other phases of television! Consult your nearest G-E office or distributor for information on the tubes described or listed on this page, or write *Electronics Department, General Electric, Schenectady 5, N. Y.*

CHARACTERISTICS OF THE TUBES ILLUSTRATED

Rating	*GL-5CP1*	*GL-12DP7*
Screen diameter	5 inches	12 inches
Heater voltage	6.3 v	6.3 v
Heater current	0.6 amp	0.6 amp
Focusing method	Electrostatic	Magnetic
Deflecting method	Electrostatic	Magnetic
High-voltage electrode, max voltage	2,200 v	7,700 v
Supplementary high-voltage electrode, max voltage	4,400 v	———
Grid No. 1, max voltage for cutoff	—66 v	—75 v
Grid No. 2 (accelerating electrode), max voltage	———	330 v

Standard General Electric cathode-ray tubes are listed below

GL—2AP1	GL—5CP7
GL—3AP1	GL—5FP7
GL—3BP1	GL—7BP7
GL—3DP1	GL—9GP7
GL—3EP1/1806P1	GL—9LP7
GL—5BP1	GL—12AP4
GL—5BP4	GL—12DP7
GL—5CP1	GL—12GP7

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GENERAL ELECTRIC

161-D9-8850

TRANSMITTING, RECEIVING, INDUSTRIAL, SPECIAL PURPOSE TUBES • VACUUM SWITCHES AND CAPACITORS

Signal Corps Radio Relay

(Continued from page 16)

the relay chain back to Algiers. The teletypewriters at either terminal chattered incessantly, the steady stream of vital operational traffic increasing in intensity as the days went by.

The immediate success of the system brought urgent demands for two more mobile teletype terminal stations. The crew rushed back to Algiers. Perkins again utilized his "secret" resources — plus the opportune assistance of a former schoolmate of W5EZD, on duty at the local signal depot. After three days and nights of continuous effort, two mobile stations were on their way to provide a radioteletype circuit from II Corps to the 1st Armored Division in its drive upon Mateur, Terryville and Bizerte.

But there had been neither time nor suitable parts to make these units as good as their predecessor. So simple a fault as a short circuit in the antenna system on the truck assigned to the 1st Armored Division resulted in failure of communications. Yet the outfit kept going through a hail of enemy machine gun fire and bombing attacks. Word of the failure reached Headquarters and W2GUM set out in pursuit, but he couldn't catch up until Bizerte had fallen. There he repaired the fault and provided the first teletype contact to AFHQ from Bizerte.

W2GUM Among First Into Tunis

Taking time out during all this, W2GUM found opportunity to be in "at the kill" in Tunis. With a party from the Hill 609 relay he rode the radio-jeep into Tunis on the day of its capture, May 8, 1943, following the victorious British forces, and announced the event over the system to AFHQ. If not the first, he was one of the first, American civilians to enter the city.

After II Corps made its final move into Mateur and had withdrawn for a much-needed rest, the mobile terminal remained there with a supply base, and the other two terminals moved near Tunis to serve with Advanced AFHQ and British First Army Headquarters. Thereafter, until June 15th, the three terminals maintained operation on a shared-time basis, working with AFHQ and each other to handle a traffic load reaching a daily peak of over 16,000 word groups. Approximately 12,000 groups were handled with AFHQ through the complete radio relay system, the remainder directly among the three forward terminals through the fourth relay station at Hill 609.

All this time the crew from Coles were beset with nearly every difficulty imaginable. Crystals were available for only four usable frequencies — they needed six frequencies for the current operation plus spares and alternates and additional ones for operations still to come, a total of 324 crystals in all. Upon receipt of a frantic appeal, W2OEF flew to Chicago, gathered up every rock in sight and shipped them off by air express. Weeks went by but still no crystals arrived in Africa, having been "bumped off" at every stop en route for higher (?) priority cargo. In despera-

THE BIRD WITH THE 16-MILE TAIL

The wire you see with the parachute on the end of it is a telephone wire, being payed out from a C-47 cargo plane.

Bell Telephone Laboratories, working with the Air Technical Service Command of the Army Air Forces, developed this idea. It will save precious lives and time on the battlefield.

A soldier throws out a parachute with the wire and a weight attached. The weight drops the line to the target area. From then on, through a tube thrust out of the doorway of the plane, the wire thrums out steadily — sixteen miles of it can be laid in 6 2/3 minutes. Isolated patrols can be linked quickly with headquarters. Jungles and mountain ranges no longer need be obstacles to communication.

This is in sharp contrast to the old, dangerous way. The laying of wire through swamps and over mountains often meant the transporting of coils on the backs of men crawling through jungle vegetation, and in the line of sniper fire. It is reported that in one sector of the Asiatic theater alone, 41 men were killed or wounded in a single wire-laying mission.

