QST

october, 1943
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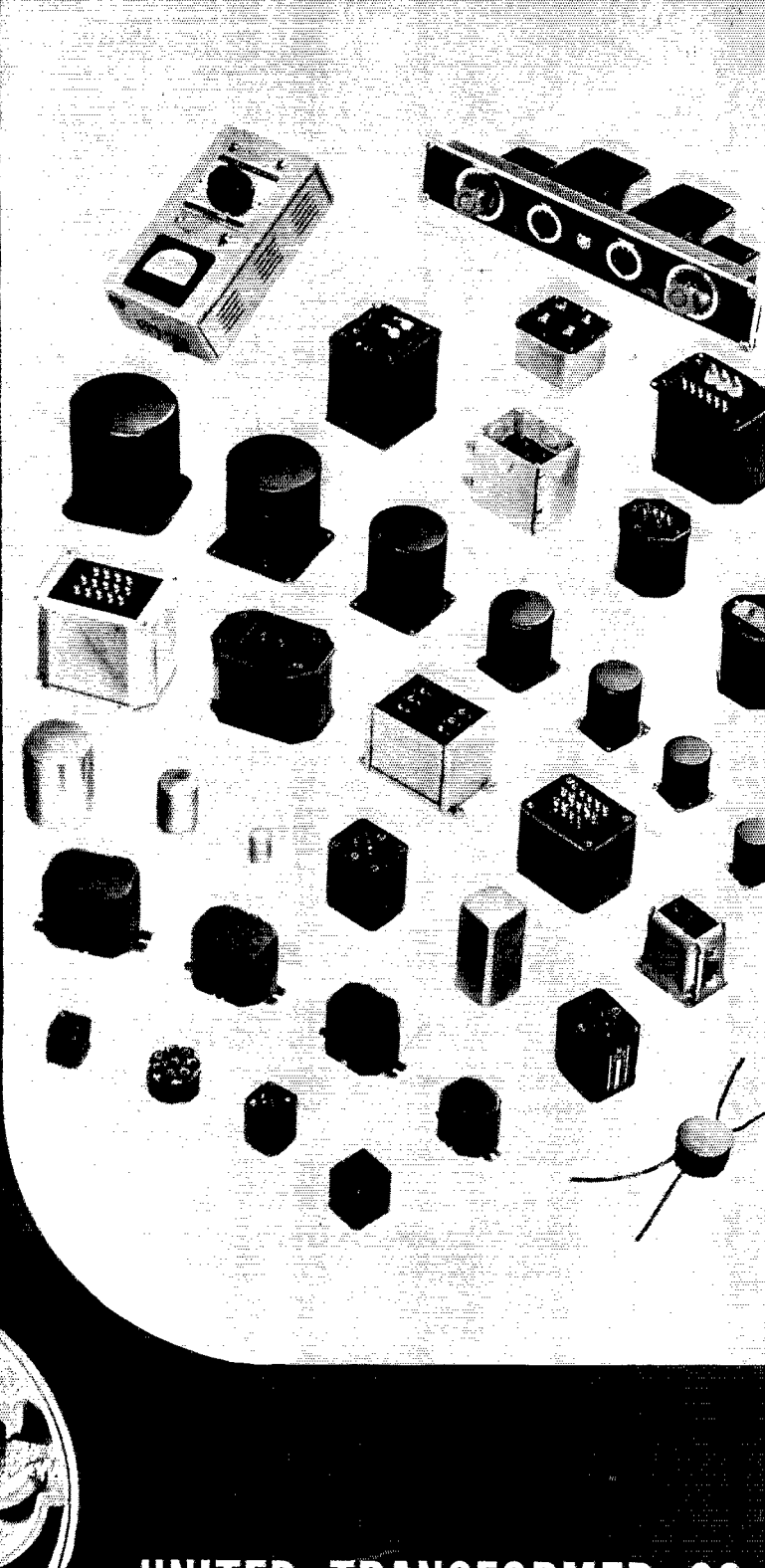
amateur radio

In This Issue:

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

UTC LEADS THE FIELD



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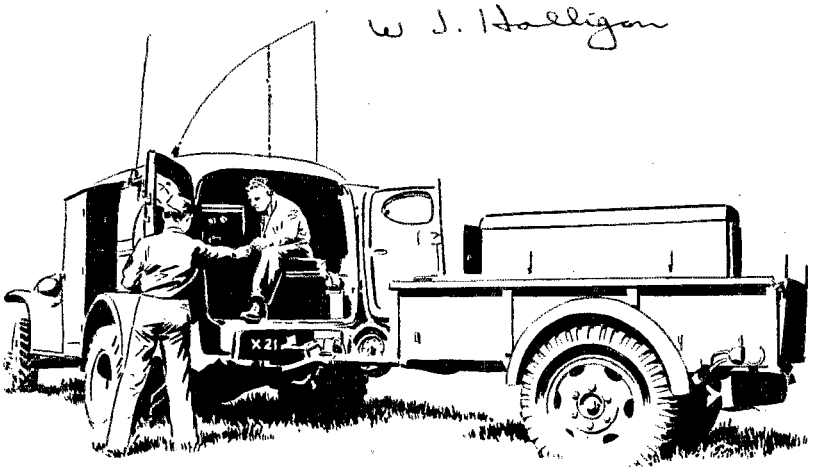

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CHICAGO, U.S.A.

OCTOBER 1943

VOLUME XXVII

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★

★

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QST *devoted entirely to*

AMATEUR RADIO

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

CONTENTS

Section Communications Managers of the A.R.R.L. Communications Department

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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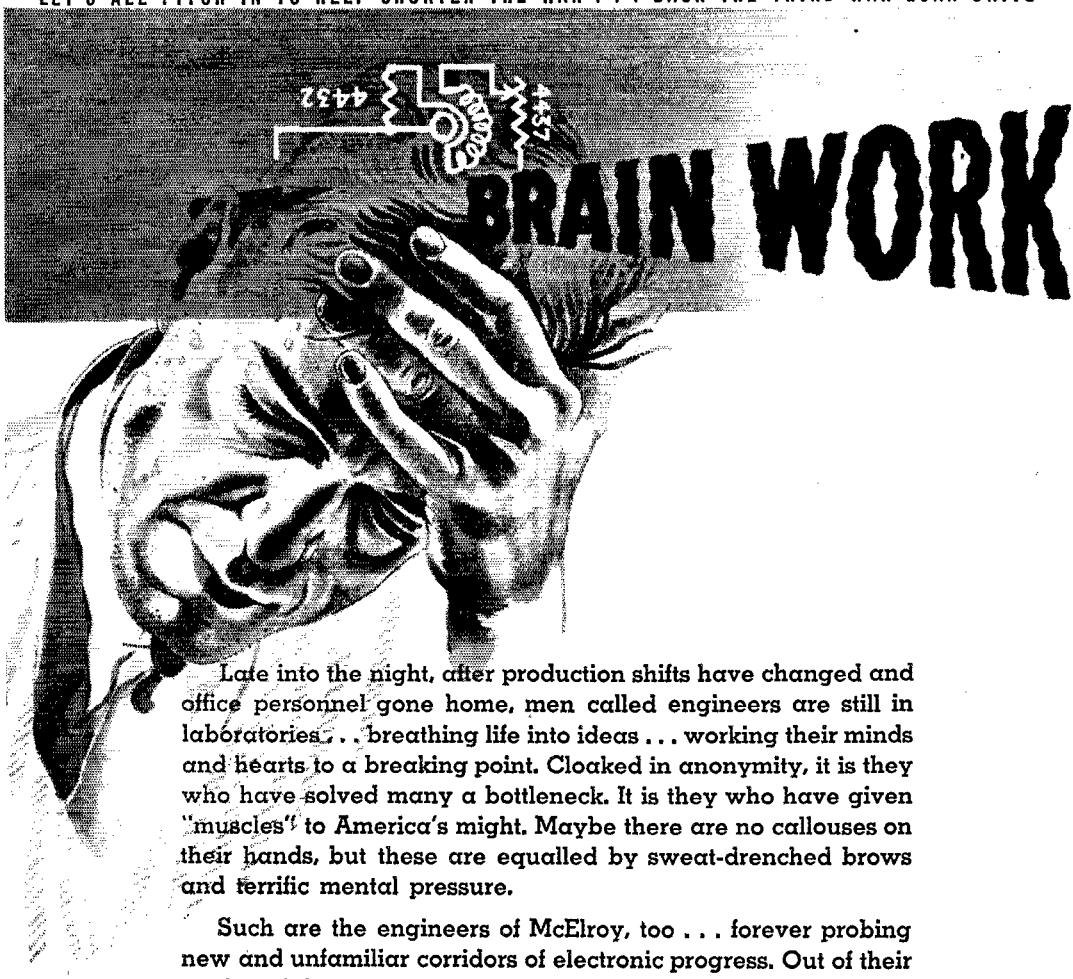

Late into the night, after production shifts have changed and office personnel gone home, men called engineers are still in laboratories . . . breathing life into ideas . . . working their minds and hearts to a breaking point. Cloaked in anonymity, it is they who have solved many a bottleneck. It is they who have given "muscles" to America's might. Maybe there are no callouses on their hands, but these are equalled by sweat-drenched brows and terrific mental pressure.

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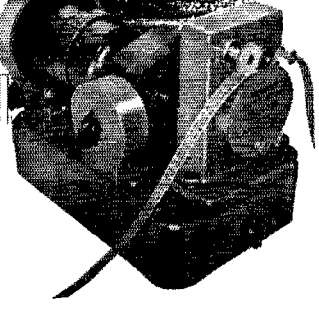

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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors.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

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

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

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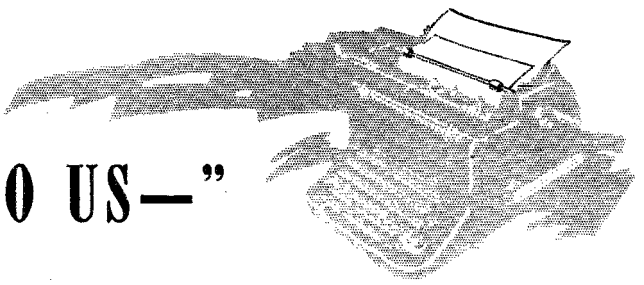


"IT SEEMS TO US—"

MIDSTREAM

AUTUMN is upon us. The nights are crisp, the days a riot of flamboyant Nature. It is the season in which, in happier times, we would be large with plans for our winter's operating activities. Every one of us would be making it his business to go over his antenna system, replacing halyards and perhaps a broken insulator, and critically appraising the ability of each piece of outdoor gear to withstand another winter's strain. Working in our monkey-suits in the patch of briers at the far end of the diamond, come Saturday afternoon, we'd think with pride and satisfaction of the signal we knew we could lay down along the curving path of that beam, whose course around the globe we knew by heart, and for us the cold dark evenings of early DX couldn't come too soon.

How different it is this year! Our stations stilled for nearly two years, we all devote ourselves to sterner tasks. Yet who amongst us can ever forget what autumn has always meant to the radio amateur? It seems to us that in the mind of every ham fighting this war there must always reside some consciousness that one of the things we are fighting for is to bring back those happy radio days that have been so dear to our hearts.

Meanwhile there is work to do, each of us to his appointed job — fighting, production, administration or what-not. What we like to talk about on this page is amateur radio, and often we are moved to think of opening up discussions here on our plans for a better postwar ham world, how we could improve our regulations and our own practices and our techniques. Yet with so many of the fellows away from home and unable to participate because of their immersion in much more vital concerns, it doesn't yet seem either fair or profitable and we have contented ourselves with simply reporting to you all that your League remains on the job of looking after the interests of amateur radio and that, through its Board committees and Headquarters, it plans for and looks forward to the day of our reactivation on the air. The war is not yet won. We only begin to see the shape of victory. Our hearts and hands must continue pledged first to that great end. The joys of freedom flow only from that accomplishment.

With the war on the way to being won, we perceive another opportunity for service on the part of amateurs still on the home front, particularly our local clubs. One of the sad but inescapable costs of victory is the wounded soldiers and sailors returning to their homes. Almost every community now has some of these ex-service men, disfigured or disabled, emotionally disturbed. Modern therapy can do wonders toward their rehabilitation but family, friends and the general public must coöperate and behave toward them with restraint and intelligence and consideration, to aid them in their readjustment. We at home owe them so much! Some of them are going to have a difficult time recovering self-confidence and the ability to lead useful lives. What they desperately need is some new interest in life, something that will let them forget their cares. Perhaps because we realize that inevitably some of them will be our brother amateurs, our thoughts turn to the desirability of helping these men to learn amateur radio. We all know, from peacetime days, what a blessing ham radio has been to countless shut-ins and Chair-Warmers. For leisure time, for an interest that will while away the weary months of readjusting tired minds and stiffened fingers, for an avocation that can quickly lead to useful vocations, we can think of no more fascinating activity in the world than the study and pursuit of amateur radio, preparing for the license exam, and planning a postwar amateur career with its infinite possibilities.

Busy as you are, you men and women still at home, and especially you officers of radio clubs, we propose to you that you look around and see whether there isn't here an activity for you, right in your home town, that makes every possible appeal to your hearts. We have found much joy in amateur radio. It has brought us pleasure and profitable hours and rich new knowledge and experiences. We know what it can do for those who sorely need a new interest. Let us share the happiness we have found in it with these our countrymen who need our help. May we at Headquarters urge upon you, individually and as clubs, the recognition of this new opportunity to serve by opening our door to those to whom its warmth can mean so much?

K. B. W.

★ SPLATTER ★

OUR COVER

EXCEPT perhaps for identification of whatever it is the operator of the WERS handie-talkie finds so dramatic in the spectacle he appears to be viewing, all of the explanation necessary for this month's cover is to be found on pages 35–38. As for that expression — well, a certain Mr. L—— to the contrary notwithstanding, it *might* have been an incendiary. . . .

•••—

ZONE X?

THE Post Office Department is a little annoyed at us. They sent us a form letter reporting that they "have received a quantity of mail addressed for local delivery, mailed by you, which does not show the Postal district numbers in the addresses." We tried to tell them that we had asked all of you who reside in the larger cities to inform us of your zone numbers; we even showed them the notice we printed on p. 8 of the July issue of *QST*. But they just nodded and said, "Yeah, but how about those copies of *QST* you're still mailing *without* zone numbers?" Single-track minds. . . .

Anyway, won't you please notify us of your local zone number, if and when you are assigned one? We don't want to have to tangle with those fellows at the post office again.

•••—

FOOTNOTES

AMONG the non-staff contributors to this issue of *QST* you will find authorities on about every subject from aeronautics and amateur radio to xylophones and zoölogy, as you will discover from the following:

By his own admission, **Thomas A. Garretson, W2ASB,** can do anything but repair a gun or clock. He has had a crowded career filled with a variety of vocations and hobbies. Among vocations, he lists teaching, politics, carpentry, electrical servicing, auto electrician, oil burner and radio servicing. Among his hobbies are a dozen musical instruments (all of which he plays well), sports, photography, fishing and amateur radio. A radio fan since 1906, and a licensed ham since 1930, last year he created the Rutgers traveling radio laboratory to handle the lab work in twenty New Jersey cities where 2000 radio technicians were being trained for the U. S. Signal Corps (see September *QST*, p. 38). In doing that job he constructed 90 different radio experiments for over 250 radio classes under the Rutgers ESMWT program. The article on p. 42 is a result of that work. . . . **Charles E. Holden (p. 30),** on the other hand, is a modest fellow who won't admit to anything about his past career — not for publication, anyway. We feel safe in saying this much, however: he *is* a well-known authority on the Japanese language. . . . The 5th District is a prime breeding ground for the ham chapter of the Ananias Club (remember Felix, et al.?), and **Major J. W. Hunt, W5TG-W5CCU,** has long been a champion of champions. It may seem out of character for a major in the U. S. Army Air Forces to revert to the rôle of spinner of tall tales, but anyone who ever heard Jim Hunt win a liar's contest at a West Gulf convention won't be surprised at the epic on p. 55. At least one thing about the story is true: W5TG did see the Far North, having been sent up there before Pearl Harbor on AACS business. He experienced many vicissitudes and hardships in addition to those described in his yarn. Perhaps the most rigorous of these was that, up there in the land of ice and snow, he went a whole year and a half without tasting a chocolate milk shake.

The co-authors of the New York City WERS account seem to have taken lessons in terse operating procedure. **Vincent T. Kenney, W2BGO,** writes: "Have held ham ticket since 1927; ARRL member since 1925; AARS member from 1928 to Pearl Harbor; member AEC since its beginning; SCM of NYC & LI Section back around 1930; RM for Bronx from 1932 till 1941, when I became regional coördinator for NYC; held two Public Service certificates for work in the Connecticut Valley flood of 1936 and the Ohio Valley flood in 1937; member A-1 Operator's Club, Rag-Chewers Club, ORS, and — that's all I can think of now." Vin neglects to mention that he is a newspaper printer by trade, and that the above was pounded out on a linotype machine instead of a typewriter and came to us in the form of a printer's galley proof! . . . **Frederick A. Long, ex-W8BSL,** similarly thumbnails himself: "Ex-W8NE and W8BSL, 1919–1923; wholesale radio salesman; announcer, WNAC; manager, WEAN; producer, CBS, New York; program manager, CBS, Washington; director of broadcasting, New York World's Fair; free-lance producer, "Lucky Strike Hit Parade" and "Believe-It-or-Not Ripley" shows; assistant director of radio, Republican National Committee, 1940; director of radio department of a major advertising agency; currently director of U. S. radio activities for the Coordinator of Inter-American Affairs; also currently Queens Borough Radio Coördinator of New York City WERS."

Edward M. Noll, ex-W3FQJ, confides that radio and he have been "like that" for the past eight years. He started as a ham in high school, and soon moved over into the pro bracket, becoming an operator at Philco's television station, WPTZ, and at several b.c. stations. Now he's an ESMWT radio instructor at Temple University, in Philadelphia. On the side he finds time for such activity as sponsoring the social career of miscellaneous interesting characters like Mr. *j* (p. 21). . . . **S. Jonathan Weitzer, ex-W2FSP,** started in ham radio simultaneously with an interest in gunpowder. This was back in 1919, in Montreal. After setting fire to the attic he was driven underground, where he operated spark (ex-2CO) in the basement. The family thereafter

(Continued on page 84)

Supersonics for Communication

Experimental Results and Circuit Suggestions

BY S. JONATHAN WEITZER,* EX-W2FSP

Do you have a nostalgia for the good old days of spark transmitters? Do you remember how you enjoyed that sense of power as 1 kw. at 20,000 volts crashed across an open spark gap? Perhaps supersonic communication may encourage a return to those noisy, fuse-blowing days.

Instead of coupling the oscillating energy to an antenna, the spark gap itself will be the source of sound energy. The sparking at any frequency emits a sound wave of that frequency. Our supersonic rig then would consist of an m.o.p.a. system at, say, 20 kc., with the final output exploding across an air gap mounted inside a teeny-bitsy horn, rotatable, so that the inaudible sound can be beamed in any direction.

This thought is offered in a sense of speculation, but, if interested, dear ham, read on, read on.

THE article on supersonics by W. P. Bollinger in May *QST*[1] encourages me to review some experiences in this field of work. Although there exists a large body of technical literature on the subject, very little has been published on the projection of supersonic waves in air for communication purposes. Most investigation has been along the lines of projection in liquids and solids. Considerable work with supersonics has been done by numerous physicists in the fields of television, testing of materials, coagulation of smoke and fog, emulsification of liquids, depolymerization, production of colloids, destruction of small insects and bacteria, and other biological, chemical and physical effects.

There is practically no helpful material published dealing with supersonics for communication, however. Even the details of the original submarine detector, developed by Langevin in 1914, have been consciously suppressed by all governments to this day, although general principles are of course available and of common knowledge to workers in this field.

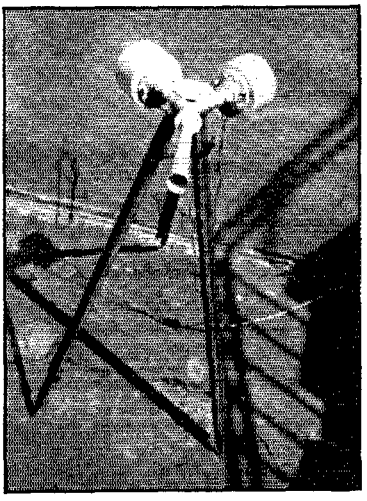
Some attempts have been made to use supersonics for aircraft altimeters. As in other altimeters, the principle consisted of transmitting a powerful sound impulse from the plane to the ground and picking up the returning echo with some form of detector. The time interval between the instant of transmission and the time the echo reaches the detector is an indication of the plane's height. Some sonic altimeters utilizing audio frequencies, generally around 3000 cycles, have been tested by the airlines, but these had numerous disadvantages — chiefly excessive weight, limited range, and error factors. As a matter of fact, in the best device, described by Sandretto, a sound generator of 100 watts acoustic power could indicate heights only up to 1400 feet. Today, most absolute altimeters and collision prevention devices function by microwave radio.

The use of inaudible sound as a means of communication has been sadly neglected, but it provides a fresh and highly interesting field for the amateur. Several years ago the writer undertook some development work in this field. The purpose of this article is to pass along some of his experiences. These will be dealt with qualitatively, with the intention of providing a background for the experimenter.

Air as a Conductor of Sound

First of all, it should be understood that air is a poor "conductor" of high-frequency sound; the higher the frequency, the greater is the "absorption," to use the correct term. For this reason, an uneconomical amount of power is required to project high-frequency sound for any great distance in air. In other words greater amplitudes of vibration are required for propagation in air, and this places a decidedly greater strain on the vibrator. At 10,000 cycles, for a certain amplitude at the source, sound will travel almost 2000 times farther in water than it will in air. Sound also can be sent along wires for a considerable distance.

The poor efficiency of acoustic or air signaling



Supersonic projector of the tweeter type, consisting of two high-power p.m. driver units modified to peak at high audio frequencies. Preliminary experiments were carried out with these units working between 16,000 and 18,000 cycles. At these frequencies, as much as 100 watts of electrical energy could be used.

*44 Moore Terrace, West Orange, N. J.

[1] Experimenters' Section, *QST*, May, 1943.

Even if you have neither opportunity nor present inclination to play with supersonic communication, you'll find this article interesting. The practical problems and possibilities are well outlined, and some novel ideas are suggested.

explains why it has been neglected. Another important factor, which contributes to the poor results, lies in the electroacoustic generators used. Several types of high-frequency sound generators, in the order of their importance, are quartz crystals, magnetostriction vibrators, air jets or special whistles, loud-speakers of the condenser and tweeter types, and the spark gap previously referred to.

The generation of sound waves of frequencies up to 400,000 cycles is common practice in supersonic laboratories; in fact, frequencies of several million cycles have been produced by advanced workers in this field. Most of the research work dealing with these frequencies utilizes quartz crystals as the sound generators. Every quartz oscillator in a radio transmitter is a sound generator of low intensity. In order to obtain high-intensity sound, a crystal cut to the desired frequency is driven by a power oscillator. As every amateur knows, r.f. crystals excited by more than 10 or 20 watts will be damaged. In supersonic generators the crystals generally are immersed in oil or other liquid for mechanical damping and cooling, but even so there is a limit to the energy which can be applied to the crystal. For extremely high-power work, several crystals are connected in parallel. Crystals for 20 kc. to 50 kc. are large bars or slabs, and at these frequencies do not possess much activity; for a given driving power, they cannot vibrate as vigorously as crystals cut for higher radio frequencies. If the vibration amplitude becomes too large, the crystal literally tears itself to pieces. However, some investigators have driven crystals with as much as 3 kilowatts of power.

Since the velocity of sound in quartz is close to the velocity in steel, a thin section of quartz can be cemented between two thicker steel plates and the whole will resonate like a single plate of the same total thickness, the over-all thickness determining the frequency. A unit with a thickness of 2½ inches will resonate at about 35,000 cycles. This arrangement not only has the advantage of cheapness, but — more important — greater amplitudes of sound can be obtained for the same exciting voltage.

Seagulls at Bay

The initial urge to take up an investigation of supersonics came about as the result of a desire on the part of the water engineers and health officials of a certain coastal city to rid their water reservoirs of seagulls. It happens that, during high tide, the gulls fly over the reservoir and drop their excrement into the water. Of all refuse there is nothing so foul as the excrement of a sea gull, and it may endanger the health of persons regularly drinking such water. The present method of safeguard is for the gatekeeper to fire blank shotgun shells whenever the birds overstep themselves. The noise of the shot frightens them away only for a while, whereupon the sham battle resumes again. By and by this business becomes as much of a nuisance to the nearby human residents as it does to the birds.

Since it is known that many birds and insects have hearing organisms sensitive into the supersonic range, it was considered that a powerful high-frequency sound with a wobbulated effect might give the birds a disagreeable sensation and tend to drive them out of range of the sound, while being, at the same time, inaudible to the local residents. In practice, this was proved to be the case. Although no permanent installation was

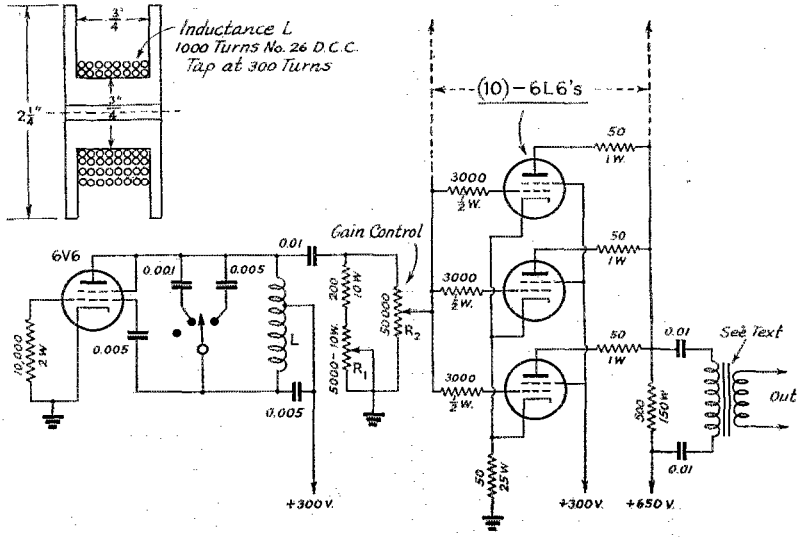


Fig. 1 — Supersonic oscillator and amplifier. The output stage is ten parallel 6L6s (only three of which are shown). R_1 is the oscillator load resistance. When set towards the 200-ohm end (that is, for lowest load resistance), variation in frequency will occur with changes in R_1. However, the voltage across R_2 will vary with each change of R_1. This arrangement of changing frequency with loss in output voltage is practical in this case because the lowest oscillator voltage is more than sufficient to drive the 6L6s to full output. For uniform power output from the tweeters, any change in R_1 will require a resetting of R_2.

made for the city fathers, demonstrations at the reservoir and the waterfront gave quite a jolt to all the winged fowl within a quarter mile; they fluttered and squeaked and quickly took themselves off to more peaceful parts. In the course of the writer's experiments parrots and canaries became so terrified that they flapped around in their cages in a mad frenzy, their feathers flying in all directions. Canaries afterwards acted sick and depressed, and it took several days for them to return to normalcy. Flies behaved differently; seemingly they became stupefied, and could be picked off the walls with the fingers. It is not known whether they experienced a brain anaesthesia or some kind of delightful stupor, for sometimes they could be seen rubbing their forelegs together like jitterbugs enthralled by Harry James.