Bell Telephone Laboratories is handling more than 1200 development projects for the Army and the Navy. When the war is over, the Laboratories goes back to its regular job — helping the Bell System bring you the finest telephone service in the world.

BELL TELEPHONE LABORATORIES Exploring and inventing, devising and perfecting for the Armed Forces at war and for continued improvements and economies in telephone service.

(*Continued from page 86*)

tion, the boys garnered some salvage quartz stock and Joe Durrer set to work grinding the precious blanks on a whetstone. A sympathetic and generous amateur photographer from AFHQ furnished his only piece of plate glass for the final polishing. And just in time, too; as fast as the crystals were finished, off they went by motor carrier and air transport to their respective stations.

Supplies had to be distributed to the isolated relay stations. Trucks shuttled back and forth almost daily between Algiers and Tunisia distributing operating personnel, food, PX supplies, clothing and other essentials. A total of 4,000 gallons monthly of "white" gasoline (a precious and supposedly unobtainable cargo) were distributed in 5-gallon "jerry" cans for the power units. Despite guard precautions prowling Arabs raided the relay stations, cutting control lines and carrying off supplies and clothing.

W2DSY practically lived at the message center in AFHQ, pounding the teletypewriter twelve to sixteen hours a day until GI operators could be obtained. The boys spent every available moment traveling up and down the system, checking and rechecking the operation of the equipment, adding to the instruction and technical training of the GI operators, scrounging for spare parts among captured enemy supply dumps — and, incidentally, collecting some valued souvenirs. Opportunities were found to revise the original equipment or increasing its reliability under the terrific beating of continuous operation in vehicles and in tents exposed to mountain-top snow, sleet and rain storms.

A measure of relief from the terrific strain of the preceding weeks was granted on June 15th, when operations were suspended until July 7th to permit overhauling equipment, and the assembly of new stations preparatory to the invasion of Sicily.

The original system was then reopened and a new system providing full duplex operation installed, extending from Tunisia to Malta with relays at the tip of Cape Bon and on Pantelleria Island. W1CIW accompanied the 250-watt terminal gear to Malta by boat. Thumbing his nose derisively at both the Luftwaffe and the local a.a. batteries, he set up his station on the brink of a cliff facing the mainland. It was an ideal location for v.h.f., but right in the line of fire! The crew ducked as Jerry bombers skimmed the waves and swooped up over the edge of the cliff — and then ducked again as local reception committees pumped ack-ack at the marauders.

With the imposition of radio silence, there was no way in which to determine whether the 148-mile gap between Pantelleria and Malta could be bridged with v.h.f. So the crews stood by chewing their fingernails until D-day, July 7th. When, to their relief, operations began they experienced unbelievably strong signals and circuit reliability. This circuit had been expected to carry a heavy bulk of traffic for the invasion commanders, but the rapid development of the campaign required the handling of only 15,158 word groups during the period of operation ending August 9th.

HELPS FOR RADIO TRAINING

Hints & Kinks

Amateurs are noted for their ingenuity in overcoming by clever means the minor and major obstacles they meet in their pursuit of their chosen hobby. An amateur must be resourceful and a good tinkerer. He must be able to make a small amount of money do a great deal for him. He must frequently be able to utilize the contents of the junk box rather than buy new equipment. Hints and Kinks is a compilation of hundreds of good ideas which amateurs have found helpful. It will return its cost many times in money savings — and it will save hours of time. *Price 50 cents*

★ ★ ★

The Radio Amateur's License Manual

To obtain an amateur operator's license you must pass a government examination. The License Manual tells how to do that — tells what you must do and how to do it. It makes a simple and comparatively easy task of what otherwise might seem difficult. In addition to a large amount of general information, it contains questions and answers such as are asked in the government examinations. If you know the answers to the questions in this book, you can pass the examination without trouble. *Price 25 cents*

How to Become a Radio Amateur

Universally recognized as the standard elementary guide for the prospective amateur. Features equipment which, although simple in construction, conforms in every detail to present practices. The apparatus is of a thoroughly practical type capable of giving long and satisfactory service — while at the same time it can be built at a minimum of expense. The design is such that a high degree of flexibility is secured, making the various units fit into the more elaborate station layouts which inevitably result as the amateur progresses. Complete operating instructions and references to sources of detailed information on licensing procedure are given. *Price 25 cents*

Lightning Calculators

RADIO, *Type A* — This calculator is useful for the problems involving frequency, wavelength, inductance, capacity, etc. It has two scales for physical dimensions of coils from one-half inch to five and one-half inches in diameter and from one-quarter to ten inches in length; a frequency scale from 400 kilocycles through 150 megacycles; a wavelength scale from two to 600 meters; a capacity scale from 3 to 1,000 micro-microfarads; two inductance scales with a range of from one microhenry through 1,500; a turns-per-inch scale to cover enameled or singlet silk covered wire from 12 to 35 gauge, double silk or cotton covered from 0 to 36 and double cotton covered from 2 to 36. Using these scales in the simple manner outlined in the instructions on the back of the calculator, it is possible to solve problems involving frequency in kilocycles, wavelength in meters, inductance in microhenrys and capacity in microfarads. Gives the direct reading answers for these problems with accuracy well within the tolerances of practical construction. $1.00

OHM'S LAW, *Type B* — With this concentrated collection of scales, calculations may be made involving voltage, current, and resistance, and can be made with a single setting of a dial. The power or voltage of current or resistance in any circuit can be found easily if any two are known. This is a newly-designed Type B Calculator which is more accurate and simpler to use than the justly-famous original model. It will be found useful for many calculations which must be made frequently but which are often confusing if done by ordinary methods. All answers will be accurate within the tolerances of commercial equipment. $1.00

ABOVE PRICES ARE POSTPAID ▪ PLEASE DO NOT REMIT IN STAMPS

AMERICAN RADIO RELAY LEAGUE, INC., West Hartford, Connecticut

(*Continued from page 88*)

W2DSY and W1CIW returned to the States about the middle of July to utilize their experience in developing a strictly GI version of the radio relay equipment. As replacement, Harold H. Kinnaman stayed on after completing another technical mission.

With the materialization of plans for the use of radio relay in Sicily and eventually in Italy, W5EZD and Durrer set out in the radio-jeep for reconnaissance in Sicily. They landed during the peak of the fighting and managed to get into more excitement than space permits recount. Durrer's penchant for hard-cooked eggs, which he was boiling over a camp fire one afternoon, apparently was shared by others. When shots came whistling by their ears with unmistakable intent, Durrer and party evacuated with equally unmistakable intent. He's still wondering who ate the eggs!

The boys selected Mt. Laura as the site of the relay station for a circuit from the American Seventh Army at Palermo to the 15th Army Group near Syracuse. Again with utter disregard for theory, which claimed that v.h.f. couldn't work that 135-mile jump from Mt. Laura to Palermo, the boys set up the equipment. Had they plotted the contour ahead of time, perhaps they would have thrown in the sponge. As it was the circuit worked nicely without excessive fading. They really knew then that v.h.f. could "go places and do things" despite all talk about line-of-sight operation.

All wire circuits across Sicily were destroyed by retreating enemy forces. The only available primary communication between the major headquarters had been by battle-weary SCR-299s. But now radio relay was on the scene, with teletype providing four times the 299's traffic-handling speed. So the manual circuits were closed and v.h.f. radioteletype took over until its need on the island no longer existed.

Shortly after its installation the Mt. Laura relay was placed under observation by the Luftwaffe in daily sweeps over the Bizerte area in Tunisia. This site was directly in their path. As the heavy bombers thundered over, barely 500 feet above, the fighter escorts would peel off and circle the area while the relay crew struck poses of innocence and nonchalance. When Perkins swore he was going to bag a couple of Nazi planes, the firing pins of the two .50-calibre machine guns mysteriously disappeared. Finally, the pilots apparently became convinced that the crew was harmless, and thereafter gave them no trouble.

Arriving in Algiers, they tarried long enough to see the original AFHQ relay system dismantled and on its way to Italy to establish new records and win new laurels. Information received subsequently has revealed that this radio relay equipment won its greatest fame in providing communication from the Anzio beachhead through a relay at Naples to the Fifth Army first at Caserta and later at Presenzano. This circuit bridged enemy-held territory in a manner impossible by wire, furnishing for this vital operation the primary means of communication with all the relia-

(Continued from page 90)

bility and traffic capacity of a wire teletype circuit, handling approximately 20,000 word groups per day during the operation.

Description of a Radio Terminal

Basically, the radio terminals included a 50-watt (or 250-watt) Motorola f.m. police radio transmitter and an associated receiver operating in the 30–40-Mc. band. The antennas were either Link vertical coaxial types supported on 30-foot poles or vertical half-rhombics (inverted "V"), four wavelengths on a side, supported by poles or convenient trees. The half-rhombic was end-fed directly from the transmitter's antenna coupling coil against a counterpoise laid directly on the ground for the full length of the system.

The intermediate step to teletype operation was the British two-tone telegraph apparatus. This unit was located with the radio transmitter. In transmitting, it was keyed by the teletypewriter contacts and sent "marking" pulses on one frequency and "spacing" pulses on another frequency, several hundred cycles apart. The two-tone output was impressed upon the modulator input in the same manner as a voice signal. In receiving, each filtered and rectified incoming tone produced a voltage which was amplified to actuate the teletypewriter receiving mechanism.