Most of these tests were made at threshold frequencies. (The author's ears being good to 18,000 cycles, no special detector was necessary. Detectors for high-frequency sound will be discussed further on.) The equipment consisted of a simple low-power oscillator feeding a special a.f. amplifier designed for reasonable efficiency at high frequencies. The latter was an output stage with ten 6L6s in parallel, single-ended, for the purpose of providing a low-impedance load and thus minimizing distributed-capacity effects in the output transformer. (See Fig. 1.) The output transformer was sectionalized, with the secondary wound over the primary. The core consisted of iron filings packed into rubber tubing. The output stage was shunt fed to keep the d.c. component out of the winding. Since the d.c. component is as much as 0.5 ampere, the size of the output transformer can be cut down by shunt feeding. There is a 250-volt drop across the plate load resistor so that the d.c. source should be about 650 volts, leaving 400 volts d.c. actually on the plates of the 6L6s. The power transformer was designed for this job, being a ½-kva. unit. A 1.0-μfd., 2000-volt condenser was used across the output of the rectifier tubes. No other filter was required.

The output of the amplifier was fed into two University Laboratory p.m. driver units, connected to a common horn 9 inches long. These loudspeaker units were modified by the manufacturers to increase their efficiency at the higher audio frequencies. The diameter of the diaphragm was made smaller and the suspension stiffer, and the entire mass of the moving elements was reduced. Thus the units actually became high-power, high-efficiency tweeters.

Although the conversion efficiency of this driver unit at 18 kc. was higher than that of any other type of transducer available commercially, it represented the weakest link in the system. Without having means for quantitative measurements, it was assumed that the efficiency was less than one per cent. Nevertheless, with the loudspeaker installed on a fire-escape and pointed down the street the pitch at 16 kc. could be heard over four blocks (about one-third of a mile) before being lost finally in the surrounding street noises. This pitch was inaudible to most persons;

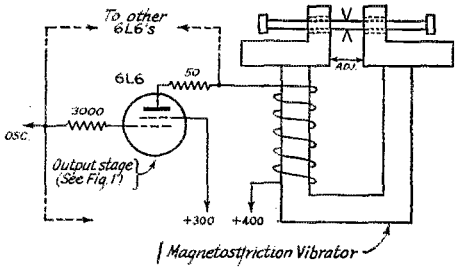


Fig. 2 — **Circuit showing how the power amplifier can be coupled to the magnetostriction vibrator.**

only an occasional passerby seemed to "sense" its presence. One has the sensation that he is experiencing a "ringing in the ears," such as sometimes accompanies a head cold.

Contrary to expectation, the attenuation or absorption in air does not seem to be as great as mathematical computation for this frequency would indicate. There is very little change in the observed sound level whether one is 200 feet or 1000 feet away. Reflection from buildings is very marked, and all sense of direction of the source of the sound is soon lost. However, when projected in free, open space the sound has a fairly narrow projection angle.

Magnetostriction Vibrators

In an effort to obtain greater sound intensities, a magnetostriction vibrator was built up somewhat as illustrated in Fig. 2. The same amplifier was used, except that the output transformer was replaced by a winding on the core of the magnetostriction vibrator. In this case, the d.c. plate supply of 400 volts goes through this winding to provide magnetic polarization of the magnetostrictive rod. This "rod" actually is monel metal tubing, of varying diameters and lengths, fitted with flanged aluminum end plates to permit its acting on a greater air area. Sound is emitted only from the ends of the rod. The flange diameter is ¾ to 1 inch and the flanged section is rather thick (½ inch) to prevent distortion from nodes forming on its surface. The rod must act like a piston. The tube is split down its length within a distance of one inch of each end. This reduces eddy currents because the circumference of the tube is broken for most of its length.

The end flanges should be hard force-fitted into the tubing and then pinned. Small screws and nuts become loosened under the vibration, no matter how much they may be tightened. Rods between 6 and 7 inches long have their fundamental frequency in the threshold region. Don't expect to hear any powerful or terrifying pitch just because a lot of electrical power is pumped into the loudspeaker or vibrator. At threshold frequencies the human ear is a poor receiver; hearing losses between 16 kc. and 20 kc. are pretty close to infinity. Although the magnetostriction vibrator at these frequencies has higher efficiency than the loudspeaker type, the former still has a great deal of loss which soon becomes apparent in the heating of the rod and other parts.

The "rods" used were ordinary ⅜ i.d. × ½ o.d. monel metal tubing, purchased from an alloy concern (Whitehead Metal Co., New York City). Tubing purchased at different times seems to vary. In some cases a slight pull is felt when the tubing is tested with a strong permanent magnet, showing an iron content, while with other samples no pull is observed. The iron in the monel metal exists in the form of impurities and does not run uniformly. Tubing with some iron content was found to be somewhat more efficient than the tubing without it.

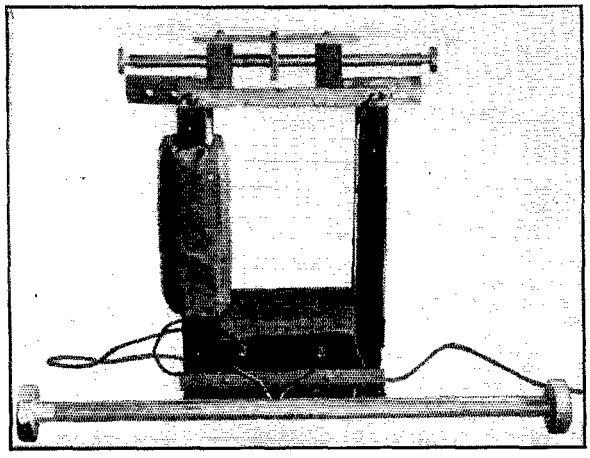
Push-Pull 204-A Oscillator

A high-power self-oscillator was built up using two 204-A tubes in parallel. The plate coil was wound over one leg of the magnetostriction core. This oscillator was capable of delivering powers up to 500 watts and had a tuning range of from about 7000 to 30,000 cycles, using a bank of fixed condensers for tuning. At 16,000 cycles the range was over two miles. The equipment could be maintained in operation only for a scant two or three minutes, however, because by that time the rod and other solid iron parts became pretty hot.

The core of the magnetostriction vibrator was made up of ordinary laminations of the type generally used for 60-cycle cores, although at high audio and supersonic frequencies the loss due to core hysteresis is quite serious. The adjustable pole pieces, which were machined from cold-rolled steel, had the greatest loss, and became hot enough to melt solder after a few minutes of continuous operation. The vibration amplitude of the magnetostriction rod decreases with temperature, and with a high-power exciter the rod may cease to function in a short time because of excessive heat.

There is much room for improvement in the design of the magnetostriction vibrator, and this problem presents a challenge to the amateur. According to one investigator, the maximum practical amplitude of vibration of the rod is one-ten thousandth part of its length. At higher frequencies, where harmonic vibration is utilized, the amplitude is much smaller and the sound intensity correspondingly weaker. Reduction of core losses would reduce heat and provide the same amplitude with less expenditure of energy. Any improvements in this direction would represent an important contribution to this science.

For the purposes of amateur communication, a frequency of 20 kc. would be just about right. Ninety-five per cent of adults are deaf to this frequency. With its directional properties, this method of communication offers reasonable privacy. The physical dimensions of the magnetostriction rod are not too small for the average constructor to fabricate and handle. At a fundamental of 20 kc. the length is between 4½ and 5 inches. It is not possible to give the exact length, because it varies with rods of different chemical composition. Monel metal is composed of 68 per cent nickel and 28 per cent copper, together with small amounts of iron, silicon, manganese and carbon. Other nickel alloys, such as Invar (36 per cent *Ni*, 64 per cent *Fe*), cobalt and nichrome, are good vibrators. Even nickel-plated iron, brass, and nickel-coated non-metallic materials exhibit, to some extent, this magnetostrictive effect, which is also known as the "Joule effect" after its original discoverer.



A magnetostriction vibrator. When driven from a high-power oscillator using 204A tubes, with an output of 500 watts at 10,000 cycles, the sound could be detected at a distance of over two miles.

A Supersonic Detector

A simple detector for supersonics in the region of 20 kc. can be made from an old ribbon microphone. The ribbon is removed and the corrugations smoothed out. It is then cut down to a width of ⅛ inch. The end-supports for the ribbon at the top and bottom of the magnet are used to support light extension plates, so that the total length of unsupported ribbon is reduced to ¾ inch. The ribbon is mounted between these new supports. There should be no wrinkles in the ribbon and it should be stretched as tight as possible. This is a ticklish job and there will be several unsuccessful attempts, so save the remaining portions of the ribbon for a second or a third attempt. In re-assembling the housing leave off the front grille, or that part of the case which normally covers the operating surface of the ribbon.

The microphone output is fed into a well-shielded voltage amplifier, made up of three pentode stages. (See Fig. 3.) The design is such that the middle and low frequencies are cut off. Shielding should be of the low-capacity type, so that shunting of high frequencies through distributed capacity effects is at a minimum. It is also important to keep down tube hiss and circuit noises. All resistors carrying d.c., such as plate, screen and cathode resistors, should be of the 1-watt size and, where possible, wire-wound. Ordinarily considerably more gain could be realized from three such stages but, because of the low values of

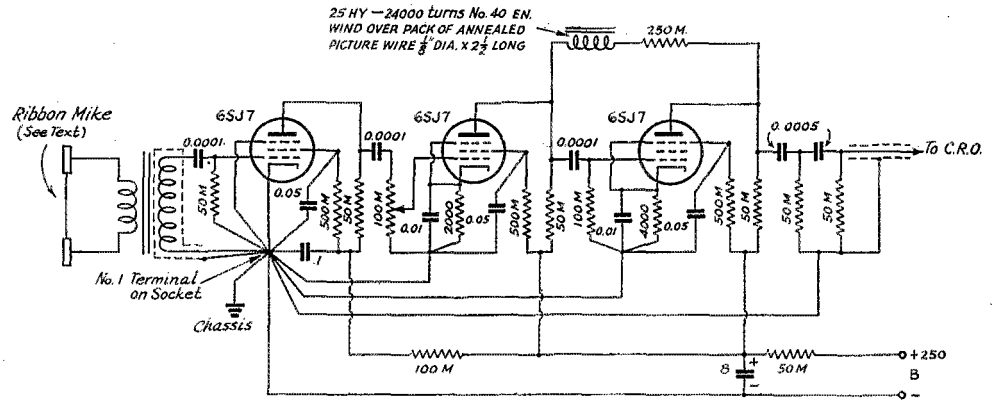


Fig. 3 — Amplifier circuit for high audio frequencies. All "B —" leads are brought to one point on chassis. The No. 1 socket terminal is used for all "B —" leads common to that stage. These are strapped together with a No. 14 jumper and grounded to the chassis opposite the No. 1 terminal on the first socket. The inductance in the feed-back circuit across the last stage provides for increasing feed-back with lower frequencies, causing the gain to rise with frequency. The inductance must be small physically, yet have reasonably small distributed capacity. If the experimenter is unable to secure or construct such an inductance, the entire feed-back system should be omitted. The cathode by-pass condensers add stability to the circuit. Electrostatic shields, where used, must not carry "B —" returns. All shielding should be grounded directly to the chassis at the nearest point. See text for additional data on design and construction.

plate load resistance, the actual gain is less than optimum. An advantage is realized in the use of relatively small plate and grid impedances, however, because distributed-capacity effects are reduced and the amplifier has decent response at the high frequencies. Careful construction technique must be employed, or the amplifier will be unstable and may develop self-oscillation at some supersonic frequency. This must be eliminated by good design practice, rather than by capacity-shunt effects or high-frequency attenuation as would be permissible in amplifiers designed only for audio frequencies.

Oscilloscope as a "Sight" Receiver

Because the equipment was available the author used an oscilloscope as a "sight" receiver, feeding the output of the amplifier to the vertical axis. When so used, the hot input terminal of the 'scope should be shielded. If the source of the supersonics is located at some distance from the microphone, it will be necessary to use a considerable amount of vertical gain. A lot of hash will appear on the 'scope from stray electrical and acoustic pick-up. Naturally most other sounds and transient noises are projected on the screen, but through all this the constant frequency from the supersonic source can be easily distinguished. The sweep-frequency control should be adjusted so that best observation is obtained. If the sound generator is keyed the 'scope can be used as a receiver, employing the sense of sight for interpretation.

Another form of receiver for code reception could be constructed by employing a variable-frequency oscillator to beat with the supersonic signal. This could be done after one stage of amplification following the microphone, which would simplify the design of the amplifier. Following demodulation, the audible beat frequency could be amplified by any conventional a.f. amplifier and fed to a loud-speaker or headphones. The local variable-frequency oscillator could be a plate feed-back regenerative circuit, with the supersonic voltage coupled to its grid circuit. Some experimenters working with frequencies in the megacycle regions employ a quartz crystal, slightly tunable, as the pick-up element, beating it with the sound signal and amplifying the beat as an i.f. in the same manner as in a superheterodyne. The output then is rectified to operate a meter or other indicating device.

Workers and References

The reader interested in this field should acquaint himself with the names of the physicists who have made important contributions to the science. In America, they are G. W. Pierce and A. Noyes, jr., of Cruft Laboratory at Harvard University; V. O. Knudsen, of the University of California; R. W. Wood, A. L. Loomis, F. O. Schmidt, W. T. Richards, J. C. Hubbard and E. N. Harvey; in Canada, R. W. Boyle; in France, R. Lucas, N. Marinesco and P. Biquard. By far the greatest amount of research effort *had* been undertaken in Germany. In all scientific fairness, the following names must be included: L. Bergmann, E. Grossmann, E. Hiedermann, Chas. Bacham, R. Bar, O. Brandt, J. Hartmann and A. Schaefer.

The author recommends a book entitled "Ultra-Sonics," by L. Bergmann, published by John Wiley & Sons, New York. This book includes one of the most complete bibliographies on this subject. Most of the references are available in foreign publications only and are on a high theoretical plane.

The *Journal* of the Acoustical Society of America, Vol. 9., No. 3 (January, 1938), contains several articles, and the *Review of Modern Physics*, Vol. 11, No. 1 (January, 1939), contains a bibliography of over 300 references.

WERS for Seven Million People

How New York City's CD-WERS System Is Organized

BY FREDERICK A. LONG,* EX-W8BSL, AND VINCENT T. KENNEY,** W2BGO

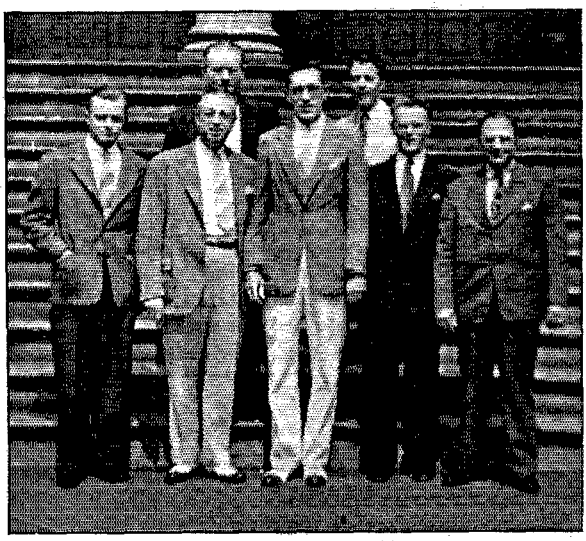
Of the 225-odd CD-WERS organizations in the United States, none is quite so comprehensive as that of New York City. Yet the system as a whole is a masterpiece of simplicity. Without financial aid, New York City's amateurs nevertheless have created a coördinated system covering the five most densely populated counties in the country. Here is the story of how the job was done.

SOONER or later every person who becomes actively connected with any vital movement believes that he has a story to tell about his organization that will prove it to be the best there is. This story is no exception, but in the wordage following an active effort has been made to temper this natural inclination. It is not a story of technical problems, such as how we got the 2½-meter signal over the hill from this point to that. Such problems have been and will be adequately covered in this and other publications and among members of the amateur fraternity whenever and wherever they meet. This story goes behind those problems and the individuals concerned, and discusses a new basic communications system from the standpoint of how to make it work. It discusses an over-all plan of WERS operation in terms of the experiences of one organization, and tells how it worked out successfully in one specific instance.

It is the story of WERS in a community of 7,000,000 people; the largest in the United States — New York City.

*Queens County Borough Radio Coördinator, New York City.

**Radio Aide, War Emergency Radio Service, Office of the Mayor, New York City.



Some of the dignitaries of New York City WERS photographed in front of City Hall. *Front row, l. to r.* — Bob Mertens. W2FDV, alternate radio coördinator for Brooklyn Borough; Reeve O. Strock, W2GTZ, assistant radio aide; Vincent T. Kenney, W2BGO, radio aide; Elphege Lussiere, W2BVT, chief electrician; John DiBlasi, W2LKC, alternate radio coördinator for Queens Borough. *Back row* — M. A. McIntire, W2BO, radio coördinator for Brooklyn Borough; F. A. Long, ex-W8BSL, radio coördinator for Queens Borough.

Simplicity Is the Keynote

Undoubtedly the foregoing will lead to the immediate assumption that the set-up is complicated, and therefore unique and not adaptable to operation in other communities. Such is not the case. The operational set-up of New York City WERS is such that the whole is the sum of smaller components, all of which operate in an autonomous fashion, exactly alike. Each is responsible only to the next organizational unit up the scale. What we have is a line of reporting, from individual to precinct to borough (county) to city — a simple chain of authority. In fact, simplicity is the keynote of our whole operation. Another "must" is that, despite the importance of WERS, sight must never be lost of the fact that every member is a voluntary contributor of his time, money, equipment and effort to an organization which not only is very demanding but is closely supervised by FCC, Army and municipal government. This, as each member must understand, is as it should be. War is a serious business.

Of course, like all WERS organizations in their formative stages, New York City WERS went through a period of feeling and groping. The main thing was to get stations on the air, to get them located and in contact with one another. That wasn't too difficult, since there were many of the old-timers who were ready and anxious to coöperate. We were blessed with competent leadership, provided by a great many of the amateur fraternity in New York who form the backbone of our organization — men such as Vincent T.

Kenney, W2BGO; Reeve O. Strock, W2GTZ; Meylert A. McIntire, W2BO; Carl Lomupo, W2DZH; Ed Ballentine, W2NH; Ted Long, ex-W8BSL; Frank Heubner; Gene Clark, and many others. Under this leadership, we grew up very fast. In some localities, especially Queens Borough, we grew up faster than we were immediately prepared for, and our problems began.

We discovered very quickly the necessity for delineation of operating procedure and adequate organization, and we set about accomplishing this. To-day our organization is in complete operation, and it works very successfully.

In approaching the problems set before us, much thought and consideration was given to methods to reduce each item to the lowest common denominator. This was for the prime purpose of obtaining simplicity and thus accomplishing workability. We found that we had to discard much of our preconceived knowledge of amateur radio organization; we had to start over almost from scratch. We found that we had not one but three major categories for consideration, and our objectives have been successfully confined to them. They are (1) the over-all plan, (2) organization, and (3) operating procedure. Furthermore, we found that to be the probable order of importance. Therefore, the over-all plan was approached first.

The Over-All Plan

In New York City, WERS operates under the supervision of the mayor through his chief of staff, communications coördinator and radio aide. The smallest subdivision of our set-up is the police precinct, which parallels the set-up of the air warden service.

For the benefit of those who are not acquainted with the Big City, five New York State counties comprise the metropolitan area; the city itself, in its local government, calls these counties boroughs of the city. Within the five boroughs there are 89 precincts. Several of these precincts are doubled up and served by one report center, however, giving us a total of 71 report centers to cover by radio. Therefore, we have three territorial alignments: (1) the city as a whole; (2) each of five boroughs; and (3) 71 precincts making up the five boroughs.

Radio aide "Vin" Kenney, W2BGO, at the mike of one of New York City's borough control stations.

Control units are established for each of these territorial units, and from there on down subprecinct control units (we have three or four very large precincts requiring what might be termed relay stations), mobile units and pack sets are established. It is interesting to note, in passing, that we have some pack sets mounted on bicycles, and quite a few handie-talkies.

Each of the three numbered categories above operates on separate spot frequencies. That is, the city control unit operates on one spot frequency and borough control units each operate on other spot frequencies. Borough control units report to city control, while each borough, except for the borough control unit, uses a third set of

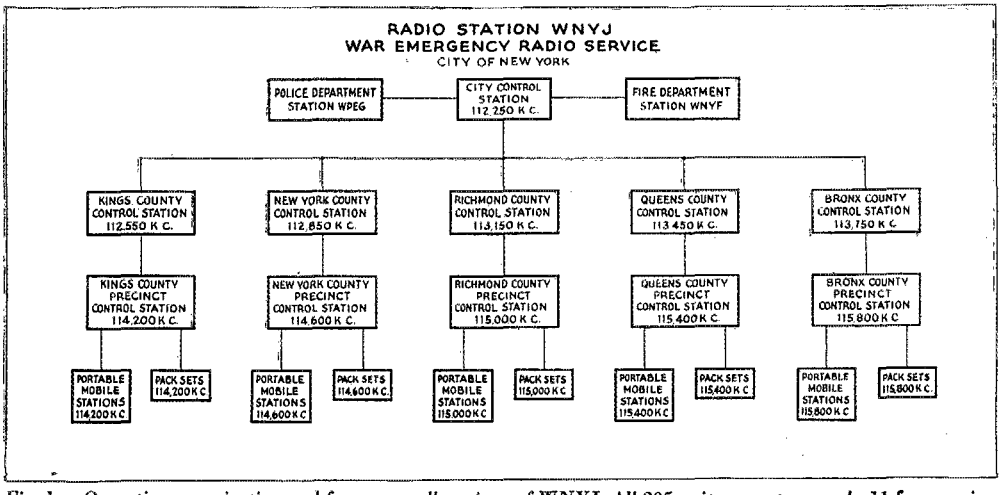


Fig. 1 — Operating organization and frequency allocations of WNYJ. All 205 units operate on only 11 frequencies.

One of New York City's mobile installations in action. The operator is co-author "Ted" Long, ex-W8BSL.

spot frequencies for all other operation within the borough. This means that all precinct control units as well as all mobile units and pack sets within a borough operate on the same frequency. While this would seem to make intolerable interference a certainty on each of these intra-borough frequencies, it has been found that careful reduction of power on the part of precinct control units and mobile units reduces interference to a tolerable minimum.

Recapitulating, the system comprises one transmitter and one frequency at City Control, one transmitter and two receivers at each borough control, and at all other fixed stations one transmitter and two receivers. Fig. 1 shows the basic allocation scheme.

From this it is readily apparent that the entire New York City WERS, currently comprising 205 stations (as of August, 1943, 75 fixed and portable, 80 mobile and 50 pack), operates entirely on only eleven spot frequencies within the 112–116-Mc. band. It has been established, through actual operation over a long period of time, that such use of frequencies is efficient and reliable, even within Queens Borough which has more than 90 station units participating simultaneously on a single frequency. With careful planning, it is not necessary to use a multitude of frequencies and thus annoy neighboring WERS services.

Another question was that of how many units and how many operators were necessary to man them adequately to cover the city and thus fulfill our responsibility. The sub-question, "Where should the stations be located?" was automatically taken care of by the locations of report centers. As time went by it was apparent that we could increase the number of station units without serious difficulty, but the ratio of increase in numbers of operators never was satisfactory.

This problem has been one of the most difficult. We are now surveying the situation to determine the maximum and minimum number of units and operators required for most efficient coverage of any given territorial unit within the city. Plans are being carried out to train the many new operators which obviously are needed. When this is accomplished, we will have a static organization that will be able to train to peak efficiency. Efficient operation already is very apparent within most boroughs. Some of the operators in New York City WERS are women. A few of them are YLRL members and licensed amateurs, notably Jean Grabscheid and Cecile Waters, both of whom hold Class B tickets.

About 70 per cent of the equipment was built by the local amateurs and practically all of it supplied by them. In order to supply the hundreds of complete transmitters and receivers necessary for the proper operation of the city-wide system, the amateurs had to donate generously — and they did. One amateur, for example, donated a TR-4, a portable-mobile installed in his car, a walkie-talkie and a handie-talkie, and is now finishing a portable-mobile f.m. unit which he will also donate.

Organization

Having established a basic plan and with a considerable number of units forming the nucleus operating under it, we turned our attention to organization. About this we learned much as we went along. There were several basic considerations — several "musts." We took our cues from other successful large organizations, commercial and volunteer, and then adapted the composite formula to our own needs. This, too, has worked successfully.

It will be noted from the organizational outline (Fig. 2) that the complete organization is in parallel with itself and is interlocking. That is to say, there is an assistant or alternate for every prime position. This is a very necessary prerequisite. In voluntary organizations, all officials cannot always be available at all times. Therefore, it is wise to have capable substitutes completely informed who can take over immediately in the absence of the principal.

There is an added advantage in that morale is best in such organizations when a maximum number of people have some delineated responsibility. All of us like to feel that we are making an important contribution and this is as it should be, because all are contributing importantly. A successful voluntary organization cannot afford to ignore a single member of its personnel.

We have found it not only wise but mandatory to keep ever in mind that all WERS personnel are specialists with above-the-average skills, who, because of our highly specialized type of work, must perforce operate under demanding supervision and regulation by various branches of the federal and municipal governments. WERS members are willing to accept such supervision only because they realize that they are doing effective work for the common good.