The fixed radio terminal at higher headquarters generally employed a 250-watt transmitter and a heavy-duty 5-kw. gasoline engine power unit or a commercial power source. For simplex operation the transmitter and receiver were installed together with one antenna. For duplex operation the receiver and transmitter were separated up to 500 feet or more to avoid mutual interference and utilize individual antennas. The two-tone unit was remotely controlled over a d.c. signaling circuit from the teletypewriter in the Headquarters signal center, usually several miles away.

The mobile radio terminal was entirely self-contained with 50-watt transmitter, receiver, two-tone unit and teletypewriter in the body of a ¾-ton weapons-carrier. Two 2½-kw. portable gasoline-engine power units were carried in a ¼-ton trailer towed by the weapons-carrier. For duplex operation, the receiver was removable for installation at a distance. Vertical coaxial antennas were used. It was possible to operate these terminals in motion on a simplex basis by providing a vehicular whip antenna. The self-contained feature was of considerable value in permitting the stations to move rapidly behind an advancing headquarters, being ready to operate immediately upon arrival at a new location.

The relay stations used the same equipment as the fixed high-power terminal station, without provision for teletype monitoring. In communicating from a relay station to a terminal or another relay, voice was used when teletype operational traffic could be suspended. Receivers were located 500 to 3000 feet from the transmitter site, depending upon terrain, to avoid interference from harmonics radiated by the transmitters and spurious responses in the receivers.

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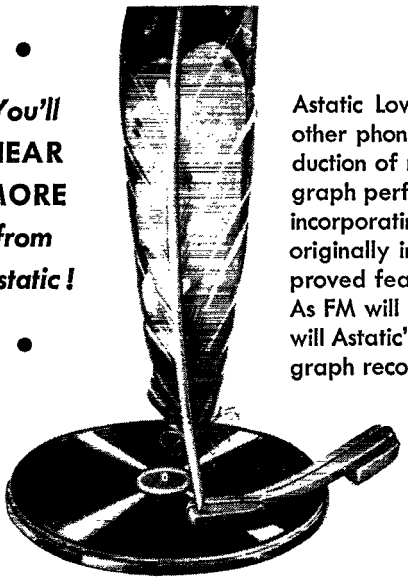

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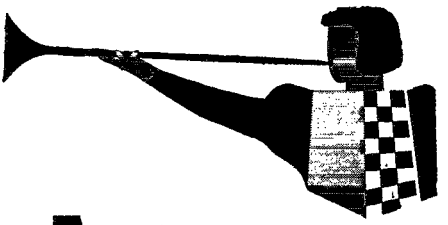

An important announcement

WARD LEONARD next month will start the distribution of bulletins describing its greatly expanded line that is now being made available to the trade through Radio and Electronic Parts Distributors. The line will include a complete assortment of

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RESISTORS RHEOSTATS RELAYS

(Continued from page 92)

The complete relay station operating complement included one officer and fifteen men, operating as an independent detachment with respect to supply, administration, and maintenance. The enlisted personnel included two radio repairmen, one power plant attendant and motor mechanic, two clerks, one cook and nine radio attendants who doubled as guards. They were equipped with first class cooking facilities and tents for long periods of operation in inclement weather. Vehicles comprised one ¼-ton jeep, with trailer, one 2½-ton cargo truck and a 1-ton trailer with installed power unit. The crew was armed with one .50-caliber anti-aircraft machine gun, four sub-machine guns, and twelve .30-caliber rifles.

Jamming

On a few occasions adjacent long-range radar installations and l.f. high-power c.w. stations caused interference to the AFHQ terminal station resulting in cessation of service for several hours at a time. For a number of days after the beginning of the Sicilian campaign, operation of the relay systems created interference to Allied intercept activities in the band from 38 to 40 Mc.

It became the practice of the enemy stations to adjust their operating frequencies close to those utilized by the relay systems thereby preventing interception by Allied Forces operating in areas within or adjacent to those served by the relay stations. It was necessary to suspend operation completely for five days until the enemy air activity had withdrawn partially whereupon service was resumed on full-time basis during night hours but on a restricted basis during daylight hours for an additional several days until the activity ceased within the range of the relay station.

Suspected attempts at jamming the relay system by the enemy on three different frequencies were unsuccessful. The signal strengths were below the minimum level to actuate the receiver relay circuits. Had the signals been of sufficient strength to actuate the receiver relays, it is probable that operation could not have been continued in view of the presence of those signals on more than one frequency which would have given rise to a tendency for the simplex system to operate in both directions simultaneously or for a "lock-in" of two or more relay stations. The jamming enemy signals were received with horizontal polarization as indicated by appreciable signal increases when horizontal antennas were substituted for the vertical coaxial antennas used normally. Possible effects of jamming need not be given as much consideration in the operation of a duplex system wherein transmission is continuous in both directions simultaneously in view of the "capture effect" of f.m. signals, or the ability under normal conditions of the stronger desired signal to override the interfering signal without interference from the latter.

Teletype Operation

The potential capacity of a duplex system is approximately twice that of a simplex system and may be achieved with the addition of relatively

(Continued from page 94)

little extra equipment. The British 7B teleprinter machines were capable of "blind duplex" operation so that one machine could be used at each terminal. However, local copy was not printed during transmissions giving rise to delays in correction of errors in typing unless the operator was highly experienced. Converting the simplex radio relay system to duplex thus required the addition of one relay transmitter to each relay station with a slight change in the wiring of the receiver control circuits and the provision for sinultaneous operation of both receiver and transmitter at each terminal station involving physical separation of the two units or operation on frequencies sufficiently separated to avoid interference in the receiver from the local transmitter.

American teletypewriter machines are commonly used in pairs for duplex operation, one for transmitting and one for receiving. This arrangement is desirable since local copy is made of all transmissions for record and correction of transmittal errors can be made at the moment.

Although the teleprinter is capable of operation at a speed of 60 words per minute, the actual speed achieved in manual keyboard operation rarely exceeds 40 w.p.m. However, with auxiliary type perforators and automatic keying apparatus the maximum possible speed may be achieved.

Conclusion

Once the bugs were ironed out of the technical and administrative phases of operating a radio relay system, the Motorola and Link equipment really settled down to do a job which should go down in the annals of military and radio history. Actual figures gleaned from traffic reports reveal conclusively that the v.h.f. radio relay could provide communication reliability 50 to 100 per cent greater than that of wire lines installed under equivalent combat conditions.

In several cases the radio relay became the only means of primary communication between two or more headquarters. The technique evolved on the battlefields of Tunisia opened up new and revolutionary fields in tactical military communications. Little did the Signal Corps engineers, sweating and slaving to prove out their first single channel radio relay principles, visualize the giant this radio relay would become within the following two years. With design based in general upon their equipment, but incorporating many new features such as provision for three two-way telephone conversations and up to twelve two-way teletype conversations simultaneously over one radio relay system, demands from the overseas combat forces for the new standard equipment have poured in to the extent that there is now available for use enough gear to provide a circuit mileage running well into six figures.

Looking into the future, one can readily visualize radio relay for radio amateurs in the postwar era, providing solid communication over hundreds and perhaps thousands of miles on v.h.f. — wholly unaffected by the vagaries of propagation normally encountered in our conventional DX bands on the lower frequencies.

Splatter

(Continued from page 50)

tenna design — and has worked on all bands. Almost equally a motorcycle enthusiast, OM Kahn has employed this hobby also to good advantage during the war. His flying figure thunderously shuttling back and forth on his gas bike between the three Electro-Voice Mfg. Co. plants is a familiar sight on the highways and byways around South Bend, Ind. . . . **John G. Marshall, W9ARL,** whose contribution to the art of antenna matching starts on page 23, received his first license in 1930 with the call he still holds. His earlier amateur activity was on 7 Mc., but for six years before Pearl Harbor he was to be found exclusively on 14- and 28-Mc. 'phone and c.w. On the rolls as Century Clubber No. 18, he participated in the 1937 and 1938 DX contests. In 1938 he was national fifth place winner — and the leading W9. DX being his chief interest, it was only natural that most of his experimenting has been in connection with directional antennas. W9ARL holds a radiotelephone first-class license, and for a short time he served as a civilian radio instructor for the Enlisted Reserve Corps of the Army Signal Corps when it was active in 1942. More recently he was discharged from the Navy, having served in that branch of the service as a radio technician. . . . **Capt. Oliver D. Perkins, ex-W7MH–W7NK,** operated exclusively on 7- and 14-Mc. c.w. from 1925 to 1938. Interspersing ham activity, brasspounding aboard WGX and KUTG, local b.c. station KOAC, and the addition of an XYL with his higher education at Oregon State, he received a B.S. degree in communication engineering and a commission in the Field Artillery Reserve in 1931 — adding an M.S. degree in physics in 1933. On becoming a registered professional engineer in 1934, Perkins served as an engineer at KOIN in Portland, and later as consultant for KGU, Honolulu. Entering Civil Service in 1936 as a radio engineer with the Signal Corps, his duties took him to Washington, Fort Sam Houston, and Fort Shafter, T. H., doing engineering and installation jobs including some of the first Army Airways Communication System radio nets. In 1940 W7NK was transferred to the Signal Corps Engineering Laboratories to develop vehicular radio equipment for combat troops. Donning a uniform in 1942, some of his subsequent activities are discussed beginning on page 11 of this issue. Now on the Engineering Staff at the Headquarters, Signal Corps Engineering Laboratories, Capt. Perkins' personal postwar plans naturally include a prompt return to the ham bands.