Operating Procedure

The same type of thinking has dictated our formula for operating procedure. It quickly became apparent that it was necessary to have a number of basic operating rules for all WERS operation in New York City. Therefore, the situation was analyzed and such a formula devised. These "rules" are floating in nature, which is to say that they are augmented, deleted from or changed from time to time as the progress of WERS in New York City demands. But the important thing is that we have established a "correct way" of carrying on all our operations and all personnel follows the same procedure.

To date, all of our procedure of operation is covered in a series of fourteen bulletins of instructions. These are simple, readable and rememberable, and their need is self-evident. It isn't necessary to go into detail here about their exact contents; the subject titles which follow make them self-explanatory. The order of issuance was happenstance, but, as so frequently occurs in considering such an over-all plan, their order closely parallels their importance.

The first, third, fourth, ninth and tenth of these bulletins have a bearing on FCC regulations in keeping with our specific operational needs. Others deal with regulations in coöperation with the Board of War Communications, U. S. Office of Censorship, the New York City Air Warden Service, the Office of Civilian Defense, and our own WERS. Following is a brief description of the contents of each bulletin of instructions on operating procedure so far issued:

1) *Call letters on transmitters.* Discusses the FCC regulation concerning the correct display of station call letters.

2) *Serial numbers on WERS equipment.* Each operator-donating equipment is assigned a serial number, which number is attached to each piece of equipment he donates. All WERS equipment in New York City technically must be owned by the city, but the assignment and affixture of serial numbers insures return of the donated equipment to the doner at the end of the war.

3) *Operators' licenses.* Concerns the FCC regulation about WERS operator permits.

4) *Station licenses.* The station license contains confidential information. The original and all photocopies should be kept in a secure place, and not be made available to unauthorized persons.

5) *Headphone operation of fixed and portable units.* Delineates the necessity for New York City WERS units being equipped with certain equipment necessary to operation, particularly headphones in report centers to prevent annoyance to other civilian defense activities.

6) *Use of WERS call letters and operator numbers.* Describes correct methods of giving unit identifications and operator numbers. Each operator is assigned a number which is given as his personal identification on the air, in conjunction with complete station identification.

7) *Opening and closing of WERS testing periods.* Defines a standard opening and closing formula

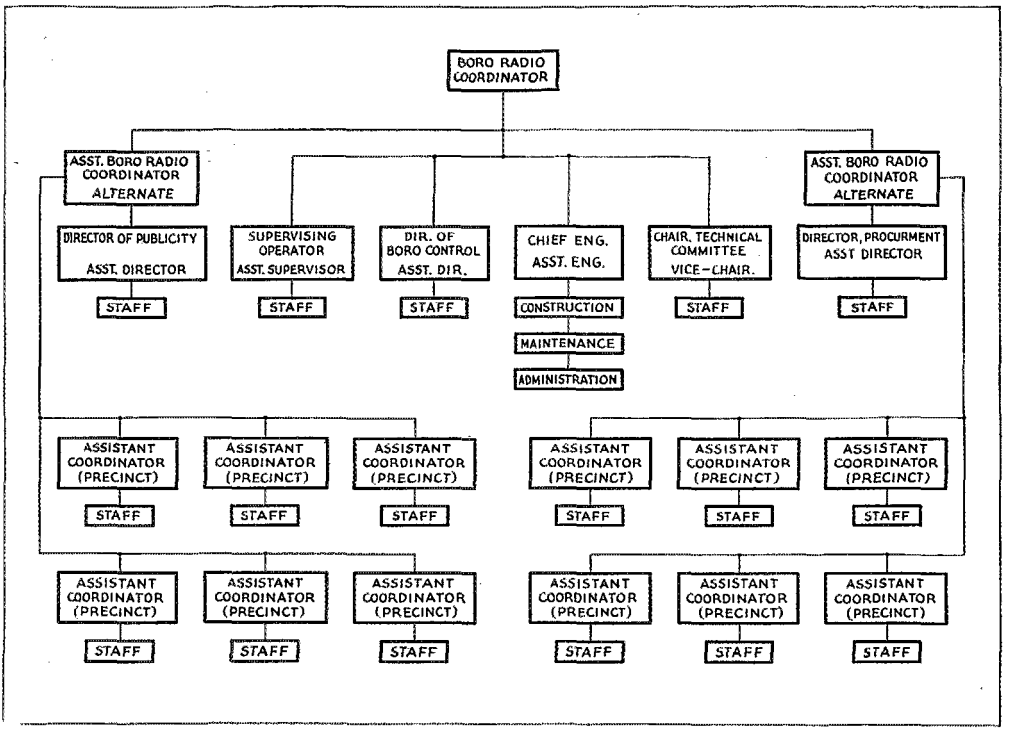


Fig. 2 — Borough personnel organization. Directing five borough coördinators is V. T. Kenney, W2BGO, radio aide.

of operation for all test periods, covering roll call, frequency announcement, station identification, correct time announcement, methods of reporting, etc.

8) *Subjects censored from WERS transmissions.* This procedure was issued in coöperation with the U. S. Office of Censorship, and covers subject material specifically censored insofar as WERS is concerned. General inclusions in these instructions will be readily self-evident.

9) *Station logs.* Instructions concerning the New York City WERS informational requirements of FCC regulations pertaining to logs. Log-sheet blanks conforming to FCC requirements are issued all New York City WERS station units, and all operators are held strictly accountable for turning completely made-out logs over to the radio aide at regular brief intervals.

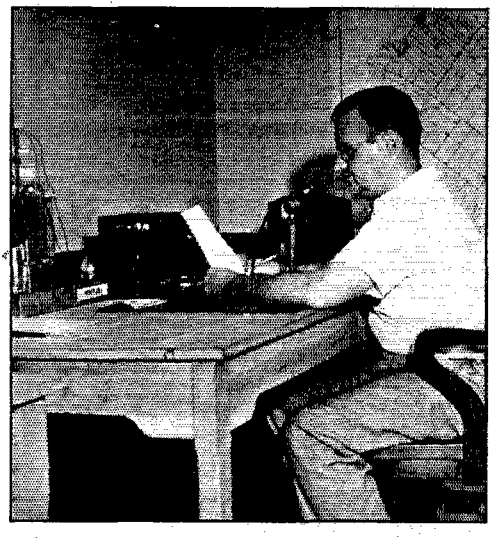
10) *Frequency measuring devices.* Concerns the necessity of frequency-measuring devices and the requirements of the FCC.

11) *Persons prohibited from entering premises containing WERS equipment or facilities.* Concerns the regulations of the BWC denying access to the premises on which WERS station units are located to unauthorized persons.

12) *Alerts.* Instructions regarding an operating formula for all New York City WERS units during alerts, including the use of code names. In New York all WERS units respond to all alerts, and no one knows until some time after the "all clear" whether the alert was test or real.

13) *Handling of express, incident and subsequent report messages.* Outlines specifically the method of handling express and incident reports and all other messages during alerts and the time requirements of all transmissions during alerts, as prescribed by the Army for such traffic.

14) *Mobilization of portable-mobile stations.* Gives the plan for mobilization of all portable-mobile units on each alert.



Even the photographer is a ham, Charles Churchill, W2JXB, operating at borough control unit WNYJ51.

In General

As has been indicated from time to time, it has been found best to amend the foregoing basic procedure. For example, an additional procedure bulletin is about to be issued concerning the use of dispatch maps. We have designed for each borough a quadrant map with supplemental precinct maps having the same quadrants. This will provide for the dispatching of a mobile or pack unit to any given point in the borough with an accuracy of within 100 feet. This is felt to be entirely adequate for our purpose, and represents something of an achievement when it is considered that Queens and Brooklyn Boroughs cover 118.6 and 80.95 square miles respectively.

Looking back over the New York City WERS set-up as here discussed, it will become apparent that, while at a glance it may seem complicated, careful consideration will demonstrate that such is not the case. The principal reasons for this are two:

1) The work to be performed is so apportioned that no one person has more than he can handle without hardship. In the event that any individual is unable to follow through, there is an alternate for the position who can immediately assume responsibility without burden.

2) A minimum of paper work is involved. Aside from the written material discussed in this article, it is necessary to keep only two formal records. These pertain to operators and equipment — records of licenses, equipment issued, etc. Two simple card file systems take care of these. Most of our inter-exchange is verbal, occurring at meetings or over the telephone and by operating experience as noted during test periods and alerts. A minimum of paper work and a maximum of personal contact is the most healthy plan for an organization such as ours in WERS.

Now, having an understanding of New York City WERS organization and operation, it is obvious that the over-all plan is adaptable to a community of any size. In reality, it is a plan of operation which could be applied as successfully in a community of 7000 people as for the 7,000,000 it is actually serving in New York City.

This WERS work must be approached with an open mind. We must forget many of our former habits, pleasures, likes and dislikes nurtured in the days of amateur radio. WERS is not play; it is hard work. It is not ham radio, nor is it commercial radio; it is emergency radio.

Emergency radio is practically a new field of communication, one vital to our country's defense in time of war. This is a very serious job we are doing. WERS presents new problems, and a challenge to the amateur fraternity the like of which has never been presented to us before. Are we responsible enough seriously to conduct a successful communications system under the wartime restrictions imposed upon us? Upon our successful meeting of this challenge will rest a very important part of the decision of what is to become of amateur radio after the war. We of New York City's WERS believe that we are making progress by returning in kind the gauntlet that has been thrown down to us.

U.S.A. CALLING!

MILITARY SERVICE

OPPORTUNITIES for service in uniform are the quietest this month we have yet experienced. The needs of the services, for men direct from civilian life, apparently have been pretty well filled. The Navy and the Marine Corps still offer a few opportunities for commission for graduates of accredited colleges, holding EE or physics degrees, as described in this column in recent months. George W. Bailey, League president, continues available to advise applicants uncertain as to their eligibility.

In the case of women, however, the story is different. While we understand the quota of the WACSCT has been filled, all of the women's auxiliaries are still actively recruiting and are providing splendid radio training for those who enlist for communications. Opportunities are particularly good for women with any amateur experience, and those who are college graduates will be in line for commissions. We suggest shopping around among your local recruiting offices for further data.

TECHNICIANS TO SCIENTISTS

THERE remains an urgent need for accomplished radio personnel in civilian capacities in work immediately associated with wartime radio developments. For an available person of almost any category of skill — a radio technician, or a radio engineer, or an electrical engineer or physicist — an interesting connection in all probability can be developed by corresponding with the president of the League, George W. Bailey, Technical Aide to the Director of the Office of Scientific Research & Development, 1530 P St., N. W., Washington 25, D. C. There will be the assurance that the work is both important and interesting, and the experience valuable, for whatever grade of work in radio one may be qualified for. Women possessing technical radio training are needed just as badly as men, and may find most interesting opportunities by writing to Mr. Bailey.

We are asked to call attention to a particular need for top-flight engineers and physicists capable of assuming technical leadership in wartime developments. Persons in this category, it is realized, unquestionably already possess good connections, but there may be some such who do not feel that their talents are being given full scope and that their work is of adequate importance for the country's hour of need. Such individuals are provided an opportunity for an entirely confidential mutual exploration of the possibilities of a more important connection by writing Mr. Bailey at the above address.

RADIO OPERATORS

THE need for brass-pounding radio operators continues unabated. The greatest need is for sea-going ops for our ever-increasing merchant marine. The U. S. Maritime Service maintains one of the finest schools for radiotelegraph operators in the world, where free training with pay is given candidates for this service. Licensed amateurs get through quicker, receiving only the additional training they need to make them perfect. See the article on Gallups Island in our May issue, particularly page 90. Further information can be obtained from the Maritime Service enrolling office nearest you, or by writing The Commandant, U. S. Maritime Service, Washington, D. C.

For service on land, many government agencies need radiotelegraph operators and this is particularly true of the FBI. These are Civil Service jobs, on which a vast quantity of information is obtainable from announcements available in the office of the Civil Service clerk at your local post office. For a particular opportunity in Civil Aeronautics, see the following article.

C.A.A. AIRCRAFT COMMUNICATORS

THE Aircraft Communicators of the Civil Aeronautics Administration provide airmen, and other persons concerned, with information vital to the safe operation of aircraft, by means of radiotelegraph, radiotelephone, teletype and interphone. They operate at airports, in contact with other ground stations and in communication with planes flying over the system. There is now a considerable need for additional personnel for this service and CAA is seeking applicants for the position of Trainee, Junior Aircraft Communicator. This is a Civil Service position with a salary of $1440 a year. There is a training course of approximately six months giving instruction not only in radiotelegraphy but in CAA procedures, meteorology for pilots, air navigation principles, equipment maintenance and radio and electrical theory. After training, a competent trainee is promoted to Aircraft Communicator, $1620 a year, with progressive opportunity upward to the grade of Chief Aircraft Communicator, $3200.

Applicants must be able to operate by touch with a typewriter at at least 40 w.p.m. or a teletypewriter at 35. There is a written aptitude test with questions on matters of general information and on code learning. Travel to training centers is at personal expense. Preference is given eligibles possessing an FCC operator license or who have completed a radio course at a resident school, or who hold a CAA pilot certificate. Applications from women are particularly sought.

Trainees first enter duty at stations located at or near regional headquarters of CAA at New York, Atlanta, Chicago, Fort Worth, Kansas City, Santa Monica and Seattle. In CAA Region I, New England and the Atlantic states to Virginia, the age limits are 21 to 32 and the training occurs at Flushing, N. Y. Interested individuals may secure information by writing to the CAA Regional Manager at New York City, or by seeing Civil Service Recruiting Circular 2R-1 at their post offices.

In other regions of the country, the age limits are 17 to 40 and one may address the nearest regional headquarters or see Civil Service Examination Specification 115 at the post office.

The Seattle training center is engaged in the interesting duty of training not only men but man-and-wife teams for Alaskan duty. Upon assignment to station duty in Alaska the salary becomes $2000 per annum plus 25 per cent differential and overtime. Transportation from Seattle to Alaska is at government expense. Those interested in Alaskan service should write the CAA Regional Manager at Seattle.

COMMERCIAL OPPORTUNITIES

THIS month our message is directed primarily toward the employer in need of radio personnel, instead of to the man looking for a radio position. For nearly two years the ARRL Personnel Bureau has been engaged in soliciting the registrations of experienced men and women, engineers, commercial operators, amateurs and service men, bringing employer and prospective employee together with mutually satisfactory results. Of course the League's only compensation has lain in the knowledge that it was aiding both the war effort and the individual.

The supply of competent radio personnel is shrinking but the completion of government-sponsored school programs releases some instructors from time to time, many of whom have excellent qualifications for positions in industry. Others now commercially employed are not working at their highest skills and are shopping for better berths.

To the employer, large or small, in need of radio engineers and technicians, we suggest he communicate his needs to the League's Personnel Bureau. The names and addresses of available men and women who can meet his requirements will be sent promptly — and the rest is up to him. As an alternative, we invite an employer's representative to visit League Headquarters and select likely looking candidates from our Personnel Bureau files. We offer our full coöperation.

Strays

Although supplies still are barely adequate, quartz crystals now are more plentiful as a result of discovery of new sources and improvements in processing. Quartz deposits have been discovered in Arkansas, California, North Carolina, Virginia and other areas, and thousands of pounds already have been brought to light. Scientists have also added effectively to the supply of quartz crystals by developing thinner saws for cutting the rocks, saving much of the crystal that went into dust. Means of cutting the crystals into thinner wafers also have been perfected, doing away with much wasteful grinding in the finishing process.

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The armed forces of this country and of our Allies now are making extensive use of quartz crystals sealed in conventional metal-tube envelopes. This type of housing assures complete freedom from moisture and atmospheric pressure changes.

CIRCULATION STATEMENT

PUBLISHER'S STATEMENT OF CIRCULATION AS GIVEN TO STANDARD RATE AND DATA SERVICE

This is to certify that the average circulation per issue of *QST* for the six months' period January 1st to and including June 30, 1943, was as follows:

Copies sold	47,722
Copies distributed free	560
Total	48,282

K. B. Warner, Business Manager
D. H. Houghton, Circulation Manager

Subscribed to and sworn before me
on this 3rd day of September, 1943
Alice V. Scanlan, Notary Public

U. S. War Bonds for Stories of War Service

***QST* wants reports on the experiences of radio hams in active service on the battle fronts — for immediate publication, 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 some amateur you know? Then sit right down and 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.

For the kind of material required, read the article "Hams in Combat," in August *QST*, p. 16. Please indicate clearly on the report if it is available for publication in its entirety, if names, dates or places should be deleted before publication, or if all information must be held confidential.

That's all there is to it — write us a letter relating your own war-service experience or the record of someone you know. If it is published, you'll receive your $25 War Bond in return.

Meet Mister *j*!

An Introduction to Complex Notation

BY EDWARD M. NOLL,* EX-W3FQJ

A MYSTERIOUS character to a large number of radio amateurs is Mr. *j*. He really is very simple and vulnerable, however, and mysterious only in the light of the ease with which he surmounts a difficult problem. All in all, to make the most of your career in radio it will pay rich dividends in time and understanding to become at ease with Mr. *j*. This article will serve to introduce the mechanics of the *j* operator and to discuss a few examples.

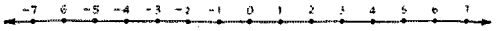


Fig. 1

First, a little background. All "real" numbers can be represented as points on a straight line, the positive numbers increasing indefinitely to the right of an arbitrary zero point and the negative numbers increasing indefinitely to the left. This is indicated in Fig. 1. Numbers whose values are intermediate to the integers can be represented by their positions on the line, following the principle used in constructing graphs. Now by ordinary algebra any negative number can be considered to be the product of two factors, one a positive number having the same absolute value (the value without regard to sign) as the number considered, the other being -1. For example, $-6 = (+6) \times (-1)$. From this viewpoint, the factor -1 is an *operator* which reverses the direction of the length of line representing the number, but does not affect its absolute value. Since $(-1) \times (-1) = +1$, two applications of the operator bring the line back to its original direction; this is simply a statement of the fact that multiplying a number by 1 does not change its value.

Now let us consider a means by which the change in direction might have been brought about. We could ignore this point, of course, and simply accept the fact that the length of line representing the number has one direction before application of the operator -1 and the reverse direction immediately afterward. But the introduction of a method by which the transition occurs can lead to useful results. Let us assume that, in reversing its direction, the line rotates in a plane about the zero point as a center, and that the direction of rotation is counterclockwise. Then the application of the operator -1 to the number 6 rotates the line through the path shown in Fig. 2 from the positive side to the negative side, and a second application of the operator causes a continuation of the rotation, in the same direction, from the negative side to the positive side. Hence, multiplication by -1 is equivalent to rotating the line through 180 degrees. Multiplying again by -1 gives a second 180-degree rotation, so that two successive multiplications by -1 are equivalent to a rotation of 360 degrees. Notice that each *multiplication* by the operator causes the *addition* of a 180-degree angle.

It is of interest to inquire by what process we could cause the line to assume a position at right angles to the original number line; that is, to halt after completing a rotation of 90 degrees from its original position. Two successive rotations of 90 degrees — or the addition of two 90-degree angles — is obviously the same as one rotation of 180 degrees. Since we obtained 180-degree rotation by multiplying by -1, and since, from the above, the addition of two equal angles is the same as two successive multiplications by a single operator, it becomes evident that the operator which causes a 90-degree rotation is some number which when multiplied by itself is equal to -1. In other words, the *square* of the new operator is equal to -1, hence the operator itself must be equal to $\sqrt{-1}$.

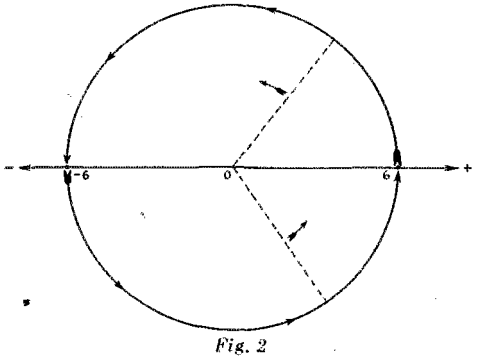


Fig. 2

Now a negative number has no "real" square root, because there is no number, positive or negative, which when multiplied by itself results in a negative number. This follows from the

Make the acquaintance of a mathematical road sign which directs numbers along proper paths. You won't be able to follow everything in this article unless you've had some previous experience with algebra and trigonometry, but if you've read the first chapter in the Defense Edition of the *Handbook* and the series on a.c. mathematics which ran in *QST* from February through August of this year, it should be plain sailing.

*117 S. Woodlawn Ave., Clifton Heights, Pa.

laws of algebra, which state that the multiplication of two negative numbers gives a positive product, and similarly for two positive numbers. Hence, a number such as $\sqrt{-1}$, or an even root of any negative number, has acquired the name "imaginary." But, by extending the field of numbers to include points in a plane instead of confining it to the real numbers, which are points on a line, a number such as $\sqrt{-1}$ acquires a meaning.

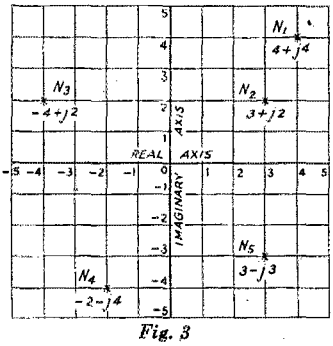


Fig. 3

The meaning is that the number lies along a line (or axis) at right angles to the axis of real numbers. Since any negative number can be factored into a positive number and -1, a number such as $\sqrt{-36}$ is equal to $\sqrt{36} \times (-1)$, which in turn is equal to $\sqrt{36} \times \sqrt{-1}$, or $\pm 6\sqrt{-1}$. Hence any imaginary number can be resolved into a real number multiplied by $\sqrt{-1}$, where $\sqrt{-1}$ is the operator indicating a rotation of 90 degrees in the counterclockwise direction. In mathematics it is customary to use the letter i to represent $\sqrt{-1}$, i standing for "imaginary unit." In electrical work, where the letter i usually represents current, the letter j is used instead.

Complex Notation

In the same way that a point in rectangular coördinates can be located by referring it to the X and Y axes, a number in a plane can be identified by separating it into real and imaginary components. Starting from the positive side of the real axis and successively applying the operator j, we have:

One application $= j = \sqrt{-1} =$ 90-degree rotation

Two applications $= j^2 = \sqrt{-1} \times \sqrt{-1} = -1$ = 180-degree rotation

Three applications $= j^3 = (j^2)j$ $= -1 \times \sqrt{-1} = -\sqrt{-1} =$ 270-degree rotation

Four applications $= j^4 = (j^2)^2 = (-1)^2$ $= 1 =$ 360-degree rotation

Thus, with the conventions adopted regarding direction of rotation and the directions of positive and negative numbers along the real axis, multiplying a number by j means that it lies along the vertical axis *above* the real axis, and multiplying by j^3 or its equivalent, $-j$, means that the number lies along the vertical axis *below* the real axis. The vertical axis is called the "imaginary axis." A number having both real and imaginary components is called a "complex number," and is expressed as the sum of the real and imaginary components. Examples of complex numbers and their representation as points in a plane are given in Fig. 3. The process of identifying the numbers is similar to that of identifying points in rectangular coördinates, but instead of specifying, for example, N_2 as being located at the point $x = 3$, $y = 2$, we simply write $N_2 = 3 + j2$. Using conventional x and y coördinates, the general expression $x + jy$ represents any complex number. The actual signs of the real and imaginary parts are determined by the quadrant in which the number lies, as shown in Fig. 4. Thus we have the following relationships between signs:

$x + jy =$ 1st quadrant
$-x + jy =$ 2nd quadrant
$-x - jy =$ 3rd quadrant
$x - jy =$ 4th quadrant

Complex notation can easily be related to the trigonometric functions used in alternating-current work. In Fig. 5, point P_1 has the coördinates x_1, y_1, and the line OP_1 makes an angle θ_1 with the X axis. By trigonometry, the projection of OP_1 on the X axis is equal to $OP_1 \cos \theta_1$, and the projection on the Y axis is equal to $OP_1 \sin \theta_1$. These projections determine the coördinates x_1, y_1, which, it is evident from the figure, are 3 and 4 respectively. In complex notation, $P_1 = 3 + j4$; and since $OP_1 \cos \theta_1 = 3$ and $OP_1 \sin \theta_1 = 4$, substitution gives

$$P_1 = OP_1 \cos \theta_1 + jOP_1 \sin \theta_1$$

By algebra, this can be factored to give

$$P_1 = OP_1 (\cos \theta_1 + j \sin \theta_1)$$

The length OP_1, which is called the *modulus* or absolute value of the number, can be found from the relationship between the sides of a right triangle:

$$OP_1 = \sqrt{x_1^2 + y_1^2};$$

In this example,

$$OP_1 = \sqrt{3^2 + 4^2} = \sqrt{25} = 5$$

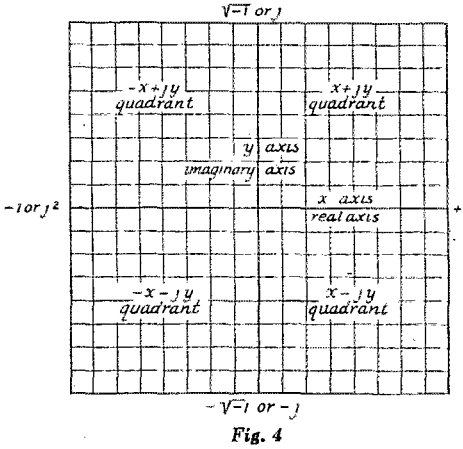


Fig. 4

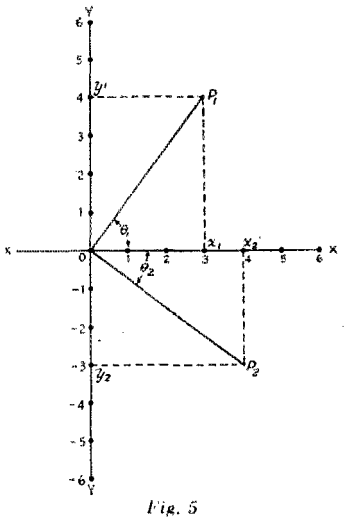


Fig. 5

Consequently,

$$P_1 = 5\ (\cos\theta_1 + j\sin\theta_1)$$

The factor $(\cos\theta_1 + j\sin\theta_1)$ evidently determines the position of a point whose distance from the origin is 5 units. The length of the line from the origin to the point is constant, hence the locus of the point, as θ is varied, is a circle with its center on the origin. We have here, then, a radius vector, and complex notation gives us a different — and convenient — way to describe it.