Two old-timers — so far as *QST* appearances are concerned — return this month with the bylines of **Paul J. Palmer, W8UGR** (Splatter, January, 1943, p. 16), appearing over a description of another QSL-type rig (p. 48), and of **Philip S. Rand, W1BDM** (Splatter, November, 1942, p. 12) atop a discourse on choosing u.f.h. sites by plotting favorable transmission paths on contour maps (p. 16).

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.
(3) The Ham-Ad rate is 30c per word, except as noted in paragraph (6) below.
(4) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.
(5) Closing date for Ham-Ads is the 25th of the second month preceding publication date.
(6) A special rate of 7c per word will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, if by a member of the American Radio Relay League takes the 7c 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 30c rate. Provisions of paragraphs (1), (2), (4) and (5), apply to all advertising in this column regardless of which rate may apply.
(7) Because error is more easily avoided, it is requested signature and address be printed plainly.

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WHEN amateurs are on the air again there will be a complete line of James Knights Precision Crystals for every amateur activity. The James Knights Company, Sandwich, Ill.

FABERADIO crystals will be available to amateurs immediately after hostilities cease. Faberadio, Sandwich, Ill.

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FOR SALE (3) Abbott TR4s, complete with tubes and a.c. power supply used approximately 50 hours. $65.00 each. Cliff Kindt, W8TIZ, Danville, Penna.

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FOR SALE: RME receiver and speaker, like new. $150.00. G. L. Hight, 107 East Second Avenue, Rome, Ga.

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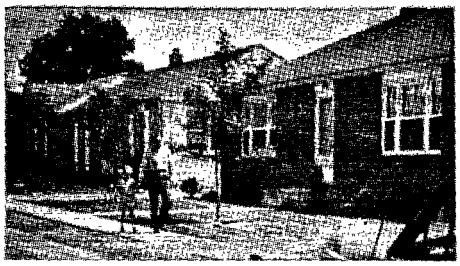
All of the above advertisers are coöperating with the A.R.R.L. to permit publication of an editorially adequate *QST* during this period of war-rationing of paper. Using less advertising space but at higher rates, they continue their customary support of *QST*. Some are using smaller space in each issue and some are using space only every second or third issue. Of the latter, those whose advertising does not appear in this particular issue are indicated by the **above.

IT'S FUN to live and work in MT. CARMEL, ILL.

Johnny Beauchamp, a supervisor at the Meissner factory in Mt. Carmel, is typical of Meissner's *precision-el*. The camera has recorded Johnny's day . . . a combination of work and play that's a big reason for the high quality you'll find in Meissner products —"precision-built by *precision-el*."

Here's Johnny at work. He's "tops" with subordinates because he's never too busy to give the other fellow a "lift" . . . help make the job easier.

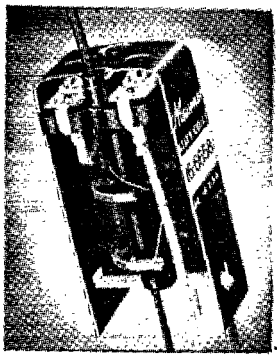


A five-minute walk at noon takes Johnny home for lunch. Usually Connie Sue, his 6-year-old daughter, meets him at the corner. Johnny owns his own bungalow in this attractive section of Mt. Carmel.

There's a smile on his face, as he leaves the factroy at 4 p. m., but smiles are the rule, *precision-el* . . . ten minutes later he's ready to apply Meissner precision to the golf game that has won him several trophies.

Flying is another of Johnny's hobbies. He and other members of Meissner's *precision-el* have organized the Mt. Carmel Flying Club, built a hangar, laid out the field. Here a group listens to a student being briefed before the takeoff.

Like most fathers, Johnny finds the baby more interesting than a tender morsel of chicken. After dinner, Johnny may go back to the plant to work out the following day's schedule.



"Step Up" Old Receivers!

These Meissner Ferrocart I. F. input and output transformers are getting top results in stepping up performance of old worn receivers. Special powdered iron core permits higher "Q" with a resultant increase in selectivity and gain, now available for frequency range 127-206. Ask for numbers 16-5728 input, 16-5730 output. List $2.20 each.

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Bethany Transmitters

From six of the world's mightiest shortwave stations, the "Voice of America" shoots "bullets of truth" to combat enemy lies. These transmitters, 200 KW each, located in Bethany, Ohio, were designed and built for the OWI by the Crosley Corporation.

The two interior photo-views of one transmitter reveal more than 60 Ohmite Resistors of various sizes . . . and one Ohmite Tandem Rheostat assembly.

The knowledge and experience that enabled Ohmite to "produce" on this psychological warfare job is at your service in solving resistance problems . . . today and post-war.