The point P_2 in Fig. 5, which has the same absolute value as P_1 (5 units), is described by the expression

$$P_2 = 5\ (\cos\theta_2 - j\sin\theta_2) = 4 - j3$$

It will be remembered that, in adding vectors, it is necessary to add the sine and cosine components separately, and then solve for the resultant. Thus, to add the vectors OP_1 and OP_2 we use the following procedures:

$$x = x_1 + x_2 = OP_1\cos\theta_1 + OP_2\cos\theta_2$$
$$= 3 + 4 = 7$$

$$y = y_1 + y_2 = OP_1\sin\theta_1 - OP_2\sin\theta_2$$
$$= 4 - 3 = 1$$

In using complex notation, we keep the number in its complex form and simply add the real and

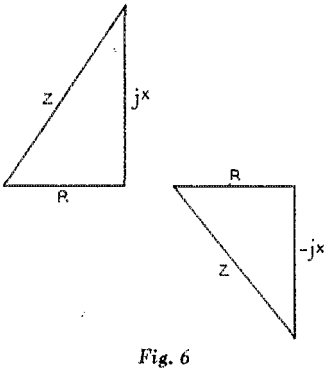


Fig. 6

imaginary parts separately:

$$P_1 = 3 + j4$$
$$P_2 = 4 - j3$$
$$P = \overline{7 + j1}$$

In both cases, the absolute value of the resultant vector would be found by the triangular rule:

$$OP = \sqrt{7^2 + 1^2} = \sqrt{50} = 7.07$$

The application to impedance problems is direct and simple. Using the resistance value as the base of the impedance triangle the value of inductive reactance is drawn at right angles upwards, as in Fig. 6, while the capacitive reactance is drawn at right angles downwards. In complex notation, the impedance in the first case is

$$Z = R + jX_L$$

and in the second

$$Z = R - jX_C$$

By keeping the impedances in this complex form, it is a simple matter to find the total complex impedance of any number of impedances in series, simply by adding the "real" (resistance) and "imaginary" (reactance) components separately. The same method may be applied to admittances in parallel circuits.

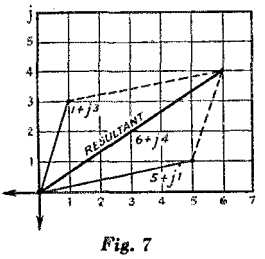


Fig. 7

Operations with Complex Numbers

In summary, the operations on complex numbers obey the laws of algebra except for the solution to $\sqrt{-1}$. Thus, as shown in Fig. 7, the algebraic and graphical solutions compare in the addition of the two complex numbers

$$(1 + j3) + (5 + j1)$$

Adding the reals and imaginaries, the solution is:

$$(1 + j3) + (5 + j1) = (1 + 5) + j(3 + 1)$$
$$= 6 + j4$$

which compares to the graphical solution. The reals and imaginaries always must be added or subtracted separately. The fundamental operations are shown below:

$$(a + jb) + (c + jd) = (a + c) + j(b + d)$$
$$(a + jb) - (c + jd) = (a - c) + j(b - d)$$
$$(a + jb)(c + jd) = ac + jbc + jad + j^2bd$$
$$= (ac - bd) + j(bc + ac)$$

in which $j^2 = -1$

It will be observed that these are the ordinary rules of algebra for addition, subtraction and multiplication. In the case of division, it is desirable to eliminate the j term in the divisor so

that the complex number can be divided by a real number only. This is done by setting up the required division in the form of a fraction and then multiplying both numerator and denominator by the *conjugate* of the divisor. The conjugate is the same complex number as the divisor, but with the sign of the j term changed. (The conjugate of $5 + j3$, for example, is $5 - j3$.) When a complex number is multiplied by its conjugate, the result is a real number equal to the sum of the squares of the real and imaginary terms. Thus,

$$(x + jy)(x - jy) = x^2 - jxy + jxy - j^2y^2,$$

and since $j^2 = -1$, this reduces to $x^2 + y^2$. Suppose, as an illustration, that $a + jb$ is to be divided by $c + jd$. Then

$$\frac{a + jb}{c + jd} \times \frac{c - jd}{c - jd} = \frac{ac + jbc - jad + bd}{c^2 + d^2}$$

$$= \frac{(ac + bd) + j(bc - ad)}{c^2 + d^2}$$

Example of Use

In the simple series circuit shown in Fig. 3-A the impedance is written in the form

$$Z = R_1 + jX_L = R_1 + j\omega L.$$

That is, the impedance is equal to the vector sum of the resistive component and the 90-degree out-of-phase inductive component. The impedance of the circuit of Fig. 3-B is written

$$Z = R_2 - jX_C = R_2 - \frac{j}{\omega C}$$

where the capacitive component is lagging the resistive component by 90 degrees. In figure 3-C we have the circuits in series, so that

$$Z = (R_1 + j\omega L) + \left((R_2 - \frac{j}{\omega C}\right)$$

or

$$Z = (R_1 + R_2) + j\left(\omega L - \frac{1}{\omega C}\right)$$

In figure 3-D we have the circuits of A and B in parallel, and by assigning values to the various components we can calculate the circuit impedance in ohms in the following manner:

Letting
$R_1 = 300$ ohms
$R_2 = 200$ ohms
$f = 4{,}000$ kc.
$L = 15.92$ μh.
$C = 132.7$ $\mu\mu$fd.

so that

$$\omega L = 400$$
$$\frac{1}{\omega C} = 300$$

The total impedance of the parallel circuit can be found by methods similar to those used for finding the total resistance of resistors in parallel, bearing in mind that in numerical calculations the *complex* values must be used. Thus, for two resistances in parallel we have the formula

$$R = \frac{R_1R_2}{R_1 + R_2},$$

and by analogy the impedance of a circuit having two parallel branches is

$$Z = \frac{Z_1Z_2}{Z_1 + Z_2}.$$

Hence, the total impedance, Z_T, of the circuit in Fig. 8-D is

$$Z_T = \frac{Z_1Z_2}{Z_1 + Z_2}$$

$$= \frac{(R_1 + j\omega L)\left(R_2 - \frac{j}{\omega C}\right)}{(R_1 + j\omega L) + \left(R_2 - \frac{j}{\omega c}\right)}$$

$$= \frac{(300 + j400)(200 - j300)}{(300 + j400) + (200 - j300)}$$

$$= \frac{(6 + j8 - j9 - j^212) \times 10^4)}{(300 + 200) + j(400 - 300)}$$

$$= \frac{(18 \times 10^4) - j10^4}{500 + j100} \times \frac{500 - j100}{500 - j100}$$

$$= \frac{(90 \times 10^6) - j(5 \times 10^5) - j(18 \times 10^6) + j^210^6}{(0.25 \times 10^6) + (0.01 \times 10^6)}$$

$$= \frac{89 - j23}{0.26} = 342.3 - j88.4$$

$$Z_T = \sqrt{(342.3)^2 + (88.4)^2} = 353.5 \text{ ohms}$$

Exponential Form

In the preceding calculation, the operations were carried out in rectangular coördinates. In order further to simplify our calculations we may use still another form of complex notation, the exponential form. This is a development of the polar coördinate form of vectors.

Polar coördinates, in which the coördinate

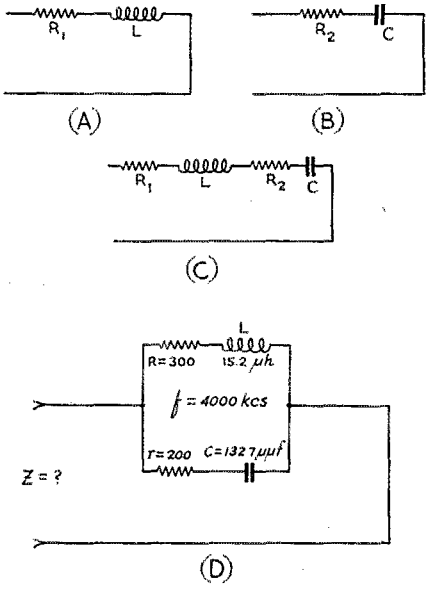


Fig. 8

lines are radial lines and concentric circles, are familiar from their application to antenna patterns. The position of a point in polar coördinates is specified in terms of its radial distance from the center or origin, and in terms of the angle which a radial line from the center to the point makes with a second radius selected as a reference. Fig. 9 represents a polar diagram in which the point P is a certain distance R from the origin, and the line OP or R makes an angle θ with the reference axis OX. The coördinates of P are (R, θ), frequently written $R \angle \theta$, where the sign $\angle$ indicates "angle."

Now in rectangular coördinates the point P is represented by the complex expression $x + jy$, as previously explained, and we have the further relation $R^2 = x^2 + y^2$. From trigonometry, the tangent of the angle θ is given by y/x, so that

$$\theta = \tan^{-1}\frac{y}{x}$$

With these relationships, and extensions of them, it becomes possible to transfer from one coördinate system to the other. The polar form is more convenient for multiplication and division.

It should be noted that the expression $R \angle \theta$ does not mean that R is to be multiplied by $\angle \theta$. To prevent confusion and to permit root and power operations on complex numbers, it is advisable to use a somewhat different method of expression. It was earlier pointed out that the rectangular coördinates of a point could be found from

$$P = R(\cos\theta + j\sin\theta)$$

where R is the modulus. The expression $R(\cos\theta + j\sin\theta)$ is the kind of expression we need for our purpose, but is cumbersome. However, it can be shown that

$$\cos\theta + j\sin\theta = e^{j\theta}$$

and

$$\cos\theta - j\sin\theta = e^{-j\theta}$$

where e is the base of the natural series of logarithms.

Hence

$$R(\cos\theta + j\sin\theta) = Re^{j\theta}$$

and

$$R(\cos\theta - j\sin\theta) = Re^{-j\theta}$$

These forms are very convenient for multiplication and division, since the exponents are handled in the ordinary way. The operations of multiplication, division, raising to a power, and extracting a root are illustrated by the following examples:

$$2e^{j60°} \times 4e^{j30°} = (2 \times 4)\, e^{j(60° + 30°)} = 8e^{j90°}$$

$$4e^{j40°} \div 2e^{-j20°} = 4/2(e^{j40°-(-j20°)}) = 2e^{j(40°+20°)} = 2e^{j60°}$$

$$(6e^{j40°})^2 = 6^2 e^{j40°\times 2} = 36e^{j80°}$$

$$\sqrt{36e^{j60°}} = \sqrt{36}\,\sqrt{e^{j60°}} = 6e^{60°/2} = 6e^{j30°}$$

A little study will show that these operations are identical with those of ordinary algebra where exponents are involved.

By utilizing the exponential form we can solve our parallel circuit problem by the following procedure:

$$Z_T = \frac{(R_1 + j\omega L)\left(R_2 - \frac{j}{\omega C}\right)}{(R_1 + j\omega L) + \left(R_2 - \frac{j}{\omega C}\right)}$$

$$Z_T = \frac{(300 + j400)(200 - j300)}{(300 + j400) + (200 - j300)}$$

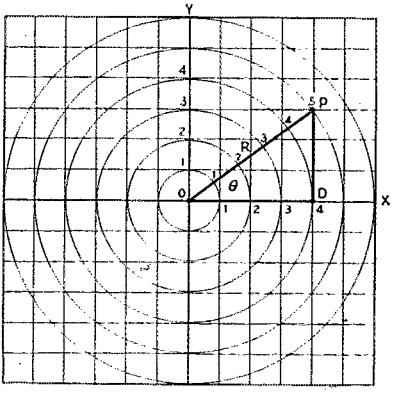


Fig. 9

To change $300 + j400$ to the exponential form we must find the modulus and the exponent. The modulus is equal to $\sqrt{x^2 + y^2}$, or $\sqrt{(300)^2 + (400)^2} = \sqrt{25 \times 10^4} = 500$. To find the exponent we must find the phase angle, which we know is given by $\tan^{-1}\frac{y}{x}$. Hence the angle is

$$\tan^{-1}\frac{400}{300} = \tan^{-1} 1.333$$

and

$$\theta = 53.1 \text{ degrees}$$

Consequently,

$$300 + j400 = 500e^{j53.1°}$$

By an identical method,

$$200 - j300 = 360.5e^{-j56.3°}$$

and

$$(300 + j400) + (200 - j300) = 500 + j100 = 510e^{j11.3°}$$

so that

$$Z_T = \frac{500e^{j53.1°} \times 360.5e^{-j56.3°}}{510e^{j11.3°}}$$

$$Z_T = \frac{500 \times 360.5e^{j[53.1°+(-56.3°)-11.3°]}}{510}$$

$$Z_T = 353.4e^{-j14.5°}$$

Since the exponent is negative the phase angle is negative, indicating capacitive reactance. The impedance consequently has a value of 353.4 ohms, with the current leading the voltage by an angle of 14.5°.

Complex notation offers an exact method of computing complex networks, as well as a relatively simple one once its principles are understood. It is used in most radio and communications textbooks, as well as in many technical articles in engineering publications.

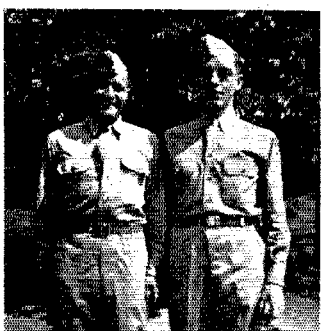
IN THE SERVICES

IN THIS month's ITS listing, we've included the YLs who have reported in to Headquarters. However, we're sure there must be many more in both civilian and military capacity who haven't told us of their whereabouts as yet. Let's have a better YL showing in the roster — and how about some snapshots, too?

...—

Occasionally, licensed amateurs in the service are assigned non-radio duties in which their past technical education and experience find no useful outlet. If you are one of these and believe it will be of benefit to the service if you are assigned to radio duties, write us details of your education and radio experience, licenses held, present duties, military serial number, and the date you entered the service.

We've been instrumental in securing transfers for many of the gang who have found themselves in such a position. Your request must receive favorable endorsement by your CO first, however, so save time all around and get his blessing before writing us.



A local Hartford OM joins a second-district ham for this snapshot — Dominick Duva, W1NEA, left, and Robert Schill, W2NLD, right. Both were aviation cadets at Niagara University when this picture was taken, but have since transferred to Nashville for further instruction before receiving their commissions.

ARMY—AIR FORCE

LT. CAMPBELL, W4GKU, instructor at Maxwell Field, writes in to tell us of an amusing incident which occurred while he was taking the roll. It seems he asked A/C Smiddy, W9OAP, what his QRA was, and when Smiddy replied, "Hammond, Indiana," another cadet immediately piped up, "I've worked you, mister." There must have been quite a ragchew when that class was over!

1AEA, Russell, Sgt., Craig Fld., Ala.
1AHN, Osgood, Lt., Orlando, Fla.
1CBB, Dubois, Lt., Presque Isle, Me.
1DDB, Macomber, A/C, Maxwell Fld., Ala.
1HDJ, Small, Sgt., Sioux Falls, S. D.
1LRA, Bosworth, Sgt., Sioux Falls, S. D.
1MET, Tierney, 2nd Lt., Bowman Field, Ky.
2EXR, Hansen, Pfc., Sioux Falls, S. D.
2KGL, Hill, Lt., Minneapolis, Minn.
2KQJ, French, Pfc., Scott Field, Ill.
2NCY, Spillner, Lt., Scott Field, Ill.
2NXV, Bowen, A/C, Oklahoma City, Okla.
2OND, Lamprecht, Pvt., Mitchell Fld., N. Y.
3CBT, Cowan, Lt., address unknown
3FOT, Schafer, 2nd Lt., Yale University
3IHB, Seibel, 2nd Lt., Westover Fld., Mass.
3JOS, Gillen, Pfc., Presque Isle, Me.
4AHQ, Story, Pvt., Patterson Fld., Ohio
4DDF, Dortch, Pvt., Westover Fld., Mass.
4DSK, Bates, Lt., address unknown
4HCY, Hinds, Pfc., Memphis, Tenn.
K5AD, Melot, S/Sgt., address unknown
5BYF, Lynn, 2nd Lt., Pecos, Tex.
5GRN, Bradshaw, S/Sgt., Kelly Fld., Tex.
5GTS, Katzer, A/C, Chicago Ill.
ex-5HJO, Taylor, T/Sgt., March Fld., Cal.
5IGW, Day, 2nd Lt., address unknown
5JQN, Crawford, Sgt., Majors Fld., Tex.
5KDO, Benham, Lt., address unknown
ex-6CJZ, Blanco, Lt., Asheville, N. C.
6IZV, Bartholomeaux, M/Sgt., San Antonio
6KTI, Martin, Pvt., Jefferson Bks., Mo.
6MQP, Dowell, Lt., Pecos, Tex.
6MWK, Spaulding, Capt., Philadelphia, Pa.
6MWY, Lundquist, Lt., Pecos, Tex.
6OJB, Sturtevant, Lt., Boca Raton Fld., Fla.
6PHA, Furst, Lt., Maxwell Field, Ala.
6RFG, Henderson, Cpl., Kansas City, Mo.
6RMH, Leto, F., Pfc., Scott Field, Ill.
6RMI, Leto, A., Pfc., Scott Field, Ill.
6RMQ, Tully, Pfc., Scott Field, Ill.
6SMC, Gaffey, 2nd Lt., Barksdale Fld., La.
6TJN, Wells, Pvt., address unknown
K7CNF, Howard, Maj., Asheville, N. C.
7GKA, Eldridge, Lt., Madison, Wis.
7GMV, Lida, aviation student, State College, Pa.
7IPE, Beason, Pvt., Jefferson Bks., Mo.
7JDD, Spender, 2nd Lt., Luke Fld., Ariz.
8IYJ, Pindroh, Sgt., Sioux Falls, S. D.
8JEL, Deeken, Lt., Boca Raton, Fla.
ex-8KPG, Ray, Pfc., Sioux Falls, S. D.
8KWN, Burgess, 2nd Lt., San Antonio, Tex.
8PNK, Southern, Lt., Tuskegee, Ala.
9AFN, Lovegren, Pvt., Selfridge Fld., Mich.
9CRE, Brown, Sgt., Rosecrans Fld., Mo.
9DIK, Hahn, Pvt./Spec., Chico, Cal.
9DLH, Matheny, Lt., address unknown
9EDS, Rousar, Lt., Scott Field, Ill.
9FMX, Williamson, Pfc., Scott Fld., Ill.
9KPJ, Lathrop, Lt., Ft. Worth, Tex.
9MEU, Quint, Cpl., foreign duty
9QLA, Passen, A/C, Santa Ana, Cal.
9TRT, Thompson, Pvt., Amarillo, Tex.
9UVS, Paulsen, Pfc., Sioux Falls, S. D.
9VIV, Clawuhn, 2nd Lt., foreign duty
9WNI, Kehborn, 2nd Lt., address unknown

Operator's license only:

Engberg, Capt., address unknown
Fayman, A/C, Logan, Utah
Gerrish, Pfc., Scott Field, Ill.
Johnson, Cpl., Alamogrado, N. M.
Kevra, Avn. Student, Kutztown, Pa.
Miller, Pfc., address unknown
Robertson, T/Sgt., foreign duty

MARINE CORPS

IN RESPONSE to our call for more Marine Corps AWSRs, we received a grand letter from the father of W4FIJ giving details of his son's service. This should be a good example for other parents to come forward and tell us of their sons who are hams as well as Marines.

1CGY, Paige, Camp Elliott, Cal.
1GFW, Rudenauer, Lt., foreign duty
2FED, Coleman, Lt., address unknown
3HKU, Lynch, Pvt., Grove City, Pa.
3JAA, Spandorfer, Pvt., Durham, N. C.
3JBS, Markowitz, Pvt., Logan, Utah
3JCE, Morris, Maj., foreign duty
3JPL, Kozak, Lt., Washington, D. C.
4DPN, O'Cain, T/Sgt., foreign duty
4FIJ, Kapp, Lt., Nashville, Tenn.
5JOO, White, S/Sgt., address unknown
6EOM, Rogers, 2nd Lt., address unknown
6FHQ, Harris, S/Sgt., Cherry Point, N. C.
8KKR, Hipkens, 2nd Lt., San Diego, Cal.
9DNM, Rathbun, Pvt., Notre Dame, Ind.
9ILQ, Crimp, Pvt., Evanston, Ill.
9JFF, Wagstaff, Pvt., Logan, Utah
9OCD, Burnett, Pvt., Lafayette, Ind.
9SHO, Christopherson, T/Sgt., San Diego

Operator's license only:

Graf, Pvt., Logan, Utah
Johnson, Sgt., foreign duty
McNett, Pvt., San Diego, Cal.
Parsons, Sgt., New River, N. C.

ARMY—GENERAL

THE other day we heard of a new non-DX QSO. One ham, employed in a metal-working shop, heard a cheery CQ being sent on a grinder by a fellow worker. Even though we're off the air, hams will always find a way to keep up contacts!

1GCM, Caffery, Pvt., Camp Haan, Cal.
1LYD, LaFont, Sgt., Camp Campbell, Ky.
1NDC, Ward, T/5, Fort Adams, R. I.
2CFW, Peterson, Pfc., Ft. Jackson, S. C.
ex-2EJW, Fellerman, Pvt., Ft. Jackson, S. C.
2MAM, Merenda, T/5, Fort Worden, Wash.
3BSR, Stanton, T/5, Washington, D. C.
3FWF, Young, Lt., Baltimore, Md.
3GWZ, Meyers, Pvt., Ft. Knox, Ky.
3HFW, Sulser, T/5, State College, Pa.
3IMI, Goldman, Pvt., Ft. Leonard Wood, Mo.

3IRO, Stevenson, Pvt., address unknown
4EMT, Poole, Lt. Col., Camp Croft, S. C.
4GYH, Minturn, 2nd Lt., Long Branch, N. J.
4HPE, Gordon, Capt., Camp Bowie, Tex.
5IJA, Williams, Pvt., Sheppard Fld., Tex.
5JAT, Cresap, Cadet, Iowa City, Iowa
5KHL, Garver, T/4, New Orleans, La.
6HYZ, Rees, Capt., Camp Hood, Tex.
ex-6IFB, Shubin, Sgt., foreign duty
6LXC, Brock, S/Sgt., foreign duty
6QVB, Nelson, Pvt., address unknown
6SGA, Mayeda, Pvt., Camp Shelby, Miss.
6SKW, Huntington, Cadet, Orono, Me.
K6TYI, Nakamura, Camp Shelby, Miss.
K6UFO, Carl, T/4, foreign duty
7FJE, Hill, S/Sgt., foreign duty
K7FOS, Gaffney, S/Sgt., foreign duty
7FZR, Lindley, M/Sgt., foreign duty
7GHZ, Quinn, S/Sgt., Minneapolis, Minn.
8ESN, Kemberling, Capt., address unknown
8MTE, Hansen, M/Sgt., foreign duty
8PPQ, Fleishman, Lt., foreign duty
8TKA, Jorek, Sgt., Mississippi
8UYN, Zimmerman, M/Sgt., foreign duty
8VBS, McFarlan, Pvt., Camp Wheeler, Ga.
8VEH, Conklin, Pvt., Ft. Bragg, N. C.
8VLC, Kevra, Pfc., Lincoln, Nebr.
9ABN, Wilson, Sgt., foreign duty
9BFH, Herbert, Pvt., Atlanta, Ga.
ex-9CKR, Anderson, Cpl., foreign duty
9DLN, Slack, Pvt., address unknown
9HCE, Herron, Cpl., Trinidad, Colo.
9JVX, Graham, Pvt., Ft. Knox, Ky.
9LTC, Berndtson, Cpl., Ft. Logan, Ohio
9MUA, Wee, Pfc., Pine Camp, N. Y.
9TFC, Stormon, W/O (jg), foreign duty
9UFQ, Nininger, Sgt., foreign duty
9UUH, Rees, Sgt., foreign duty
9VGZ, Colvin, Pvt., Ft. Bliss, Tex.
9WQH, Ingels, T/4, foreign duty
9YSI, Hoffman, S/Sgt., Camp Haan, Cal.

Operator's license only:

Bailey, Pvt., Ft. Riley, Kan.
Berger, Pvt., Camp Roberts, Cal.
Boyle, Pvt., Ripon, Wis.
Chambers, M/Sgt., foreign duty
Evans, Pfc., address unknown
Fisher, T/4, address unknown
Ford, T/3, address unknown
Isaacs, Pvt., Ft. Knox, Ky.
Jugenheimer, Pfc., Ft. George Meade, Md.
Lesage, Pvt., Ft. Knox, Ky.
Lowish, Pvt., Camp Bowie, Tex.
Mack, Pvt., Fordham University, N. Y.
Neville, Pvt., Fort Adams, R. I.
O'Donnell, Pvt., Columbia, Mo.
Smith, Pfc., Camp Breckenridge, Ky.
Van Winkle, Pvt., Ft. Knox, Ky.

NAVY—FOREIGN OR SEA DUTY

ARM1c RIGGS, W7HAD, really is in the groove! He built up a record player with the aid of an article in *QST*, and says, "We make our own recordings now and also have the best in hep-cattin' music."

1DDK, Salloom, RM1c; 1LDV, Gooding, RM2c; 1NNI, Prinsen, RM; 2HYK, Melanson, Ens.; 2JHK, Lewis, RM1c; 2LCM, Moffat, Lt.; 2LMR, Abeles, RM3c; 3FYK, Werner, RM1c; 3GEV, Armstrong, EM1c; ex-3HIP, Kramer, EM1c; 3JML, Kwapien, CRM; ex-3OA, Stein, CRM; 4BZA, Thomas; 4CUR, Meredith, RT1c; 4GBA, Krape, ART2c; 5BZH, Compton, CM2c; 6AGW, Owen, RM3c; 6CP, Rawson, ACRM; 6EMX, Hudson, RT1c; 6HID, Cotchefer, Lt. Comdr.; K6IQN, Spare, Lt. Comdr.; 6NJK, Dixon, RM2c; K6NSD, Johnson, CRM; 6OBC, Trumbo, Lt. (jg); K7IQJ, McLaughlin, ARM1c; 6SGL, Collett, RM1c; 6TJY, Sowman, CRM; K6UHL, Warren, Lt.; 6UKM, Hall, RM2c; 7KX, Parrott, Cmdr.; 8NSE, Ross, CRT; 8RHM, Jones, RM1c; 8UIL, Hughes, ARM1c; 8UIY, Baker, Lt.; 8VNN, Damm, RM3c; 9APU, Berent, RM1c; 9IQM, Weber, RM1c; 9IYP, Larimer, Lt.; 9LSF, Petersen, RT2c; 9OSZ, Fischer, ARM2c; 9PIN, Murtberg, RT1c; 9SYC, Heckert, Lt. Comdr.; 9VLG, Berent, RM2c.

ARMY—SIGNAL CORPS

QST takes a bow after receiving a letter from Lt. Col. Hertzberg, now on foreign duty. W2DJJ says: "After walking three blocks from the railroad station of a tiny British town and snooping idly through an olde book shoppe, what did I find but a shiny copy of the July, 1943, *QST*. It sure looked good, and I read it through five times in one evening."

1GKX, MacNeill, Sgt., address unknown
1KDB, Mroczskowski, Sgt., address unknown
1LRL, Armstrong, Sgt., address unknown
1NBN, Carleton, Lt., Indianapolis,, Ind.
1NFP, Manna, Pfc., Ft. Monmouth, N. J.
ex-2ABZ, Regan, Keyport, N. J.
2GOB, Davidson, Ft. Monmouth, N. J.
2HLS, Till, T/Sgt., Military Res., Va.
2HUQ, Grady, Cpl., Half Moon Bay, Cal.
2KPE, Katz, Cpl., Fresno, Cal.
2KSS, Kieser, Lt., foreign duty
2LFE, Kayhart, 2nd Lt., Cambridge, Mass.
2LHY, Schnetzer, T/5, Ft. Monmouth
2LOP, Cooke, Pvt., Camp Toccoa, Ga.
2MTX, Samuels, Sgt., foreign duty
2OFP, Rodin, Pvt., Camp Crowder, Mo.
3AG, Hunton, address unknown
3GOZ, Reynolds, Lt., Cambridge, Mass.
3ICA, Schaff, T/5, Ft. Monmouth, N. J.
3IHU, Kensinger, T/Sgt., foreign duty
4FLC, Tsumas, T/4, foreign duty
4HUU, Levine, Lt., foreign duty
4IDI, Talley, Pvt., Camp Ellis, Ill.
5JBL, Mathews, T/5, Davis, Cal.
5KER, Stith, Lt., foreign duty
6GVU, Elser, Lt. Col., foreign duty
6KAV, Bull, 2nd Lt., address unknown
6MPA, Mogida, 2nd Lt., Brookley Fld., Ala.
6ROD, Frederickson, Capt., foreign duty
6TYX, Dolan, Pvt., Davis, Cal.
7AAX, Dillow, Maj., Sacramento, Cal.
7ELW, Peterson, T/5, foreign duty
7GTD, Cole, Maj., foreign duty
7HAN, Donaldson, Pfc., foreign duty
7INX, Matsen, T/Sgt., Robins Fld., Ga.
8ANA, Muscari, Lt., Ft. Monmouth, N. J.
ex-8BFI, Reuman, S/Sgt., Camp Murphy
8KJP, Schneider, T/5, Ft. Monmouth, N. J.
8KRS, Balmer, Lt., foreign duty
8NPK, Apple, Cpl., Camp Sill, Okla.
8PZE, Norris, Lt., Washington, D. C.
8RMS, Clark, 2nd Lt., address unknown
8RZG, Miller, Pvt., address unknown
8SZC, Ebersole, 2nd Lt., Carrabelle, Fla.
8TQO, Malinowski, Pvt., Camp Crowder, Mo.
8TWQ, Walter, address unknown
8UHP, Baur, address unknown
8UQW, Kaczmarczyk, Pvt., Columbia, S. C.
8VOI, Haynes, Pvt., Half Moon Bay, Cal.
9BMW, Knoll, Lt., Dayton, Ohio
9CZB, Sweeny, 2nd Lt., foreign duty
9GAZ, Stodden, M/Sgt., Camp Adair, Ore.
9IZJ, Eaton, Sgt., foreign duty
9LCT, Kirby, T/5, Lexington, Ky.
9MHB, Mills, Lt., foreign duty
9NMH, Creutz, Cpl., Camp Crowder, Mo.
9PLD, Graham, T/4, foreign duty
9POU, Fesenmeyer, Madison, Wis.
9TGO, Price, Cpl., foreign duty
9TWO, Rufing, Pvt., Camp Crowder, Mo.
9URM, Austin, Pvt., Camp McCoy, Wis.
9VZM, Neudecker, Lt., foreign duty
9WRB, Limberg, Lt., Atlanta, Ga.
9YXY, Johnson, Pvt., Ft. Snelling, Minn.
9ZEM, Toberman, Pfc., Camp Murphy, Fla.

These five patriotic hams have just completed a pre-radio course at one of the midwestern schools. Before separating to take advance training in various parts of the country, they got together and had this snapshot made. *L. to r.* — RT2c Hamlin, W1MCA; RT2c Geisler, 2WKEY; RT2c Miller, W8WBT; RT2c Blum, W2MY; RT2c Russell, W8UIZ.

G. C. Bartoo, W3JAO, of Hyattsville, Md., was a cadet at the Coast Guard Academy at New London at the time this picture was taken. We haven't heard from Glenn lately, but wherever he is we're sure he's giving a good account of himself.

Operator's license only:

Engstrom, Pvt., Camp Crowder, Mo.
Feldman, Cpl., Cincinnati, Ohio
Secondari, T/5, Ft. Monmouth, N. J.
Simon, T/5, Camp Crowder, Mo.
Sinuk, T/5, Ft. Monmouth, N. J.

WAC

8UCW, Koch, Cpl., Hollidaysburg, Pa.

WAVES

1NRB, Bucknam, Ens., Norfolk, Va.
6PCO, Rumrill, Ens., Washington, D. C.
8UCY, Conrad, Ens., Norfolk, Va.

COAST GUARD

JUST to start something, RM1c Voodre, W8MUR, nominates himself as the oldest ham in service — having been past 51 when he enlisted on October 28, 1942. Any takers?

1DWG, Schermerhorn, AS, Manhattan Beach
1MJS, Bowen, RM1c, Groton, Conn.
2DCA, Aherne, CRM, Miami, Fla.
2ILE, Beecher, RM1c, Florida
ex-3GQV, Twiford, RT1c, Norfolk, Va.
3HRA, Treat, Asst. Surgeon, Ft. Trumbull, Conn.
3JAN, Britton, RM1c, Port Angeles, Wash.
4AXY, Murphy, RT1c, Miami, Fla.
4FNR, Adams, AS, address unknown
6FKL, Souza, RT1c, San Francisco, Cal.
ex-6RFK, Roughton, RM1c, foreign duty
7GOW, Alcorn, Ens., Nelscott, Ore.
8AXE, Dygert, Ens., address unknown
8UJJ, McMillan, Coxswain, foreign duty
9DJG, Jansen, address unknown
9TZY, Scovell, S1c, foreign duty

Operator's license only:

Widmann, ASR, Brooklyn, N. Y.

NAVY—GENERAL

ONE ham sends us a fine list of amateurs in his branch, and says: "Keep up the good work on *QST* while the hams make the JIGs sign QRT."

1KVP, Randall, address unknown
1LU, Allen, Lt., New York, N. Y.
1MHD, Jones, RM1c, address unknown
1ND, McGaughey, address unknown
2DZR, Grelck, Ens., Princeton, N. J.
2FKL, Nole, CRM, Port Blakely, Wash.
2JNU, Cravitz, S2c, Sampson, N. Y.
2LSG, Knowles, AS, Ithaca, N. Y.
2LPD, Laster, Ens., New York, N. Y.
2MQS, Howard, Photo. Mate 1c, Indian Head, Md.
3CYQ, Hopwood, Lt. (jg), Lauderdale, Fla.
3GYW, Loucks, Lt. Comdr., Washington, D. C.
3HAT, Seehler, ARM1c, Quonset Pt., R. I.
3IJQ, Ruehl, Lt. (jg), Cambridge, Mass.
3JLX, MaCarthy, Lt. (jg), address unknown
3JMB, Wilson, Lt. Comdr., Washington, D. C.
4FXM, Caesar, RM1c, Richmond, Fla.
4GFB, Malone, RE, address unknown
4GQW, Hall, RM2c, Norfolk, Va.
4HIJ, Cook, CM2c, Duncan, Miss.
5JZE, Cresap, ARM1c, San Diego, Cal.
6JHU, Bates, A/S, Hiram, Ohio
6PRC, Holk, Lt. (jg), Cambridge, Mass.
6RKP, Chavarria, RM2c, Treasure Is., Cal.
6SVT, Woodcock, W/O, Corpus Christi, Tex.
6TIX, Hill, Lt. (jg), San Diego, Cal.
7ERA, Manning, RM2c, New York, N. Y.
7IOZ, Kopra, S1c, Logan, Utah
7JBE, Brown, S1c, Logan, Utah
8ELO, Lorentz, Lt., Morehead City, N. C.
ex-8GPF, White, RE, Arlington, Va.
8TIT, Anderson, A/S, Great Lakes, Ill.
8TRV, Nye, address unknown
8TSS, MacPherson, RM3c, Brooklyn, N. Y.
8UCB, Fox, Lt. Comdr., Annapolis, Md.
8VGY, Roberts, A/S, Cleveland, Ohio
8VWV, Gibson, RM1c, address unknown
9AEJ, Skinker, S1c, Stillwater, Okla.
9BLS, MacMillan, A/S, Middletown, Conn.
9DXY, Quinby, Lt. Comdr. Lincoln, Nebr.
9EHT, Kirts, A/S, Great Lakes, Ill.
9FFP, Smith, A/S, Evanston, Ill.
9GFF, Frohardt, A/S, Great Lakes, Ill.
9GPA, Thompson, A/S, Louisville, Ky.
9NDM, Shell, Lt., Norman, Okla.
9NWM, Winslow, A/S, Appleton, Wis.
9OLX, Olson, Ens., Lincoln, Nebr.
9POD, Weber, Ens., Washington, D. C.

Operator's license only:

Allen, Candidate, Lafayette, Ind.
Aseltine, A/S, Berkeley, Cal.
Augustyn, S2c, address unknown

Here's a fine representative of a radio-minded family — Pvt. D. J. O'Connor, W8UVQ, of the Signal Corps. He is now learning to copy code GI-style at Camp Kohler, Calif., having been transferred from the Coast Artillery by virtue of a ham ticket and ARRL. W8UVQ got his ticket at the age of 16. His YL sister is W8WRH and his brother is W8SOZ.

A 'phone ham now pounding brass for Uncle Sam, Pfc. E. J. Sedik, W9NRN, better known as "Chink," when last heard from was finishing up his training with a bombardier group of the AAF. His keying even now may be piercing the ether over some hot spot in the battle zones!

Briemer, A/S, Sampson, N. Y.
Craig, A/S, Urbana, Ill.
Eggert, A/S, Boulder, Colo.
Ferraino, RM2c, Green Cove Springs, Fla.
Harrison, A/S, Farragut, Idaho
Holt, S2c, Moscow, Idaho
Hooker, S2c, Williamsburg, Va.
Jones, A/S, Urbana, Ill.
McCuistion, A/S, Ruston, La.
McKelvey, A/S, Ames, Iowa
Reynolds, A/S, Hoboken, N. J.
Rutishauser, A/S, Pasadena, Cal.

MERCHANT MARINE AND MARITIME SERVICE

W. V. LANDA, W5HNH, Chief Radio Officer, dispatches a message to us in which he says: "The merchant seaman always was a pretty unassuming fellow, even to getting accustomed to being called 'Radio Officer' instead of the 'Sparks' of former days. However, it would be nice to see more names of hams in this outfit who now help keep them sailing." We second this idea unanimously!

1IFV, Hansen; 1JTI, Tallman; 1LCA, Dunham; 1LYF, Gels; 1MKL, Peduto; 1MPT, Doherty; 1NBQ, Doak; 1QQ, Boocock; 2DGM, Johnson; 2GRZ, Heineken; 2HNJ, Erhardt; 2JAU, Bjornsen; 2LPQ, Laster; 2MPI, Borglum; 2MRY, Gillen; 2NJO, Warner; 2OGO, Schellhorn; 3GBK, Maples; 3HPO, Kost; 3IFU, Stumpo; 3JHS, Barnes; 4BRB, Sykes; 4HAC, Waldrop; 4HHK, Wilson; 5EIZ, Taylor; 6GES, Johanson; ex-6LHS, Diehl; 6OMX Churchon; K6RYR, Choi; 6RZI, Grill; 6SHL, Howell; 6TMQ, Gray; 7GBL, Sterling; 7JCC, Brockway; 7FH, Johnson; 8RGL, Schenck; 8SXD, Garcia; 8TFX, McQueen; 8TWP, Wallander; 8TYX, Hunter; 8VDF, Breynak; 8VSP, Hickman; 9DEJ, Gibson; ex-9EOP, Smay; 9FSI, Teegarden; 9GZZ, Quinn; 9ITH, Meyer; 9JPY, Heffernan; 9PBW, Lee; 9PVC, Kleven; 9VQE, Bellman; 9YMV, Waggoner; and Birge, Derapelian, Edall, Fells, Gamburg, Hartwick, Hollisian, Kelsey and Rampy with operator's license only.

CIVIL SERVICE

1BHK, Ortelt, FCC, radio operator
1ENW, Moriarty, SC, Ft. Monmouth
1GGH, Paulsen, Signal Labs, Ft. Hancock
1GRF, Munzer, SC Labs, Ft. Monmouth
1IPL, Mix, Navy Dept., foreign duty
1KUY, Mould, technician, foreign duty
1LTC, Nobrega, Philadelphia Signal Depot
1MAQ, Pigeon, Philadelphia Signal Depot
2AOB, Nuremberg, SC, Ft. Monmouth
2CCX, Moscovice, Philadelphia Signal Depot
2ERH, McHenry, Lexington Signal Depot
2FOB, Mirani, radio engineer
2FTI, Morse, Signal Labs, Ft. Hancock
2HOW, Pomerantz, SC, Ft. Monmouth
2HXO, Mogensen, Signal Labs, Ft. Hancock
2ISE, McCarthy, Philadelphia Signal Depot
2JVV, Noyes, SC, Ft. Monmouth
2KFG, O'Brien, SC, Ft. Monmouth
2KTD, Nicholas, SC, Ft. Monmouth
2LFR, Perry, radio work, Scott Field, Ill.
2LIR, Moore, SC, Ft. Monmouth
2LNP, Popkin, SC, Ft. Monmouth
2LZK, Pater, radio instr., Flushing, N. Y.
2MTD, McCann, SC, Ft. Monmouth
2OBD, Moreira, inspector, Evanston, Ill.
2OCC, Marshall, SC, Ft. Monmouth
2OFA, Ohlstein, SC Labs, Ft. Hancock
2OOC, Pope, SC Labs, Belmar, N. J.
3EIS, McClenon, NRL, Bellevue, D. C.
3EMM, Priest, radio work, foreign duty
3ESO, Oertel, NRL, Bellevue, D. C.
3FNG, Melton, NRL, Bellevue, D. C.
3FQB, Montgomery, NRL, Bellevue
3FYJ, Price, NRL, Bellevue, D. C.
3HCZ, Page, NRL, Bellevue, D. C.
3HUD, McCabe, NRL, Bellevue, D. C.
3HYS, McCoy, NRL, Bellevue, D. C.
3IKK, McVay, NRL, Bellevue, D. C.
3JME, Mengle, NRL, Bellevue, D. C.
4BCZ, McMasters, SC, Tallahassee, Fla.
4CCM, Shinn, CAA, op. in charge, Albany, Ga.
4DMZ, Pope, SC Labs, Ft. Monmouth
4EHU, Wiggins, USNAS, Jacksonville, Fla.
4ERM, Towns, Lexington Signal Depot
4EVK, McCrory, AAF, ARM, El Paso, Tex.
4EX, Wofford, FCC, Washington, D. C.
4FHJ, Moore, Signal Labs, Ft. Hancock
4FJI, Strain, FCC, radio technician
4HAD, Villareal, SC, foreign duty
4HJO, McLendon, FCC, asst. mon. officer
4HUL, Petree, Signal Labs, Ft. Hancock
4IFE, Searcy, AAF, instructor
4IHV, Phillips, SC, radio mech., Ogden, Utah
4PL, White, US Engineers, radio operator
5AAQ, Webb, War Dept., insp., Wright Field
5ABI, Velte, Lexington Signal Depot
ex-5ABM, Ray, FCC, asst. mon. officer
5AET, Meiners, Lexington Signal Depot
5AMX, Lantz, Philadelphia Signal Depot
ex-K5AQ, Stewart, radio instructor, Goodfellow Field, Tex.
5AUP, Townsend, Naval Air Base, Corpus Christi, Tex.
ex-5BBB, Rumble, Signal Labs, Ft. Hancock
5BI, Schreiber, operator, Brooks Field, Tex.
5BTK, Sharpwinkel, Lexington Signal Depot
5CJF, Stone, Lexington Signal Depot
5CLP, Rountree, FCC, intercept officer
5DYU, Wood, AAF, jr. aircraft electrician
5EER, Yount, Lexington Signal Depot
5EHU, Snyder, radio instr., Cushing, Okla.
5EIR, Polvado, radio, Duncan Field, Tex.
5EIV, Mullen, radio work, Ft. Worth, Tex.
5EPC, White, NRL, Anacostia
5EUI, Suggs, Lexington Signal Depot
5EVL, Mills, instructor, San Antonio, Tex.
5FDS, Threadgill, Lexington Signal Depot
5FKB, Newsom, Lexington Signal Depot
5GGC, Rubin, Lexington Signal Depot
5GGU, Simmang, operator, Brooksfield, Tex.
ex-5GIL, Wright, instructor, Scott Field
5GNF, Nelson, FCC
5GYQ, Mitchell, Lexington Signal Depot
5HDY, Stadtlander, radio instructor, Goodfellow Field, Tex.
5HIP, Smith, assoc. RE, Ft. Sam Houston
ex-5HYW, O'Donnell, FCC, intercept officer
5IJJ, Morrison, radio work, San Antonio
5IOW, Smith, AAC, radio repairman
5IPE, McCulloch, Lexington Signal Depot
5IVC, Taylor, Lexington Signal Depot
5IYJ, Roy, radio work, San Antonio
5JC, Rives, FCC, radio work
5JHR, Romine, Lexington Signal Depot
5JIG, Nixon, radio mechanic-technician
5JKC, Montemayor, opr., Brooksfield, Tex.
5JQF, Sorrells, Lexington Signal Depot
5JSY, Schmitz, SC, inspector, Wright Field
5JXJ, Terhune, FCC, monitoring officer
5KEE, Rotramel, Weather Bureau, Ft. Worth
5KEV, Southworth, Lexington Signal Depot
5KGR, Theriot, Navy Dept., junior engineer, Washington
5KNR, Towery, War Dept., Washington, D. C.
5KQD, Young, flight instructor
5OI, Shults, Lexington Signal Depot
5ZX, Sanders, Lexington Signal Depot
6DJI, Wendt, eng. aide, Ft. Rosecrans, Cal.
6DOX, Melchert, Lexington Signal Depot

6EFC, Schmitz, Lexington Signal Depot
ex-6FFK, Sherman, SC Labs, Ft. Monmouth
6GS, Powell, instructor, Marana, Ariz.
6HGO, Miller, SC, McClellan Field, Cal.
6IOJ, Reed, MIT Radiation Labs
6JMR, Smith, FCC, asst. mon. officer
6JRW, Stephens, NRL, Anacostia
6KTQ, Peele, radio instr., Whittier, Cal.
6MLA, Young, SC, radio mech., Los Angeles
6MXM, Waesche, OCSO, Washington
6PBR, Shaw, Navy Dept., research & dev.
6PJS, Paulson, SC, Hill Field, Utah
6QAM, Nielson, SC, Hill Field, Utah
6QAN, Nelson, student, Camden, N. J.
6QBQ, Vaughan, jr. monitoring officer
6QPR, Neal, Army Ordnance, San Francisco
6RGN, Tanner, AAF, radio mechanic
6RIF, Young, instructor, Logan, Utah
6RLJ, Weber, instr., Minter Fld., Cal.
6STE, Sneddon, instructor, Logan, Utah
6SUP, Metke, SC, address unknown
6SZR, Mussen, SC, address unknown
6TDT, Wootton, FCC, opr., Santa Ana
6TN, Turner, SC, radio mechanic
6UQB, Salisbury, instr., Logan, Utah
7AIT, Robbins, AAF, radio mechanic-technician, Hill Field, Utah
7BRD, Napper, USNTS, instructor, Moscow, Idaho
7BWG, Wyndham, Navy Dept., radio opr.
7CPG, Smith, SC, address unknown
7DCV, Ripley, SC, radio repair work, Walla Walla Air Base
7DHW, Weedman, NRL, Washington
7DRY, Peterson, radio opr., Ft. Wright, Wash.
7FWB, Poole, E. Greenwich, R. I.
7GCA, Wright, FCC, Grand Island, Nebr.
7GYB, Myklebust, BuStan., Washington
7GU, Moore, radio section, Gowen Field, Idaho
7HQP, Rice, inspr., Wright Field, Ohio
ex-7MH, Perkins, SC Labs, Ft. Monmouth
8BZP, Peckham, Ft. Monmouth, N. J.
8CEU, Susko, chief operator, Huntington, W. Va.
8CPX, Reece, Lexington Signal Depot
8DNX, Osche, Signal Labs, Ft. Hancock
8EBF, Sonn, SC, inspr., Danvers, Mass.
8EKG, Morris, Signal Labs, Ft. Hancock
8ENH, Wolford, AAF, address unknown
8FEP, Smarey, radio inspr., Chester, Pa.
ex-8FYX, Murlin, SC, inspr., East Orange, N. J.
8GFD, Yatko, SC Labs, Ft. Monmouth
8GPM, O'Neil, eng. aide, Wright Field
8HEF, Weiss, SC Labs, Ft. Monmouth
8HGE, Wallstrom, SC, address unknown
8IYI, Porter, War Dept., opr., Langley Field
8JAH, Willison, SC, eng. aide, St. Louis
8JFC, Rahmes, War Dept., radio mechanic trainee, Patterson Field, Ohio
8LEM, Wiejek, Lexington Signal Depot
8MAR, Weiss, SC, chief inspector, Cleveland
8MDU, McVicker, SC, inspector, Marion, Ind.
8MFM, Rice, Patterson Field, Ohio
8MKI, McKee, SC, radio mechanic technician, San Francisco, Cal.
8MXL, Watson, eng. aide, Wright Field
8NAC, Shafer, AAF, Wright Field, Ohio
8NAF, Taylor, assoc. inspector, Wright Field
8NH, McCulloch, SC Labs, Ft. Monmouth
8NSV, Meadows, SC, inspr., New York, N. Y.
ex-8OAG, Solomon, FCC, radio operator
8OKN, Schramm, AAFTS, instructor, Tomah
8PBP, Miller, SC Labs, Ft. Monmouth
8PFT, Price, SC, inspector, Wright Field
8RKM, Pettet, SC, inspector, Philadelphia
8RMR, Shurtleff, Dept. of Commerce
8RNJ, Wilton, SC Labs, Ft. Monmouth
8RZT, Scott, Ft. Monmouth
8SJI, Treston, SC Labs, Ft. Monmouth
8SJL, Nusly, SC Labs, Ft. Monmouth
8SKV, Stoner, AAFTS, instructor, Tomah
8SOQ, Weppler, SC Labs, Ft. Monmouth
8TO, Young, SC Labs, Ft. Monmouth
8TUO, Pomeroy, FCC, radio operator, Allegan, Mich.
8TVX, Syme, FCC, radio operator
8UBE, McLaughlin, Navy Dept., radio inspector, Chicago, Ill.
8ULJ, Price, SC, inspector, Cleveland, Ohio
8UST, Turner, SC, procurement office
8UTT, Pantalone, War Dept., radio operator, Langley Field, Va.
8WAP, Snyder, Philadelphia Signal Depot
8WCD, Vanderbilt, Navy Dept., inspector
8WGU, Schmalzel, Ft. Monmouth
8WUI, Prater, radio instr., Ft. Hayes
9AA, Read, SC, Burr School, Chicago
9ABD, Williams, SC Labs, Ft. Monmouth

Lt. William E. Geyser, K7IIYK, is shown here in his present ham shack and operating position. Lt. Geyser hails from Anchorage, Alaska, and is a bomber pilot with the AAF. When his present duties are completed, he hopes to see all his old friends on 20 meters with a California kilowatt.

ex-9ACD, Sherwood, Navy Dept., radio instructor, Chicago
9AGC, Voiles, Lexington Signal Depot
9AGO, Rodenburg, SC, Athens, Ga.
9AHW, Mickel, Naval Research Lab, Bellevue
9AKS, Spencer, OCD, Washington, D. C.
9AMJ, Sauvago, Lexington Signal Depot
9APK, McClelland, instructor, Des Moines
9ARE, Richelieu, CAA, Washington
9AWX, Noland, Lexington Signal Depot
9AZT, McLoud, radio lab, Wright Field
9BGH, Reynolds, radio instr., Scott Field
9BKK, Schmid, SC Labs, Belmar, N. J.
9BLD, Vavak, instructor, Scott Field
9CCH, Story, SC, address unknown
9CCZ, Soell, Philadelphia Signal Depot
9CNM, Powers, AAFTS, code instr., Chicago
9CSP, Raines, instructor, Scott Field
9CXJ, Miller, Lexington Signal Depot
9DPE, Wood, radio operator, Grand Island
9DSO, Oberg, code instructor, Chicago
9DVL, Peterson, Philadelphia Signal Depot
ex-9EAW, Weldon, OWI, radio engineer, Washington
9EIS, Murphey, radio instructor, Paducah
9EOU, Moore, SC, inspector, Wright Fld.
9EQM, Weatherly, Lexington Signal Depot
9EVP, Meuer, Philadelphia Signal Depot
9EYH, Wallace, FCC, Grafton, Wis.
9FBY, White, SC, Omaha, Nebr.
9FDS, Rush, SC, radio inspector
9FEI, Stevens, address unknown
9FFU, Rosenberger, Navy Dept., instructor, Boulder, Colo.
9FII, Partney, Philadelphia Signal Depot
9FOE, Warriner, Signal Labs, Ft. Hancock
9FMJ, Prehm, Philadelphia Signal Depot
9FPO, Mitchell, address unknown
9GPN, Ruthstrom, address unknown
9GQF, Suomi, FCC, address unknown
9GTI, Piettau, address unknown
9GWK, Wollin, AAF, instructor, Madison
9HCR, Zindars, USNTS, radio instr., Madison
9HGG, Musall, AAF, radio instr., Madison
9HMO, Weinman, USNTS, radio instructor, Madison
9HRH, Snodin, address unknown
9HXE, Pearson, SC, inspector, Wright Field
9IAO, McKinnon, address unknown
9IGQ, Wesnick, Duncan Field, Tex.
9IIU, Rayfiel, Navy Dept., instr., Chicago
9IJF, Olson, Lexington Signal Depot
9IJV, Olson, USNTS, instr., Madison
9IWT, Stoleberg, FCC, foreign duty
9JER, Stall, SC, inspector
9JLF, Roark, Geiger Field, Spokane
9JPT, Thompson, AAF, radio instr., Scott Field
9JSW, Moore, SC, operator, Omaha, Nebr.
9JUE, Stachura, Lexington Signal Depot
9KFF, Vandersluis, SC, inspector, Jackson
ex-9KNF, Thompson, SC, inspector, Dayton
9KRA, Robinson, SC, inspector
9KVL, Miles, Philadelphia Signal Depot
9LIP, Munger, technician, foreign duty
9LSE, Patton, FCC, asst. intercept officer
9LUN, Snelly, Philadelphia Signal Depot
9MBI, Reynolds, SC, inspr., Wright Field
9MDI, Wathen, Wright Field, Ohio
9MDV, Tipton, SC, radio inspector
9MIE, Morris, Lexington Signal Depot
9MLF, Wood, AAFTS, instructor, Chicago
9MPV, Terborg, AACS, Dayton, Ohio
9MTB, Zumwalt, radio technician, Chicago
9MTL, Schwager, instructor, Scott Field
9MXJ, Wemmer, Philadelphia Signal Depot
9MZG, Miller, Lexington Signal Depot

HAM HOSPITALITY

SINCE publishing the Radio Society of Great Britain's address in "Ham Hospitality" in the August issue, we've received word that the Society has established new headquarters in central London. The new location is New Ruskin House, 28/30 Little Russell St., London, W. C. 1, and the telephone is Holborn 7373. (A double dose of best wishes in that number. FB!)