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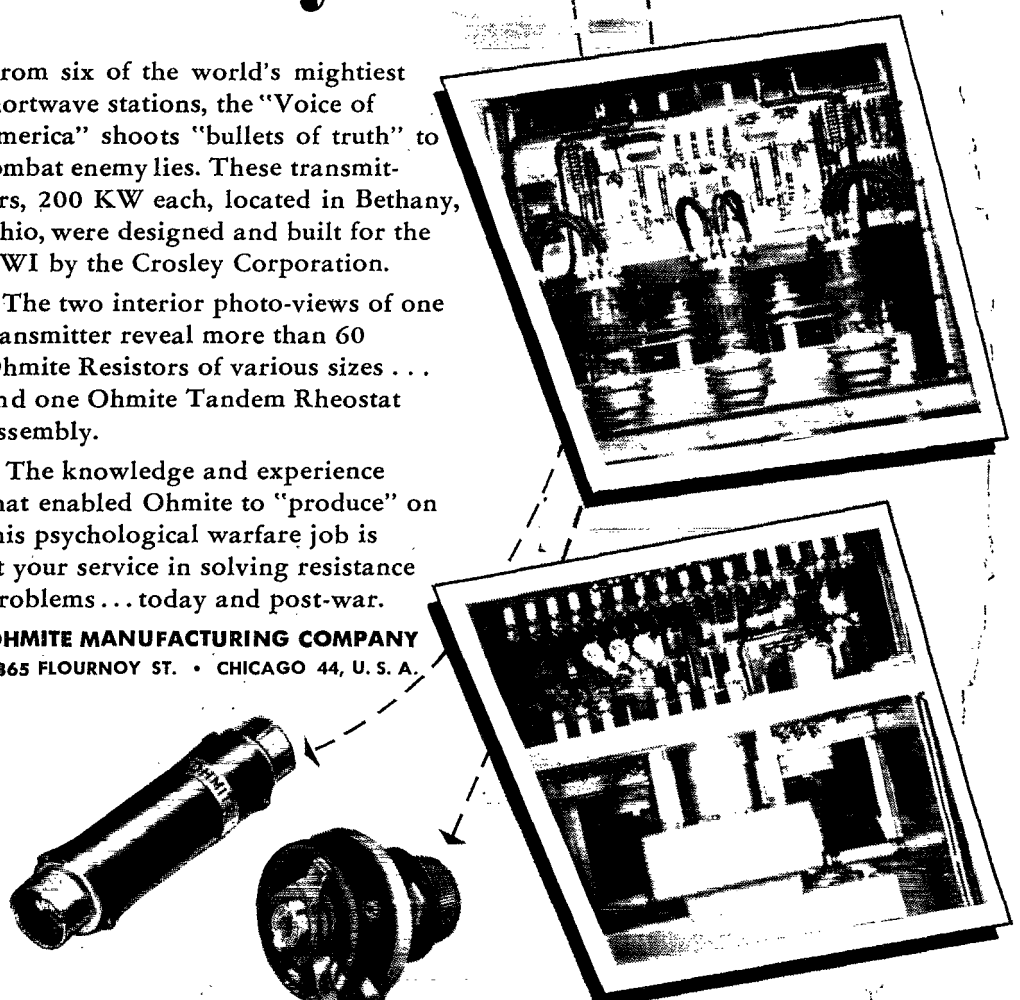

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Gives data on Ohmite stock resistors, rheostats, chokes, tap switches. Address Ohmite, 4865 Flournoy St., Chicago 44.

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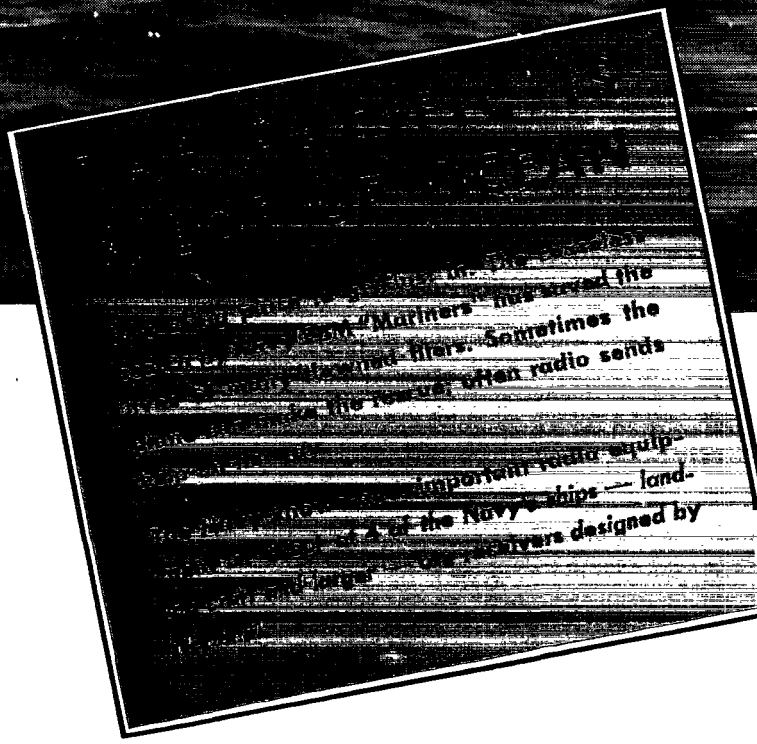