Little Russell Street is about five minutes from Holborn Tube Station and very close to the British Museum. RSGB's suite is on the top floor of a modern building and provides a fine view across South London.

John Clarricoats, G6CL, general secretary of RSGB, extends a cordial invitation to all amateurs in the service to stop in for a visit, and it is hoped the new location will enable more hams to call on them.

Arthur Milne, G2MI, says he would count it an honor to meet and help entertain any of the boys who may be in London. Write him at 29 Kechill Gardens, Hayes, Bromley, Kent, or, if you'd rather, telephone HURstway 1877 (CLErkenwell 4088 during business hours).

The Japanese Morse Radiotelegraph Code

What It Is and How It Is Transcribed

BY CHARLES E. HOLDEN*

THE Japanese use two systems of telegraphic code symbols. The one based on their own written language is called "Bekuraito," and is used on landline and by ship and fixed radio stations throughout Japan. When messages are sent to foreign countries or ships, however, the International Morse Code is used.

The numerals and the letter U are identical in the two codes; otherwise, there is little similarity. Although the letters A, E, I, N and O appear in the Japanese phonetic alphabet, their code equivalents are entirely unlike the International. The remainder of the phonetic alphabet is made up of two- and three-letter groups having other combinations of dots and dashes, as may be seen in Fig. 1.

Before attempting to transcribe messages transmitted in this code system, it is essential to have some knowledge of the structure of the Nipponese language. The following notes on the language will be of particular interest to anyone undertaking the study of the Japanese code, but should also be of general interest.

The Japanese Language

The Japanese had no written language until the third century, at which time Chinese and Korean missionaries introduced the Chinese ideographic script, "Kanji," with its thousands of intricate characters. Although similar in their origins, the pronunciation of the spoken Japanese language was entirely different from that of the Chinese, and in the process of combination many changes were brought about. For example, the Chinese character for "man" is pronounced "JIN," and in Japanese the word for "man" is "HITO." The Japanese, therefore, had to make a choice between using the single Chinese character for "man" and calling it "HITO," thus eliminating the Chinese pronunciation, or combining two of their own characters which, when placed together, would produce the sounds of "HI" and "TO."

Actually the Japanese did both. In their spoken language both "JIN" and "HITO" mean man, and either set of characters may be used in writing, but for efficiency the single Chinese character is used. The original Chinese characters and pronunciation have been used in many cases and, in addition, the Japanese have created a basic phonetic alphabet called a "syllabary," in which the various sounds of the language are represented by symbols. These are arranged in an order known as the "GOJUON" or "fifty sounds," which corresponds, in a measure, to the alphabets of the western world. This is not an alphabet in the sense of a basic group of single-letter symbols whose innumerable combinations could be used to represent any meaning, but rather of symbols assigned to the Japanese basic syllables, which in turn are combined to form words or complete ideas.

In their written literature, the Japanese use both the Chinese ideographs and the characters of the Japanese syllabary. For example, in newspaper printing Chinese ideographs are used for the principal words in a sentence and beside them in small type appear the Japanese syllabary equivalents. Thus a person otherwise lacking the proper education will be able to decipher the Chinese symbols.

Chinese ideographs do not usually represent parts of words but more normally whole words or complete ideas portrayed in a crude picture form. All of the symbols have been developed from early picture writing. For example, the word for "river" (KAWA) is taken from a bird's-eye view of a stream flowing between its two banks 川. "Man" (HITO or JIN) has been simplified from a picture of a man to its present form 人. "Prisoner" is formed by placing a box around "man" 囚.

Some words are formed by combining characters of two or more words, writing them in a sort of imaginary square. For example, river and mouth combined become "KAWAGUCHI" 川口 (mouth of a river). Man and mouth combined become "JINKO" 人口, which means "population" or "the voice of the people."

From the Chinese ideographs there came into existence, about the close of the eighth century,

* c/o L. C. Chase & Co., 295 Fifth Ave., New York, N. Y.

In the September, 1942, issue of *QST* we published a short article on the Japanese radiotelegraph code. Apparently it was a fortunate editorial selection, because that article attracted considerable interest and found widespread use not only in classrooms but by individual students. In part, this interest is demonstrated by the calls still being received for back copies of the issue, which, unfortunately, has long been out of print. Subsequent experience with the practical teaching of Japanese has disclosed the desirability of certain additional background on the structure of the language. This additional background, together with a modified and corrected version of the original chart, is presented in the accompanying article by a recognized authority on the Japanese language.

two main sets of simplified characters of Japanese invention called "Katakana" and "Hiragana" (the latter sometimes incorrectly spelled "Hirakana"), both of which have the common term "Kana." The heavy ideographic characters in Fig. 1 are Katakana and the lighter ones are Hiragana.

The Katakana characters are plain, stiff symbols, generally used in formal documents, in writing foreign names and in books for children. The more elaborate and flowing Hiragana is used as a cursive script for correspondence and in printing books and newspapers.

Although every Japanese word can be written in Kana, its use has not completely replaced the ideographs of China. In Japanese books, magazines, newspapers and in letter writing, both the Chinese ideographic script, Kanji, and one of the Kanas are used. Very seldom do all three appear together, the usual practice being to combine Kanji and Katakana or Kanji and Hiragana. This provides efficiency in writing. For instance, the name for the large volcano, Fujiyama (literally "Fire Mountain"), if written in Kana requires four symbols, whereas only one symbol is necessary if the Chinese ideograph is used.

Roman Letters Substituted

On coming into contact with the rest of the world, in which letters of the Roman alphabet are used predominantly in communications, the Nipponese had to devise letter combinations corresponding to the Roman alphabet. This Romanized Kana has been called "Rōmaji" (the Japanese equivalent of the word Roman).

In 1885 a society was organized by occidentals and Japanese for the purpose of effecting a substitution of the Roman system of writing for the Chinese and Japanese ideographs. An Englishman, J. C. Hepburn, is credited with the invention of the accepted system. Until a few years ago, however, the Romanization of the Japanese writing was far from being a reality. In 1927 the Japanese government ordered "substantial improvements" on the Rōmaji, under the guise of removing the foreign taint. The result was labeled "Nippongo" (sometimes erroneously called "Romazi"). Both Rōmaji and Nippongo are in use to-day in Japan.

The chart of Fig. 1 shows the regular syllabary arranged in the accepted sequence of Japanese sounds, as in our own alphabet. The English phonetic equivalent, Rōmaji, is shown and where

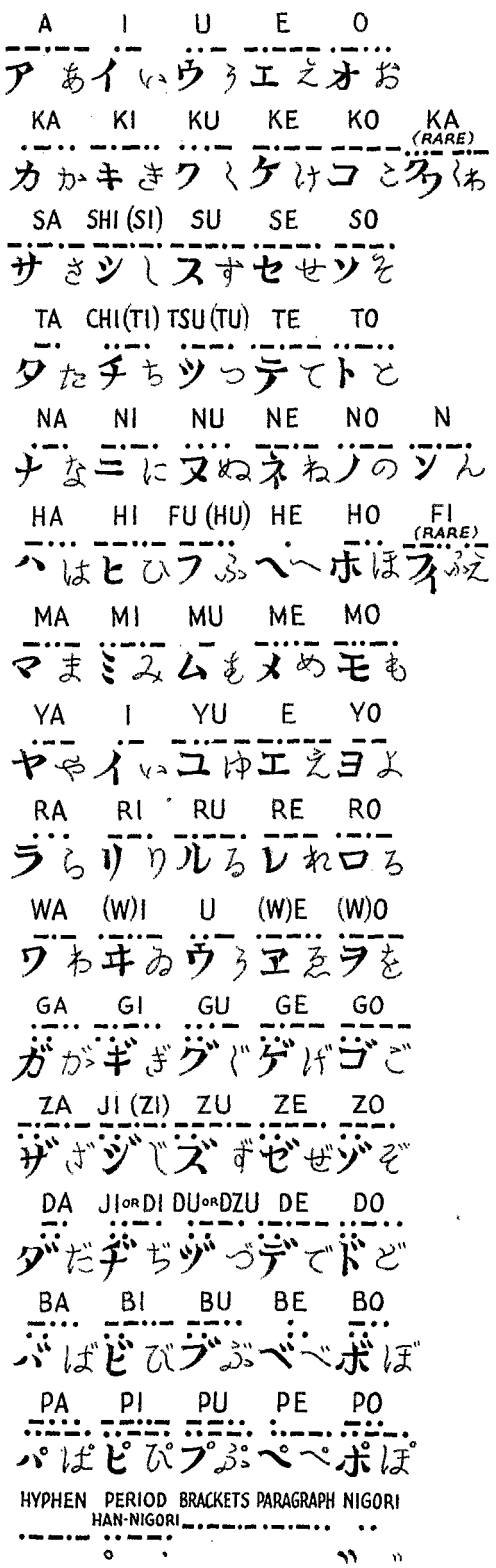


Fig. 1 — This chart gives the regular Japanese syllabary arranged in the accepted sequence of Japanese sounds, as in our own alphabet. In each group are English phonetic equivalents or Rōmaji and where Nippongo has changed these spellings they are placed beside the Rōmaji in brackets. The dots and dashes of the code are given for the syllables. The code symbol for a hyphen is also used before a vowel to indicate that it is long. The lines of the chart having two groups of dots and dashes for their code equivalents are the Nigori and Han-Nigori variations of the regular syllabary. In actual transmission the two groups of dots and dashes are sent with no letter space between them. The simple Katakana ideographic symbols and the more cursive Hiragana script are also given.

Nippongo has changed the spelling, the new spelling is placed beside the Rōmaji in brackets. The sounds are pronounced crisply — KA KEY KOO KAY KO — with no attempt to linger on any vowel. It then goes on to SA SHI SU SE SO, etc.

Certain native symbols of the main syllabary are repeated with the addition of the "Nigori" (the two small quotation mark figures) or the "Han-Nigori" (a small circle) placed at the upper right side of the character. These indicate a modifying or softening effect on the syllable sound. In code the Nigori sign is expressed by the transmission of two dots following the first code group and the Han-Nigori sign by ..— —. following the first code group.

With the Nigori:

KA	becomes	GA	TA	becomes	DA
KI	"	GI	CHI(TI)	"	JI
KU	"	GU	TSU(TU)	"	DZU
KE	"	GE	TE	"	DE
KO	"	GO	TO	"	DO
SA	"	ZA	HA	"	BA
SHI(SI)	"	JI(ZI)	HE	"	BE
SU	"	ZU	HI	"	BI
SE	"	ZE	HO	"	BO
SO	"	ZO	FU(HU)	"	BU

With the Han-Nigori:

HA	becomes	PA
HI	"	PI
FU(HU)	"	PU
HE	"	PE
HO	"	PO

Under certain circumstances words beginning with hard consonants take the Nigori. That is, their initial letters become softened. Thus "FUNE" (ship) when used as the second member of a compound word becomes "BUNE."

Certain irregularities and duplications are found in the syllabary. Most of these peculiarities owe their appearance to the inability of Japanese organs of speech to articulate certain sounds which therefore were replaced by the substitutions indicated, and many abnormal Rōmaji conjugations are due to them. Nippongo has gone a long way toward removing this confusion by substantiating the expected spelling without changing the actual Rōmaji articulations. It has made some changes in the phonetic spelling for grammatical and syllabary uniformity, but in spite of these changes the *sounds* remain the same as in Rōmaji.

The Japanese cannot pronounce the following sounds, and Rōmaji has recognized this by combining the Roman letters that give the nearest approximation to the sound in Japanese.

Unpronounceable Syllables	*Rōmaji Phonetics*	*Nippongo Spelling*
WI	I	WI
DU	DZU	*DZU
TU	TSU	TU
SI	SHI	SI
ZI	JI	ZI
TI	CHI	TI
DI	JI	*JI
WE	YE	WE
WU	U	WU
YI	I	YI
HU	FU	HU

* Note that Nippongo does not change these.

Rōmaji uses all letters of the Roman alphabet with the exception of L, Q, V and X. When the Japanese adopt foreign words they often are forced to use these four letters, in which case:

RU	does	the	work	of	L
KI-YU (KYU)	"	"	"	"	Q
FU (HU)	"	"	"	"	V
E-KU-SU	"	"	"	"	X

In the following cases, the Rōmaji and Nippongo sounds and the corresponding ideographic symbols are identical:

(W)U and U (Y)I and I (Y)E and E

In practice, (W)U is used for the vowel U, and (Y)I and (Y)E are used for the vowels I and E.

Although the native ideographic characters differ, these have the same Rōmaji sounds:

(W)I and I (W)E and E (W)O and O

Although the characters (W)I and (W)E are not used in the written and spoken language, they are used in Japanese radio communication.

The characters of the Japanese language, like those of the Chinese, are arranged in columns, beginning on the right-hand side of the page and running from top to bottom and from right to left. Most Japanese books begin where English books end. Some, however, especially those on technical subjects, are written in normal occidental fashion.

Code Transmission

Although in the written Japanese language both the Chinese ideographs (Kanji) and one form of Kana are used, in radiotelegraphic communication Kana must be used exclusively. As mentioned previously, Fujiyama is written by one Chinese symbol. However, in radiotelegraphy the four Kana symbols are used, the code equivalents being — —.. ..— —... .— — —.— Messages may be transmitted according to the Rōmaji spelling or the Nippongo modification.

In the actual transmission of code there are no spaces or long dashes as in American Morse. Code groups usually are comprised of five digits, sent in sections of fifteen groups.

Japanese code signals are recorded on paper tape by means of the ink recorder, just as the characters of the International Morse code are received on tape.

In telegraphic work the Katakana ideographs are frequently used, both tape and page types of teleprinters being employed.

The Japanese use a number of abbreviations in communications which are similar in nature to our Q code. These are given on the opposite page. The vocal radio code is used primarily for close communications, such as between tanks or between warships in the same area. The landline telegraphic code is used for greater distances.

In addition to these abbreviations, the Japanese also have codes for their various military units and divisions. For example, "SA" means heavy field artillery (Yasen Jūhōhei), "HO" means infantry (Hohei), and "KI" means cavalry (Hihei).

Abbreviations Used in Japanese Communications

Verbal	*Telegraph*	*Telephone*	*Radio*	*Translation*
KAKU	.—.. ... —	KAKU		General call
UKE	.. — —.—.—		UKE	I have a message for you
WA	.—.—		WA	Transmit your message!
O	.—...	MATE	O	Wait
	...—.	OWARI	...—.	End of message
NA	.—.	RYŌKAI	NA	Understood — acknowledged
CHI	..—.			Although I did not understand your message, since it is urgent, will deliver it at once
INUNA	.— .... .—.		INUNA	I shall continue transmission
	...—.—		...—.—	End of communication — finished — ending signal
SARA	—.—.— ...	SARA NI	SARA	Repeat entire message — will repeat entire message
SENI	.——.—. —.—.			Static or interference — repeat entire message
SESAN	.——.—. —.—.—. .—.—.			Static or interference — repeat entire message 3 times
KONI	——— —.—.			Static or interference — repeat each word
KOSAN	——— —.—.— .—.—.			Static or interference — repeat each word 3 times
KANI	.—.. —.—.			Static or interference — repeat each letter
KASAN	.—.. —.—. — .—.—.			Static or interference — repeat each letter 3 times
UU	..——.. (No pause between letters)			Routine message — not business
HONE	—...—. (No pause)		HONE	Main body of telegram
	.....	AYAMARI	.....	Error, will correct
YOSHI	—.— ——.—.			Go ahead — all right — understood
UHO	..——.. (No pause)	DOKA	UHO	Interrogation
INA	.—. —.			Negative — no
RIYA	—.—.—.— (No pause)		RIYA	Will use code or abbreviation
SHIA	—.—.—. —.—.—.			I have a message to transmit. I shall send number of next message. Have you a message to transmit?
SHINA	—.—.—. .—.			I have nothing to transmit
KAN	.—.. .—.—.	KAN	KAN	Sensitivity
KAN MU	.—.. .—.—. —	KAN NASHI	KAN MU	No sensitivity
KAN HI	.—.. .—.—. —..—.	KAN WARUSHI	KAN HI	Low sensitivity — cannot read
KAN YO	.—.. .—.—. ——	KAN YOSHI	KAN YO	Good sensitivity — can read
		MEI YOSHI		Clarity good
		MEI WARUSHI		Clarity poor
TEWA	.—.— — .—		TEWA	Switch to telephone
RIMU	——.—			Official telegram
UNA	..— .—.			Urgent
MA	—..—			Relay
		DENSHIN		Switch to telegraph
HOTOKI	—... ...—.. —.—..			Time broadcast
KISE	—.—.. .———.			Weather forecast
HEI	. .—	HEISHIYO	HEI	Close station
KAI	.—.. .—	KAISHIYO		Open station
HOKI	—.. —.—..			Artillery meteorological msg.
IMA	.— —..—			The present telegram
SAHO	—.—.— —..			The previous telegram
MAREME	—..— ——— ...—			Send last letter of each line
KESE	—.——. .———.			Disregard!
TESE	.—.—. .———.			Correct!
TESU	.—.—.—.—.—.			Have corrected
FUKU	——.. ...—			Repeat code signal!
FUFU	——.. ——..		FUFU	Code signal is not clear
FUYA	——.. .—.—		FUYA	Transmission is not clear
OSO	.—... ——.—.		OSO	Send slower!
KONSO	———.— .—.—. ...—.		KONSO	There is jamming or interference
KU	...—			Static present } Both used
KU	...— ..—.—.			Static present }
SATSO	—.—.—. .——.			There are atmospheric noises
UKA	..— .—..			I will be able to receive
FOKA	——.—. .—..			Communication reëstablished
UKO	..— ——.—		UKO	Receiver out of order
SOKO	———. —.—.—			Transmitter out of order
KINA	—.—... .—.			No damage has been done
			*TSUINA	Urgent
			*RARERA	Disaster — am in difficulty
			*RIKU	Landed

* These last three are for air-ground communications and tanks.

ON THE VERY HIGHS

CONDUCTED BY E. P. TILTON,* W1HDQ

How far is it possible to work on 112 Mc.? Do the factors which produce extended range on 56 Mc., such as reflection from the aurora and sporadic-*E* skip, influence 112-Mc. signals also? These questions were never satisfactorily answered during the two years of intensive 112-Mc. activity which preceded the outbreak of war, but occasional rumors then and now persist in which long-distance reception of 2½-meter signals, beyond the range which can be explained by lower-atmospheric bending, is mentioned. One we'd like to know more about is reported by Lt. Fred Bornman, W8QDU/6, who has heard that Detroit WERS signals were heard in New York and confirmed by long-distance telephone. Does anyone know about this? If so, how about supplying some details?

Out in San Diego, Fred's v.h.f. activity has consisted principally of listening to K45LA on the f.m. band. Though the airline distance is more than 100 miles reception has been excellent, with few exceptions. During June, Milwaukee and Columbus (Ohio) were heard when the band opened up.

Fred makes the suggestion that now is the time when we should be thinking in terms of concentric lines — how to construct for low losses, how to match impedances, etc. Who, for instance, will be the first to design a tight bearing joint for rotary arrays having concentric feed? With the vast amount of this sort of thing now going on in the war effort, there should be a considerable amount of good concentric line available when the shooting is over. We agree that we should know how to take advantage of it in our postwar antenna design work.

These Air Forces boys really get around! After more than a year in England, W4GJO is now back in the States — in Walla Walla, almost as far from home as before, but in the opposite direction. Grid is having a fine time gorging himself on ice cream, hot dogs and other delicacies which were nonexistent in England, but despite this he's looking forward to another overseas assignment soon. For the time being, his address is: 1st Lt. Ansel E. Gridley, Hq. 17th Bombardment Wing, Army Air Base, Walla Walla, Wash.

How does a ham in the service go about getting acquainted with the other hams in the vicinity? If you have any suggestions, send them to W1NEA, who would like to know. Address: A/C D. D. Duva, Sqd. H-5, NAAC, Nashville, Tenn. Dom, incidentally, is very happy over his classification as a pilot.

By the time this appears in print, your conductor will be up to his ears in a new job. We can't say much about it in print until the war is over, but it was taken for the experience it will offer — we'll be working with frequencies we've only read about heretofore. Inasmuch as we'll be under naval orders, eventually, and subject to assignment anywhere in the world, it may mean the end of our work on this column for the duration; but we'll be able to come back to amateur radio when the current rumpus is over with a good working knowledge of the techniques how employed in secret devices operating in the v.h.f. and u.h.f. ranges.

In the meantime, we will welcome correspondence from any of the v.h.f. fraternity. Regardless of our location, the mail address, for the time being at least, will remain the same: 329 Central St., Springfield. Should it become necessary for us to cut loose from "On The Very Highs" for a while, arrangements will be made for forwarding all correspondence received relative to the column to whoever may be selected to carry on the work in our absence.

*329 Central St., Springfield, Mass.

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"Handy Andy"

A 112-Mc. Hand Set for WERS

BY PAUL J. PALMER,* W8UGR

"Hi there, fellers," said Tuffy 6L6G, "wottaya-know — after all dese years I gits a break frum dis guy 8UGR. He sez t'me, he sez, 'Tuffy, you can take a vacation!' Phew! Man o' man, I shure needs it after de woikout dat Geestoppo guy Barbee, 2MWX, gimme. Wow, I'm still sweatin! So-o-o, while I'm fishin' 'n loafin', me fren Shorty 6V6GT er his pals'll do a good job fer ya in dis li'l WERS rig. Handy Andy mebbe ain't so smart as de one Uncle Sammy's got, but youse kin tote 'im roun' easy an' run 'im off de car radio, a shimmy pack er sum batts. Well, here's dat 8QBW stooge P.J. agin. S'long, gang. 73 — and bcnu."

"HANDY ANDY" has been built after the fashion of the handie-talkie used in the armed forces, in an endeavor to provide a unit that can be used in a similar way in the War Emergency Radio Service. It is readily portable for field operations and short-distance work and should prove to be a versatile little outfit, especially since the WERS regulations have been broadened to permit disaster work as well as ARP service. Designed to be operated while held in the hand, it weighs around 4½ pounds and occupies less than one-tenth of a cubic foot of space. At that, it might be possible to reduce the size and weight by using a small microphone transformer instead of the bell-ringing model we were obliged to use.

The batteries or other power source must, of necessity, be carried in a separate case to avoid excessive weight in the hand unit. This case may be of the knapsack type or a shoulder-sling case like those for the larger plate cameras; maybe the YL's or XYL's handbag would fill the need.

Circuit Details

The circuit, shown in Fig. 1, is a composite of many designs appearing in recent issues of *QST*. An effort has been made to eliminate frills and superfluous equipment, so far as possible. While the diagram resembles that of a transceiver, in that the same tube is used for both oscillator and detector, separate tank circuits are used so that the receiver and transmitter may be tuned independently and each circuit designed for best performance without compromise. This is made practicable by the use of a special home-made push-to-talk switch, which will be described in detail later. Of low-loss construction, it is designed to handle the r.f. circuits and the non-r.f. circuits with separate sections (S_1 and S_2), thereby reducing losses through switch capacities. This switch, whose control is located on the side of the unit, is normally in the "receive" position. Depressing the control bar breaks the receiver connections and changes the plate, grid and antenna leads over to the "send" position. When the bar is released, "receive" connections are restored.

The detector circuit is of the self-quenching superregenerative type. Its low-C tuned circuit, consisting of L_1 and C_1, may be coupled to the antenna either by means of a small coil, L_2, or capacitively through a compression-type trimmer condenser, C_{11}. The tuning condenser, C_1, is a midget air condenser, adjusted by the tuning knob on the right-hand side of the case.

The transmitting oscillator circuit is the straight ultraudion with a high-C tank, C_3-L_3, designed for maximum stability. The tank condenser, C_3, is a double-section ceramic compression type of 140 $\mu\mu$fd. capacity per section, the sections being connected in series. Adjustment of tuning is made by screwdriver through openings in the left side of the case. L_4 is the transmitter antenna-coupling coil, although capacitive coupling (C_{12}) is optional.

The audio section consists simply of a single tetrode or pentode stage driven directly by a single-button carbon mike. Since suitable transformers were not available, it was necessary to use choke modulation. An ordinary bell-ringing transformer serves as the mike transformer, while a small filter choke, L_5, is used for modulation as well as for coupling to the single headphone mounted in the upper part of the front of the unit.

Impedance-capacity coupling is used between the detector and audio circuits, using the secondary of the microphone transformer as the coupling

W8UGR's "walkie-talkie" designed for hand-set operation as a portable/mobile unit in WERS networks. Controls for receiver tuning and regeneration are on the right-hand side. The bar operates the push-to-talk change-over switch. At the top of the front panel is the headphone unit, while the microphone is behind the grille at the bottom.

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

impedance. RFC_2 and C_5 serve as a filter to keep quench-frequency energy out of the audio system. When transmitting, C_5 is disconnected by one of the switch points of S_2, so that the higher audio frequencies will not be by-passed.

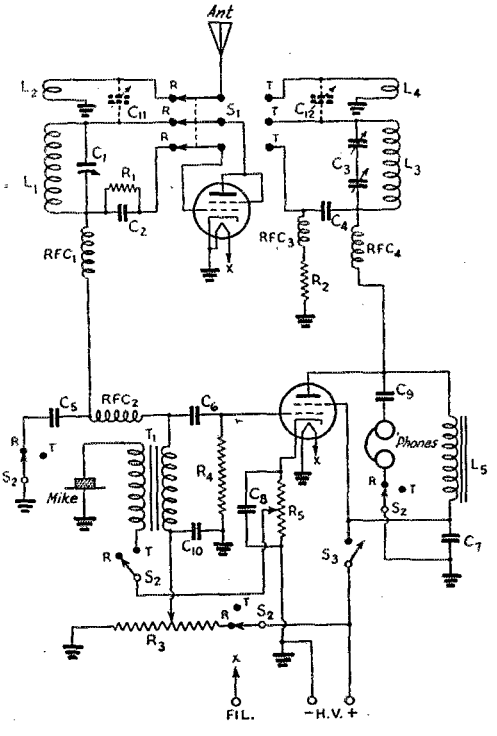
Voltage for the single-button mike, placed behind the grille in the bottom part of the case, is supplied from a slider connection on R_5, the cathode resistor of the audio tube, thereby eliminating the necessity for an extra battery. The microphone is disconnected by another contact on S_2 when receiving. A fourth contact disconnects the headphone when transmitting.

The headphone circuit is capacity-impedance coupled to the plate of the audio tube, removing d.c. voltage from the 'phone windings and permitting the use of a crystal unit if desired. A single unit has been used, although a standard double set might give more volume if less convenience.

It may be necessary to add condenser C_{10} to bypass audio frequencies around the regeneration-control potentiometer, R_3. This resistor draws no current while transmitting, since another contact on S_2 opens this circuit.

Construction

The construction was planned to provide as small a unit as possible for hand use. The case is made of sheet aluminum and measures 3½ inches in width, 4½ inches deep and 10 inches high. The 3½-inch width is necessary to accommodate the microphone at the lower end. The front and sides are formed from a single piece, but the ends are made of separate pieces so as to be removable to aid in assembly and wiring.



Two small sub-bases in the form of shelves divide the interior of the case into three compartments for the r.f. circuits, the audio-output stage and the microphone circuit. Both bases are flanged for strength. The upper one is shorter than the depth of the case, to provide room for the headphone unit. The front edge is bent up to form a shield between the headphone and the r.f.-circuit components mounted behind it.

The r.f. switch section, S_1, and the antenna-terminal feed-through insulator are mounted on the upper end piece. A Hammarlund HF-15 midget variable, with one rotor and one stator plate removed, is mounted with metal spacers on the right-hand side of the box so that short leads to the switch may be made. The tank coil, L_1, is soldered directly to the rotor and stator terminals of this condenser. The grid resistance, R_1, and condenser, C_2, connect to the grid switch point and to the rotor of the tank condenser; another lead goes from the stator to the plate switch point. The v.h.f. choke, RFC_1, also connects to the rotor, its lead passing through a grommet and thence to the 80-mh. choke, RFC_2, mounted beneath the top platform. The receiver antenna link coil is attached to one of the points of S_1 and grounded to the case at the other end of the link.

On the left-hand side of the case, opposite the receiver tuning condenser, the transmitter tank condenser, C_3, is mounted with a metal spacer and with L_3 soldered across its terminals. Screwdriver holes are drilled in the case at appropriate spots to permit adjustment of the capacity. L_3 is fitted with a link, supported between the proper switch point and a ground point on the case. Short leads are run from the tank to the "send" side of the switch. R_2, RFC_3, RFC_4 and C_4 are grouped, with short leads to their various connections.

The detector/oscillator tube socket is mounted upside down through the upper platform, so that the tube itself extends into the middle compart-

Fig. 1 — Circuit diagram of "Handy Andy."

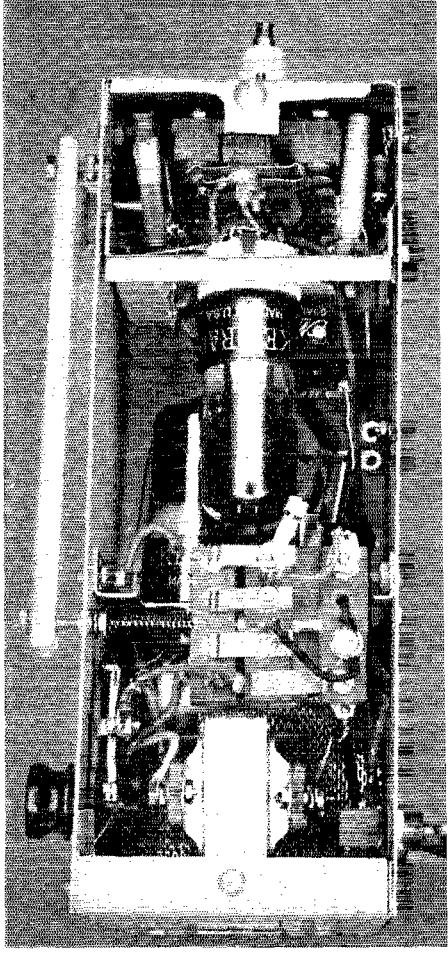
C_1 — 10-$\mu\mu$fd. midget variable (Hammarlund HF-15 with one rotor and one stator plate removed).
C_2 — 100-$\mu\mu$fd. mica.
C_3 — Dual ceramic mica, 140 $\mu\mu$fd. per section.
C_4 — 100-$\mu\mu$fd. mica.
C_5 — 0.002-μfd. to 0.004-μfd. mica.
C_6 — 0.01 μfd. paper.
C_7 — 8-μfd. paper.
C_8 — 20 μfd. 50-volt electrolytic.
C_9 — 2 to 6 μfd. paper.
C_{10} — 1 μfd. paper.
C_{11}, C_{12} — 3–30-$\mu\mu$fd. compression mica trimmer.
R_1 — 5 megohms, ½ watt.
R_2 — 10,000 ohms, 1 watt.
R_3 — 100,000-ohm potentiometer.
R_4 — 0.5 megohm, ½ watt.
R_5 — 400 ohms, 10 watts (with slider).
L_1 — 3 turns No. 14 e., ⅜-inch diameter, 1/16-inch long.
L_2 — 1- or 2-turn link, No. 14 e., ⅜-inch diameter.
L_3 — 1 turn No. 12 e., ½-inch diameter.
L_4 — ½ or 1 turn No. 14 e., ½-inch diameter.
L_5 — 15-henry, 40-ma. filter choke.
RFC_1 — V.h.f. r.f. choke (Ohmite Z-1).
RFC_2 — 80-mh. r.f. choke.
RFC_3, RFC_4 — 70 turns No. 28 e., closewound on ¼-inch polystyrene rod.
S_1, S_2 — Change-over switch sections (see text).
S_3 — S.p.s.t. or d.p.s.t. toggle switch (see text).
T_1 — Bell-ringing transformer.

ment. This permits very short leads between the grid and plate terminals and the switch. These leads are made of Litz (or other very flexible wire) to allow them to move slightly when the switch is operated. The 80-mh. r.f. choke is attached to the under-side of this platform.

The audio/modulator tube socket, the coupling choke, L_5, and the second switch section, S_2, are mounted on the lower deck or sub-base. A cut-out in the rear edge of the latter makes room for the second switch section, which is mounted from it by means of small angle pieces.

The microphone transformer is fastened to the bottom end-section of the case. It should be placed as far to the rear as possible, to leave room in front for the mike. At the lower end of the front of the case a circular opening for the mike is cut. This hole is covered on the inside with a screen to protect the microphone. A mouthpiece, bent from sheet metal, is fastened in front so that the voice will be deflected into the mike opening. The upper rim of the mouthpiece should be turned over, to avoid sharp cutting edges. In the bottom compartment also are mounted the regeneration control, R_3, and the "on-off" switch, S_3, the former on the right-hand side of the case and the latter on the left. R_5 is mounted inside the right-hand side near the rear, where it may be reached for adjusting the tap.

Filament wiring is as simple as possible. One lead supplies each socket, while the other connection is grounded to the case. The power-supply cable enters the case at the left side through a hole lined with a grommet. The back cover of the case is fitted with a strap to fit over the back of the hand when the unit is in use and for carrying.



Interior view of the "handie-talkie" with the back cover removed. The r.f. circuits are in the top compartment, the audio-output stage in the center and the mike circuit at the bottom. The first switch section, S_1, is mounted against the top of the case, while the second section, S_2, is mounted vertically below.

Switch Assembly

The two sections of the change-over switch are constructed of low-loss sheet material, such as polystyrene, and are so located that the channel-shaped metal control bar, mounted on the right-hand side of the case, operates both sections simultaneously. Details are shown in Fig. 2. The r.f. section, S_1, consists of an insulating base, 1½ inches wide, 2 inches long and 3/16 inch thick. Across each of the shorter ends is mounted a stationary contact strip of insulating material, ½ inch wide, 1½ inches long and ⅜ inch thick. If ⅜-inch stock is not available, it can be made up of two thicknesses of 3/16-inch material. Countersunk oval-head machine screws are used for contacts and also serve to fasten the strips to the base. Three of these contacts are needed for each of the two stationary strips.

In between the stationary strips is a sliding strip of the same dimensions, on which are mounted, by means of small machine screws, three double-prong contact strips of spring brass or phosphor bronze. This movable strip is thrust back and forth by a ⅛-inch threaded plunger-rod and return spring fastened to the strip. A bearing for the plunger rod is provided by a hole in the front stationary strip. To prevent side play, the tail end of the plunger rod extends through a hole in the other stationary strip at the rear. The holes for the plunger rod are drilled midway between the contact screws. Connections to the movable contact fingers also are made with the flexible wire.

The second section of the switch, S_2, is made in a similar manner. Since four poles are required, the base is 2 inches wide and the contact strips 2 inches long. Three stationary contacts are required for the "receive" side of the switch, while only one is needed for the "send" side. Since this section requires only single-throw action, the contact fingers extend at only one side of the movable bar, three toward the "receive" side and one toward the "send" side. By careful construction and adjustment of the return springs, a smoothly operating switch can be obtained and "push-to-talk" operation is readily accomplished without the necessity for multitudinous switch manipulations and extended wiring leads.

Accessories

The antenna is of the quarter-wave rod type, made of a 15-inch length of copper tubing ¼ inch in diameter. A screw soldered to one end of the tubing is threaded into the metal bushing atop the antenna insulator. The other end of the tubing is fitted with a collar drilled to pass a ⅛-inch extension rod about 14 inches long. The collar has a set screw for locking the extension rod in place,

and marks may be placed on the sliding rod for different frequency settings. A small nut at the top of the sliding rod prevents it from dropping down into the copper tube.

Power for the rig may be obtained from a small vibrapack, the b.c. car-radio power supply, blocks of "B" batteries, a small a.c. unit or a genemotor, or even from a small gasoline-driven generator. At W8UGR we have a small vibrator pack giving 130 volts at 50 ma. from the car battery. This gives ample power for short distances — around 6.5 watts input. The power leads are long enough so the supply may be placed on the ground.

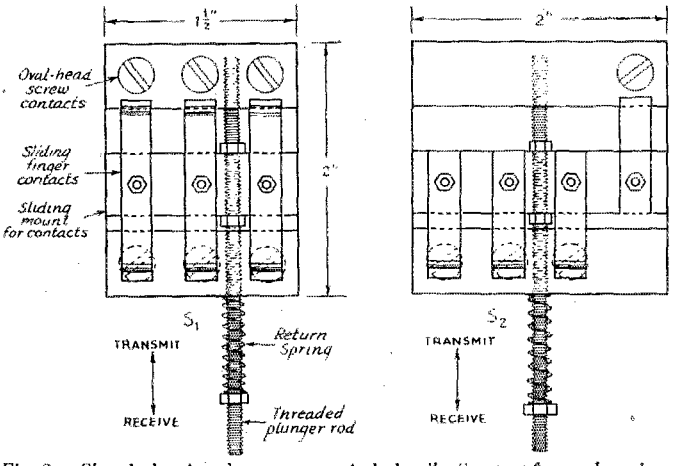


Fig. 2 — Sketch showing change-over switch details. See text for explanation.

If a suitable power supply is available, either a Type 6J5 or 6C5, or a Type 6F6 or 6V6GT with screen and plate tied together, may be used as the oscillator/detector tube. Either a 6F6 or a 6V6GT may be used in the audio stage. When operating from dry batteries, however, the 1Q5GT is recommended for both sockets, the tube being connected as a triode for the r.f. section. If the 1Q5GT is used, the cathode connection for the r.f. tube shown in Fig. 1 should be eliminated. In the audio stage, the cathode connection and C_8 and R_5 will also be omitted. A small 4.5-volt "C" battery must be inserted between the lower end of R_4 and ground. This may be three small "penlite" cells wired in series and taped together. Also, a separate mike battery must be included. Two flashlight cells can be used.

S_3 may be either s.p.s.t. or d.p.s.t., depending upon the type of power supply used. If dry batteries are employed, the d.p.s.t. type should be provided to prevent running the batteries down through R_8 when the set is not in use.

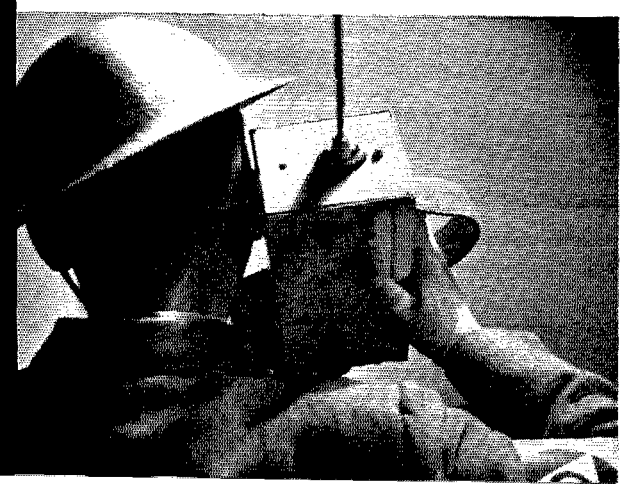
Testing and Operating

Since the change-over switch normally is in the "receive" position, this circuit may be tested first. Upon turning on the power switch and allowing the filaments to warm up, the superregenerative hiss should be noticed. If no hiss is heard, it may be necessary to experiment with the values of the grid resistor, R_1, and the by-pass condenser, C_5, as these play an important part in receiver operation. Wiring also should be checked carefully. After superregeneration has been obtained, the receiver tuning range should be adjusted to cover the 112-Mc. band. This can be done by changing the spacing of the turns of the tank coil until the center of the band falls in the middle of the tuning range. The total range should be a little more than the full width of the band. Frequency settings may be marked on the case.

Antenna coupling and length for both transmitting and receiving should be adjusted at the same time, since the effects of such adjustments will shift the tuning range. The coupling should be adjusted to give the maximum signal strength consistent with smooth regeneration. In the event that capacitive instead of inductive coupling to the antenna is used, the condensers first should be set at minimum capacity and then adjusted so as to obtain optimum performance.

Once the receiver is operating satisfactorily, the transmitter unit may be tested. Removing the return springs from the switch sections will make it unnecessary to hold the switch down during testing. The tank coil should be adjusted to make the effective capacity as large as possible at the desired frequency. This will insure maximum stability. More output is obtained with less capacity, but stability suffers. The coil should be cut until the transmitter tunes to 112 Mc. with C_3 screwed up to nearly maximum capacity. Adjust to the desired frequency by turning both adjusting screws about the same number of turns each time, to keep them as nearly as possible at the same capacity.

The range of such a rig naturally is limited, compared with that of a larger unit. Under reasonable conditions, however, around a quarter to a half mile should be obtained with dry-cell tubes and a 90-volt supply. The range could be extended by using larger tubes and higher plate voltage.



"Handy Andy" in operation. The two-section antenna threads into the feed-through fitting on top of the case.

HAPPENINGS OF THE MONTH

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 1944–1945 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-Law 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 any member upon request.

Voting will take place between November 1st and December 20, 1943, on ballots that will be mailed from the headquarters office in the first week of November. 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. Nominating 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 1944–1945 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 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 October, 1943. There is no limit to the number of petitions that may be filed on behalf of a given candidate but no member shall append his signature to more than one petition for the office of director and one petition for the office of alternate. To be valid, a petition must have the signatures of at least ten 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 to be members in good standing. It is not necessary that a petition name candidates both for director and for alternate but members are urged to interest themselves equally in the two offices.

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 and acting director, Herbert M. Walleze, W8BQ. Dakota Division: director, Tom E. Davis,

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.

W9VVA; alternate, Donald M. Beaudine, W9RPJ. Delta Division: director, E. Ray Arledge, W5SI; alternate, B. G. Lowery Smith, W4DEP. Midwest Division: director, Floyd E. Norwine, jr., W9EFC; alternate, William H. Graham, W9BNC. Pacific Division: director, J. L. McCargar, W6EY; alternate, Elbert J. Amarantes, W6FBW. Southeastern Division: director, William C. Shelton, W4ASR; alternate, William 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

August 23, 1943.

NEW APPLICATION FORM

FCC's new Form 610, for applying for an amateur license, is now in distribution and the old blank with which we are so familiar may no longer be used. The new form relates exclusively to an amateur operator license, as FCC no longer entertains amateur station applications. As we mentioned last month, the new form serves notice on the applicant that it is a criminal offense to make false statements and the form therefore no longer requires notarizing.

The execution of the blank is straightforward enough. We note one new question: wherein the applicant advises whether or not he has been convicted of a crime. If he has to answer affirmatively, he must attach a statement giving the particulars. It is also to be noted that the applicant now applies for a new, modified or duplicate operator license. Nothing is said about applications for renewal. Of course this is understandable, since FCC Order 115 prevents any expirations for at least a year longer, but the present language indicates the Commission's probable intention of still further extending existing licenses, if necessary, and escaping the need to deal with renewal matters during the war.

This is strictly an interim wartime form. As soon as amateur radio is reopened a new form will be distributed to deal with station applications as well as operator matters.

NOTICE TO MEMBERS DISCHARGED FROM THE MILITARY SERVICES

THE requirement of continuous membership in the League for eligibility to ARRL offices has been waived under most circumstances for members serving in the uniform of the United States. See particulars on page 24 of July *QST*. 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.

THE AMATEUR WAR RECORD

THE rate at which Headquarters receives the war service record form reproduced at the bottom of this page shows that there are still many of you fellows from whom we have not heard. It is important that ARRL compile a record of what the amateur is doing for his country in this war, so that we can throw it down on the conference table at the proper moment to demonstrate how important the institution of amateur radio is to the welfare of the nation. Wherever you are in this war effort, if you're an amateur in

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.

radio or communications, ARRL wants your record. We have made it as easy for you as possible: simply cut out and mail this convenient form, or duplicate its essentials on a post card. Note that, in addition to those serving in the armed forces, we want the record of those in civilian radio work — for we must arm ourselves to tell our whole story.

CHINA CONVENTION WANTS SOUVENIRS

IN OUR July and September issues we reported the remarkable success of the China Amateur Radio League in holding, under war's difficulties, a national convention celebrating China Amateur Radio Day. Through the Office of War Information we have just received word that the China Amateur Radio League will again hold important public exhibitions of amateur radio equipment and publications throughout China on January 1st of the coming year. Amateurs all around the world are requested to make available any material they would like to contribute which seems suitable for public exhibition and for permanent display later in the headquarters of the China League.

Headquarters, of course, is taking care of the larger part of this matter, as concerns this country, but it occurs to us that many American amateurs would like to participate individually, by contributing some photographs of their station and antennas and a copy of their QSL card, and possibly by writing a letter of greetings and appreciation to the amateurs of China. If all of you fellows who care to do this will send this material in to ARRL headquarters, appropriately designated, we'll be glad to look after the job of assembling and getting it forward to the China gang through the kind facilities of OWI. October 25th is about the deadline, so please act promptly.

STAFF NOTES

WE ANNOUNCE the appointment of Donald H. Mix, W1TS, for many years the senior assistant technical editor of *QST*, as our acting technical editor. George Grammer, who as technical editor has headed our technical team for many years, has been given leave of absence to engage in important radio development work of a secret nature immediately connected with the war. Fortunately, he will continue to reside in West Hartford and will retain active association with the staff in a consulting and contributing status. Thus we shall continue to hear from him in our pages. In fact, the first of a new series of his valuable articles is about to roll from his typewriter.

Hollis M. French, W1JLK, whom we welcomed a few issues back as a member of the ARRL secretarial department, is now serving as assistant technical editor where he can better let off some of that v.h.f. steam.

Don Mix, of course, needs no build-up to ARRL members, being one of the best-known hams in the world. He has been in the game continuously since 1920 and a member of our staff for the past ten years. He is one of the most consistently active amateurs we have ever known, The Old Man years ago having dubbed him the Sleepless Wonder. That this appellation was well-earned was proved by 1TS's lists of "Calls Heard," which through many of our earlier years were the longest and most consistent of any contributor. His thorough competency as an operator caused him to be chosen by the ARRL Board of Directors as the first amateur operator ever to accompany an exploring expedition, the occasion being the MacMillan Arctic Expedition to Greenland in 1923. Zenith contributed and installed a station, and ARRL selected and paid the salary of the operator, to demonstrate that contact with civilization could be maintained through amateur stations. On the expedition's schooner, the *Bowdoin*, Don was frozen in the ice of Etah Harbor for the eventful winter of that year, during which time amateurs at home first made the trek downward from 200 meters and found that the shorter waves would span the oceans. Although handicapped by having only 200-meter apparatus on shipboard, Don kept his expedition in contact with civilization and fully justified amateur radio's faith in selecting him to prove that it was no longer necessary for distant exploring parties to be out of touch with home. Since that first voyage of his, no expedition has ever shoved off for remote parts without reliance on ham radio.

DONALD H. MIX

GEORGE GRAMMER

For the intervening decade before joining the ARRL crew, Don was employed in the research laboratories of a number of outstanding organizations, including Burgess and Press Wireless. He is that unique combination — a skillful and enthusiastic technician as well as a proficient operator; a ham's ham; the kind of fellow who can design gear for and write the transmitter chapters of the *Handbook*. His well-balanced down-to-earth viewpoint has been and will continue to be a valuable asset to *QST*.

HOLLIS M. FRENCH

Transmission-Line Matching Simplified

Easier Methods of Determining Stub Dimensions

BY THOMAS ARMSTRONG GARRETSON,* W2ASB

Stripped of mystery and most of the math, this article on the two-wire transmission line is based on one of a series of demonstration lectures prepared by the author in connection with an ESMWT radio course at Rutgers University. Keeping his feet on the ground throughout, W2ASB comes through with a system of simplified calculations which will be of value to every ham.

A TRANSMISSION line can be as useful to the radio man as a hammer to the carpenter — if only he knows how to use it. Like the hammer, it can do several jobs. According to the usual conception, a transmission line is a circuit element which is used to transfer energy from a source to a place where work is done. It can also be used like a transformer, to match impedances, and, at the very-high frequencies where physical dimensions are small, to measure wavelength. Such a line can also be made to act like an inductor or a capacitor. You may well ask how it is possible for so simple a device to do all these things without substantially altering its form. Some of the answers are given in this article.

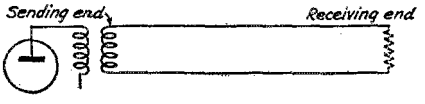


Fig. 1 — Two-wire transmission line.

For the purposes of this discussion we will use the conventional balanced two-wire line, shown in Fig. 1. Let us first consider such a line with its receiving end open-circuited and with no load connected. We know that energy which is introduced by a generator (such as the output circuit of a radio transmitter) at the sending end of the line travels to the other (receiving) end of the line and is reflected. The reflected wave combines with succeeding waves emanating from the generator to form "standing" waves, which may be detected and studied with relatively simple apparatus. One who is not too familiar with transmission-line phenomenon will find experimental verification of these statements both helpful and interesting.

One of the simplest indicators for r.f. measurement at any frequency is a d.c. milliammeter in combination with a crystal detector. The galvanometer shown in the photograph has a full-scale range of about 600 microamperes, but a standard 1-ma. meter will do as well. The crystal may be galena or silicon, the latter being preferable because it is usually more stable. The combination is used with a probe, the length of which may be varied. The circuit is shown in Fig. 2.

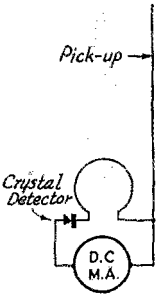


Fig. 2 — Circuit diagram of the r.f. indicator. The d.c. milliammeter should be a sensitive instrument having a maximum range of 1 ma. or less. The pick-up antenna is a wire probe of adjustable length.

Another meter needed is an r.f. milliammeter fitted with rods which may be adjusted to a quarter wavelength at the frequency at which measurements are to be made. This meter preferably should be a current-squared galvanometer, since the scale is linear and readings at the low end of the scale can be made more conveniently. In using the current-squared meter it must be remembered that the square root of the reading is the value desired. The reason for using this meter with quarter-wave rods can be explained by saying that such an arrangement makes a voltmeter out of the r.f. milliammeter, just as a resistor in series with a d.c. milliammeter makes a d.c. voltmeter, as indicated in Fig. 3. While the actual voltage at the r.f. meter need not be known, since we will be interested only in relative values, the proportional accuracy of the current-squared meter must be good to make the relative readings obtained coincide with the theoretical values.

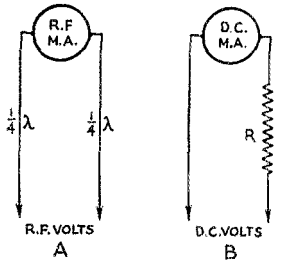


Fig. 3 — An r.f. milliammeter (A) with quarter-wave connecting leads forms a voltmeter for r.f., in the same manner that the d.c. milliammeter (B) and resistor form a d.c. voltmeter. The quarter-wave line has the same size conductor and spacing as the transmission line.