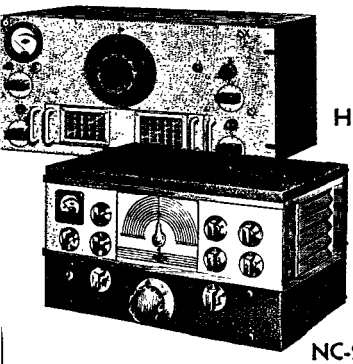

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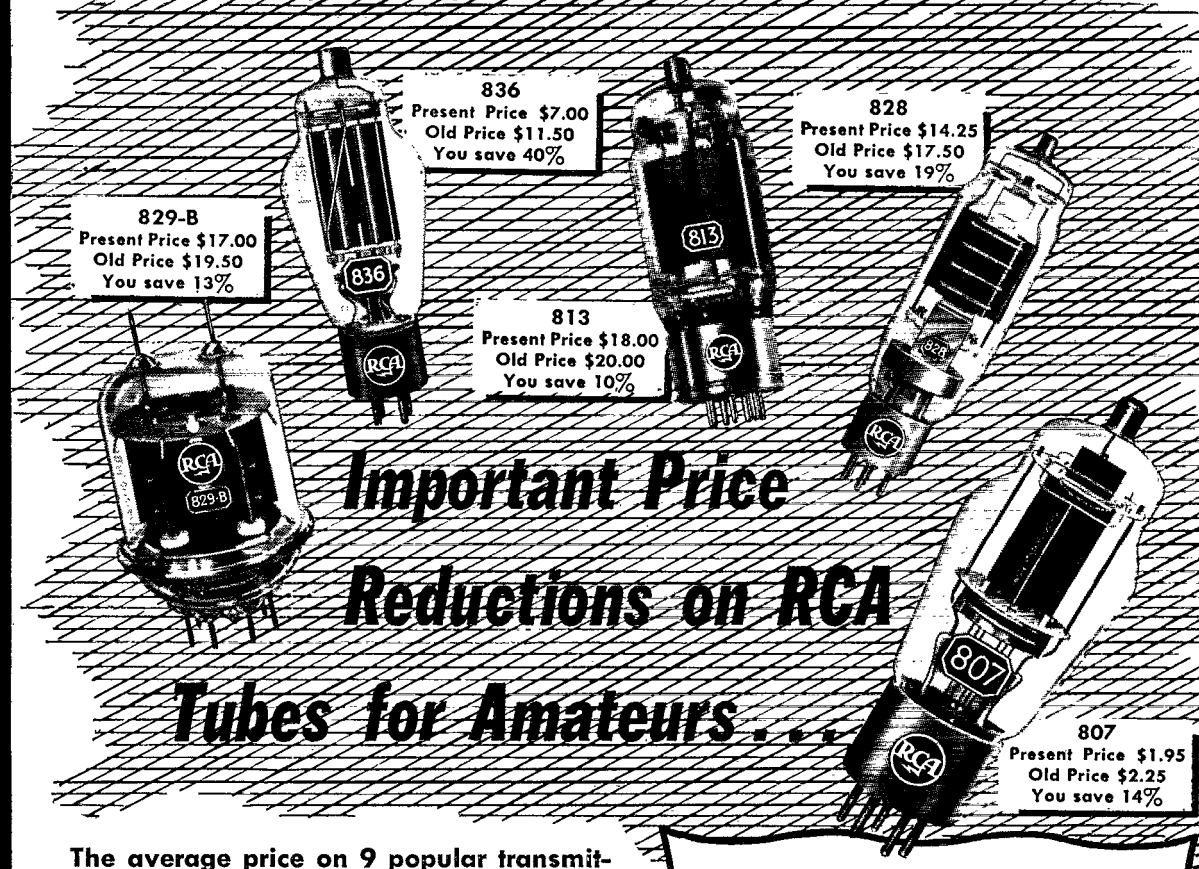

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The average price on 9 popular transmitting tubes for amateurs has come down 22.4%, owing to manufacturing economies—and at no sacrifice of RCA quality!

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In spite of steadily rising costs all along the line, improved manufacturing methods at RCA have caused prices to tumble as much as 40%.

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You'll find, too, that while RCA prices go down, RCA quality still remains tops. You can always look to RCA for the best tube values available to amateurs. RADIO CORPORATION OF AMERICA, Tube Division, Harrison, New Jersey.

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