*105 State Street, Perth Amboy, N. J.

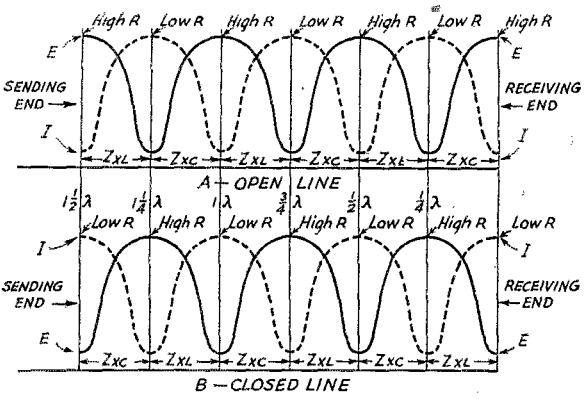


Fig. 4 — Curves showing standing waves of voltage and current along an open transmission line (A) and a shorted or closed line (B). The nature of the impedance over each ¼ wavelength is indicated.

An r.f. oscillator of some kind will be required to feed the line. To keep the physical dimensions of our experimental set-up from becoming prohibitively large, we will choose an operating wavelength of around 1½ meters. The line then need not be longer than 10 or 12 feet. The one shown in the photographs is made of ⅜-inch copper tubing so as to be self-supporting and mechanically stable.

Distribution on Open Line

Now let us see what we can find out about our two-wire transmission line. Referring to Fig. 4-A, as we move the r.f. voltmeter along the line we will find that the voltage, *E*, rises and falls, indicating the presence of standing waves. (If the line were free from standing waves, the meter would give practically constant readings at all points along the line.) We find the voltage at the receiving end to be maximum, since the line is open and no current can flow. Because the ratio *E*/*I* obviously is large, it follows that the impedance, *Z*, at the receiving end is high.

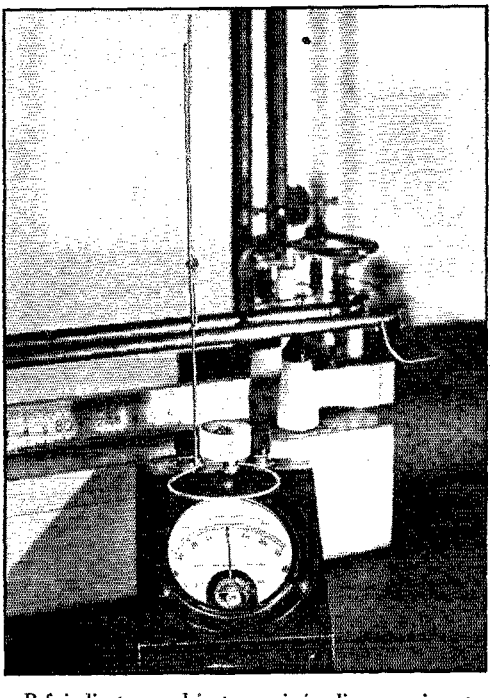
Moving toward the sending end, we find that the voltage falls off and that eventually we come upon a node, or point of minimum voltage. If we could insert an r.f. ammeter in the line at this point, we would find that the current (*I*) is high. Since the ratio *E*/*I* now is low, we know that the impedance is at a minimum. If end effects could be neglected, this voltage node would occur at a point ¼ wavelength from the receiving end.

If we continue on down the line toward the sending end we find that the voltage increases to a maximum again, then decreases to a minimum, and so on down to the sending end, as indicated in Fig. 4-A. Measurement with a meter stick will show that there are separations of ½ wavelength between points of maximum deflection, ½ wavelength between points of minimum indication, and ¼ wavelength between a maximum and the next minimum. Since all but the first ¼ wavelength are well removed from the end of the line, end effects are reduced and the wavelength of the generator can be measured quite accurately by doubling the distance in meters between any two consecutive minima or maxima.

In between the maximum- and minimum-voltage points, intermediate values of impedance will be found. While the impedance curve differs in shape from the voltage curve, their maxima and minima coincide. Fig. 4 indicates the nature of the impedance to be found over any quarter wavelength along the voltage curve. At exact ¼-wavelength points the impedance will appear as pure resistance, low in value at voltage nodes and high in value at the high-voltage points. In between these points the impedance will be reactive, capacitively reactive (Z_{XC}) from high to low-voltage points and inductively reactive (Z_{XL}) from low to high-voltage points, progressing from the receiving end of the line toward the sending end. In other words, between the points of pure resistance the line will take on the characteristics either of a coil or a condenser.

Shorted-Line Distribution

So much for the open line. Let us look now at the distribution along the line when it is short-circuited at the receiving end, as shown in Fig. 4-B. It does not take much figuring to find out what goes on here. Because the line is shorted, the current at the receiving end must be a maximum. Since this means that the receiving end of the line is at a voltage node, we find that the distribution has shifted 90 degrees (or ¼ wavelength) toward the receiving end of the line, as shown in Fig.



R.f. indicator used in transmission-line experiments. The crystal detector, loop and adjustable pick-up all are mounted on top of the d.c. milliammeter case.

4-B. The distance between maximum and minimum points has not changed, however.

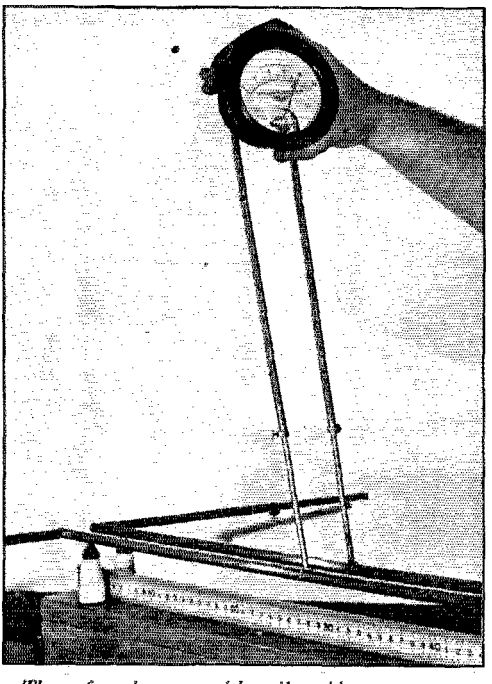
If, instead of shorting or opening the line, we terminate it in different values of resistance or reactive impedance, the shift in distribution may be greater or less than 90 degrees and the *shape* of the curves may change depending upon the nature of the terminating impedance, but the distance from one maximum or minimum to the next always remains ½ wavelength. These changes, which have been described in detail by Gadwa,[1] can be readily demonstrated with our experimental line.

Advantages of Flat Line

It is apparent that, under most conditions, standing waves will appear on a transmission line. It is our purpose now to show how standing waves may be eliminated. But first, let us consider why we should want to eliminate the standing waves. After all, we know that, in practice, an antenna can be fed quite effectively even by a line which does have standing waves.

In the first place ohmic losses are reduced when standing waves are eliminated, because the average line current is reduced. There are no points of high r.f. voltage, which is a consideration where insulation for high powers is involved. Reduction in voltage also decreases dielectric losses. Because dielectric losses in the twisted-pair feeder are relatively large, it is especially important to eliminate

[1] Gadwa, "Standing Waves on Transmission Lines," *QST*, December, 1942, p. 17.



The r.f. voltmeter with adjustable quarter-wave leads. The ends of the leads are fitted with sliding contacts which fit the transmission line. Conductor size and spacing of leads should match those of the line.

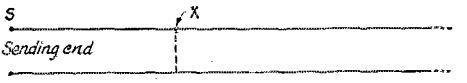


FIG 5

Fig 5 — **Any section, *SX*, of a line of infinite length will have the characteristics of an infinite line if it is terminated in its characteristic impedance, as shown.**

standing waves when this type of line is used. Since line radiation depends, among other things, upon the value of current flowing, a "flat" line, or one without standing waves, will radiate less and, by the same token, will pick up less signal when connected to a receiving antenna, thereby reducing phasing troubles which may be important when distortion of the pattern of a directional antenna is to be avoided. A flat line is desirable also because it presents a constant impedance to either transmitter or receiver, regardless of the length of the line, whereas the impedance of the resonant line varies with its length.

Requirements for a Flat Line

Now let us see what conditions are necessary to eliminate standing waves. If a line were of infinite length, waves started at the sending end would never arrive at the receiving end, and reflection could not take place. Therefore no standing waves would appear, and the ratio E/I would be constant for the entire length of the line. This constant impedance is known as the characteristic or surge impedance and is dependent only upon the physical dimensions of the line, i.e., the size of the conductors and their spacing.[2] If Fig. 5 is taken to represent an infinite line, the impedance at any selected point along its length, such as the point X, will be the characteristic impedance, and the section SX, for instance, could be considered to be terminated by the remainder of the line. Since the remainder of the line also is of infinite length it also has an impedance equal to the surge impedance of the entire line, so that the section SX can be considered to be terminated in an impedance equal to its characteristic impedance. It follows, then, that if any finite length of transmission line, such as SX, is terminated in a resistance equal to its characteristic impedance, there will be no standing waves.

Methods of Matching

Thus the problem in eliminating standing waves from a transmission line is that of arriving at a condition where the line is terminated in its characteristic impedance. There are several ways of doing this. In some cases the choice may rest upon the impedance presented by the particular antenna in use at the point where it is to be fed, while in others the type of line to be used may be the deciding factor. If, for example, we take a half-wave antenna which is to be fed at the center, we know that the impedance is in the vicinity of 73 ohms. Since the common variety of twisted-

[2] For a concentric line, the characteristic impedance is $Z = 138 \log \frac{a}{b}$, where b is the inside diameter of the outer conductor and a the outside diameter of the inner conductor.

pair feeder has a characteristic impedance of about this value, matching impedances automatically would occur simply by connecting a line of this type in series with the antenna at its center. A properly designed concentric line also could be used in the same manner.[2]

However, considerations of expense in the case of the concentric line and of efficiency in the case of the twisted-pair line may make the use of a two-wire open line desirable. By trying a few selected dimensions in the formula for impedance for the two-wire line,[3] we find that it is physically impossible to build such a line with an impedance much lower than 400 or 500 ohms if we use ordinary wire conductors. The commonly used line made of No. 12 wire with a 6-inch spacing gives a characteristic impedance of about 600 ohms, which is considerably higher than the 73-ohm termination provided by our half-wave antenna. Therefore, to terminate the line in its characteristic impedance will require a matching device.

Matching Stubs

If, now, we examine a short line one-half wavelength or so long, as pictured in Fig. 6, we find that we have a device with impedance which varies along its length, the distribution depending upon whether the section is shorted (Fig. 6-A) or open (Fig. 6-B). To obtain any desired impedance requires only that we cut the section off at the proper point. The use of a matching stub, as such a portion of transmission line usually is called, may be described by referring to Fig. 7, which shows a two-wire transmission line feeding a half-wave antenna. At any distance (X), from the antenna, the line will have an impedance (remember that, as yet, the line is incorrectly terminated) which may be considered to be made up of reactance (either inductive or capacitive) and resistance, in parallel. The reactive component may be eliminated by shunting the line at distance X from the antenna with another reactance equal in value but opposite in sign for the reactance pre-

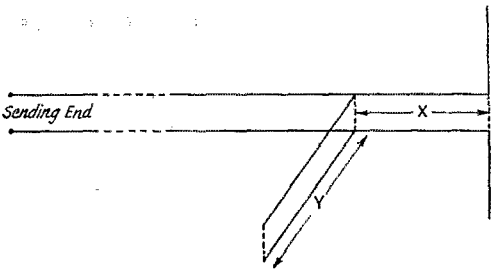


Fig. 7 — When antenna and transmission line differ in impedance, they may be matched by means of a short length of transmission line called a stub. The determination of the critical dimensions, X and Y, for proper matching is discussed in the text. The stub may be either open or closed at the end, but the dimensions of the two types differ for the same case of matching.

sented by the line at that point. If distance X is such that the line presents an inductive reactance, a shunting capacitive reactance will be required. The similarity between this linear circuit and the more familiar lumped tank circuit is apparent. In this case, the required compensating reactance may be supplied by shunting the line with a stub cut to proper length, Y. With the reactances canceled only a pure resistance remains as a termination for the remainder of the line between the sending end and the stub, and this resistance may be adjusted to match the characteristic impedance of the line by adjusting the distance X.

A match may be obtained with either a closed or an open stub, but it will be found that the match occurs closer to the antenna if a closed stub is used where the antenna impedance is higher than the characteristic impedance of the line, or if an open stub is used where the antenna impedance is lower than the line impedance. Since standing waves still will occur between the antenna and the matching point, it is desirable to keep this distance as short as possible. An end-fed antenna should be tuned to resonance by adjusting its length with the line disconnected, before matching is attempted. With the center-fed antenna close tuning is not too important, any discrepancy in antenna length automatically being taken care of in adjusting the stub since the center-fed antenna is a balanced system.

[2] For a two-wire line, the characteristic impedance is given by: $Z = 276 \log \frac{a}{b}$, where b is the spacing between conductors, center to center, and a is the radius of the conductor. Use the same units for both b and a, of course.

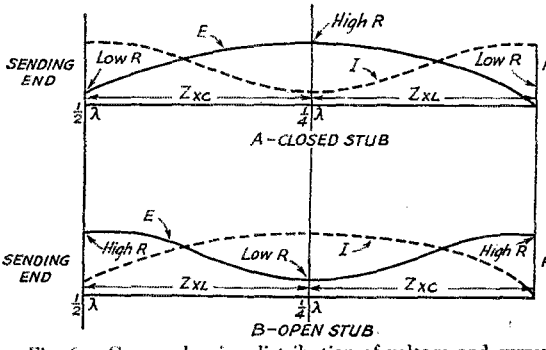


Fig. 6 — Curves showing distribution of voltage and current along closed (A) and open (B) matching stubs for lengths up to ½ wavelength. Compare these with the similar sections shown in Fig. 4.

Experimental Measurements

Since both X and Y (Fig. 7) are interdependent, experimental adjustment is not always an easy job. The usual cut-and-try method of calculating the location and length of the stub can be very cumbersome. However, the author, with the assistance of Mr. Samuel L. Quaranta and Prof. J. L. Potter of Rutgers University, has succeeded in working out a system of simplified calculations which, with the aid of graphs, may be reduced finally to one simple operation in arithmetic.

Before making these calculations, a few simple experimental measurements are required. One of the things we need to know accurately is the wavelength of the oscillator output. We can measure this on our experimental transmission line, using it as a Lecher system. First, set up the oscillator and connect it to the sending end of the transmission line. Place the d.c. meter with the crystal rectifier near the sending end of the line, but not too close to the tank circuit of the oscillator. With the oscillator running, the meter should show a deflection. Now, slide a shorting bar along the line toward the receiving end. This will serve to vary the active length of the line. When the shorting bar is approximately ¼ wavelength from the meter a voltage maximum will occur in the part of the line near the meter, causing it to show maximum deflection. The location of the shorting bar when this occurs should be marked on the line. The shorting bar then should be moved farther along the line, until another maximum deflection is obtained at the meter. This second location of the shorting bar also should be marked, and the distance between the two marks measured in meters or centimeters. Doubling the measured distance then will give the wavelength of the oscillator output, since the maxima occur ½ wavelength apart.

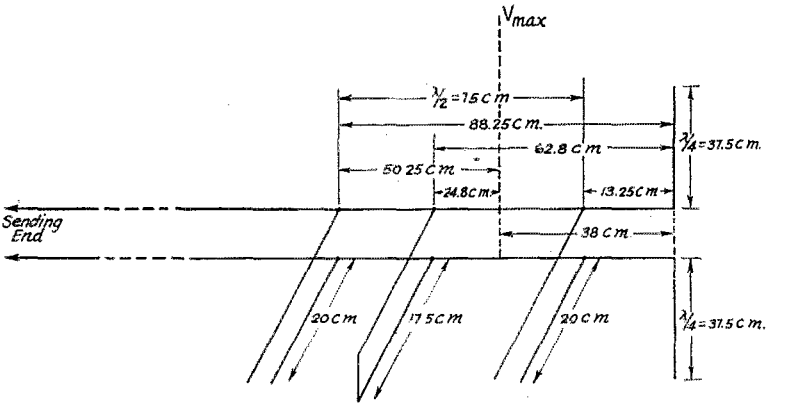
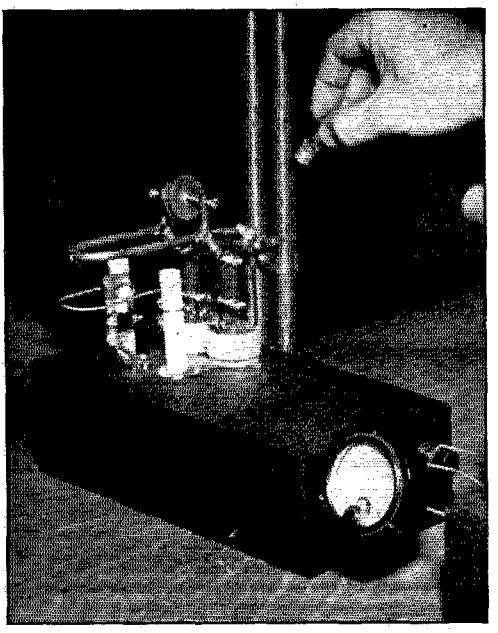


Fig. 8 — Results of sample calculations given in the text. The open stub may be located at either of the two positions shown, but the one nearest the antenna is preferred.

Before using our improvised r.f. voltmeter we must check it to make sure that the connecting rods are exactly ¼ wavelength long, since otherwise the readings will not be accurate. We can do this by connecting the rods across the line and watching the d.c. meter at the sending end of the line for fluctuations. The correct length for the rods is that which causes least fluctuation of the d.c. meter when the r.f. meter is connected across the line.

The antenna now should be connected to the receiving end of the line. Starting at the antenna, the r.f. meter should be moved along the line toward the sending end until the first point of maximum deflection (V_{max}) is reached. This is a reference point for all future measurements, so its location must be carefully determined. Record the magnitude of V_{max} and its distance from the antenna. Now move the meter farther toward the sending end, until a voltage node (V_{min}) is found. Record the magnitude of V_{min}. As a cross-check for wavelength, the distance between V_{max} and V_{min} should be ¼ wavelength.



The oscillator used to feed the experimental line. It consists of push-pull HY75s operating at 1.5 meters.

Simplified Calculations

With the wavelength, the magnitude of V_{min}, and the position and magnitude of V_{max} recorded, we can now proceed with the computations. This method of computing is a simplified version of the method shown in notes on "Transmission-Line Impedance Matching," a paper written for class use by James L. Potter, Professor of Communications, Department of Electrical Engineering, Rutgers University.

We first use the formula

$$Q = \frac{V_{max}}{V_{min}}$$

Do not forget to take the square root of the readings if a current-squared meter is used.

Laboratory set-up showing procedure used in checking standing waves on the transmission line with the r.f. voltmeter.

Now substitute the value obtained for Q in the following formula:

$$K = \frac{Q - 1}{Q + 1},$$

where K is the reflection factor.

The distance to a closed stub from V_{max} toward the sending end of the line is given by:

$$\text{Distance in degrees} = \frac{-\cos^{-1}K + 180}{2}$$

The length of a shorted stub is given by:

$$\text{Length in degrees} = \tan^{-1}\frac{\sqrt{Q}}{Q - 1}$$

The distance to an open stub from the point of V_{max} toward the sending end may be determined from:

$$\text{Distance in degrees} = \frac{\cos^{-1}K + 180}{2}$$

The length of an open stub is given by:

$$\text{Length in degrees} = \tan^{-1}\frac{Q - 1}{\sqrt{Q}}$$

It will be noticed that dimensions are given in degrees. Since a wavelength is equivalent to 360 degrees, the length may be converted to linear units by:

$$\frac{\text{Length or position in degrees}}{360} \times \text{wavelength of oscillator (in any unit, such as meters or cm.)} = \text{length or position (in similar units, i.e., meters or cm.)}$$

Example

To make sure that the use of these formulas is understood, let us go through an actual example. Referring to Fig. 8, the line is made up of +-inch diameter tubing spaced 1.56 inches center to center. Its characteristic impedance is 254.3 ohms and it is terminated with a dipole each half of which is 37.5 cm. in length. The meter used for maxima and minima measurements is a Jewell r.f. milliammeter (0—100 ma. current-squared scale).

We read V_{max} as 75 at 38 cm. and also at 113 cm. from the receiving end, thus giving us 75 cm. for one-half wavelength, or 1.5 meters as the wavelength. We read V_{min} as 9. Since these readings were taken on the current-squared meter,

$$Q = \sqrt{\frac{75}{9}} = 2.88$$

$$K = \frac{2.88 - 1}{2.88 + 1} = \frac{1.88}{3.88} = 0.485 = \cos 61°$$

$$\text{Position of shorted stub} = \frac{-61 + 180}{2} = 59.5°$$

Converting to cm.,

$$\frac{59.5}{360} \times 150 = 24.8 \text{ cm.}$$

from V_{max}, or 62.8 cm. from the antenna.

$$\text{Length of shorted stub} = \tan^{-1}\frac{\sqrt{2.88}}{1.88}$$

$$= \tan^{-1} 0.902 = 42.1 \text{ degrees} = 17.5 \text{ cm.}$$

$$\text{Position of open stub} = \frac{61 + 180}{2}$$

$$= 120.5° = 50.25 \text{ cm.}$$

from V_{max}, or 88.25 cm. from the antenna.

$$\text{Length of open stub} = \tan^{-1}\frac{1.88}{\sqrt{2.88}}$$

$$= \tan^{-1} 1.11 = 48° = 20 \text{ cm.}$$

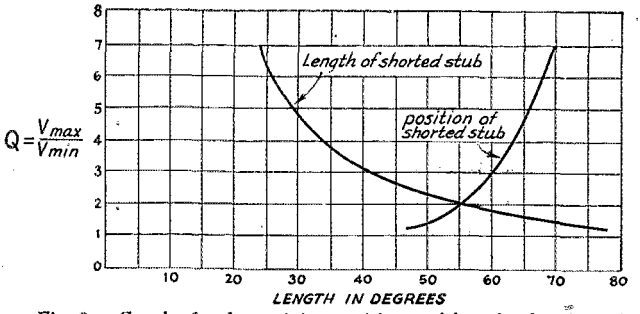


Fig. 9 — Graphs for determining position and length of a shorted stub. Dimensions in degrees may be changed to linear units after values have been taken from the graph. The spacing and size of the stub conductor must be the same as those of the transmission line.

Dimensions for both closed and open stubs are shown in Fig. 8. Note that, in the case of the position of the open stub, the distance is given as 88.25 cm. from the antenna. Since this is more than ½ wavelength, another point 75 cm. nearer the antenna should be used. This would bring the open stub 13.25 cm. from the antenna.

Use of Graphs

In order further to reduce the computations, two graphs have been prepared. Fig. 9 is used to find the position and length of the

shorted stub, while Fig. 10 is for the open stub. To use the graphs, only the ratio of V_{max} to V_{min} need be known. The only additional operation is conversion to linear units. By first calculating the results in degrees, they may be made to apply to any wavelength where it is physically possible to use this method. Of course, when the quarter-wave line for the r.f. meter is too long, other methods of obtaining maxima and minima must be used.

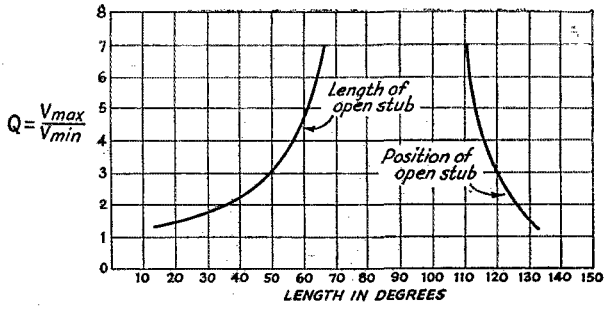


Fig. 10 — Graph for finding the length and position of an open stub when the ratio of V_{max} to V_{min} is known. Spacing and size of stub conductors must be the same as in the transmission line.

A Convenient Calculator

Fig. 11 shows an easily constructed calculator for quickly determining the length and position of a stub once the ratio of V_{max} to V_{min} has been determined. This calculator is an original development by Samuel Quaranta of the Rutgers ESMWT staff.

The calculator may be laid out on rectangular graph paper. First draw the 90-degree arcs, *A*, *B*, *C* and *D*, using the junction of the *X* and *Y* axes of the graph paper as the center and 13, 13.5, 14 and 14.5 graph-paper units respectively as the radii. Divide these arcs accurately into degrees with the aid of a protractor. Mark the scale labeled "Read length or position of closed stub" from 0 to 90 degrees in a counter-clockwise direction. Mark the scale labeled "Read position of open stub" from 90 to 180 degrees in a clockwise direction. Finally, mark the scale labeled "Read length of open stub" from 0 to 90 degrees in a clockwise direction.

Then plot the "length" and "position" curves according to the following table, using the graph-paper units:

Length Curve		*Position Curve*	
Over (*X*)	*Up* (*Y*)	*Over* (*X*)	*Up* (*Y*)
0	2.0	1.5	1.5
0.5	2.4	1.75	2.05
1.0	2.7	2.0	2.6
1.5	2.95	2.25	3.2
2.0	3.15	2.5	3.85
3.0	3.5	2.75	4.6
4.0	3.8	3.0	5.4
5.0	4.05	3.25	6.3
6.0	4.3	3.5	7.2
8.0	4.7	3.75	8.1
10.0	5.1	4.0	9.1
12.0	5.5	4.5	11.0
14.0	5.9	5.0	13.3

The movable pointer is 15 graph-paper units long and is numbered (1 to 7) every two graph-paper units, i.e., 2 graph-paper units equals one unit on the pointer. The pointer pivots at zero on its own scale, and at the junction of the *X* and *Y* axes. It is best to make the pointer of some kind of transparent material, such as stiff celluloid.

To use the calculator, first find the ratio of V_{max} to V_{min} experimentally as described previously. Locate this value on the pointer scale and move the pointer until its center line crosses either the "length" line or the "position" line at the ratio value calculated, depending upon which dimension is desired. Then read the position or length in degrees on the proper protractor scale. In the setting shown in the sketch of Fig. 11, the ratio of 4 indicates either a closed stub length of 33 degrees or an open stub length of 57 degrees. For position from the first point of V_{max} from the antenna, the reading on the "position" line would be used instead. "Position" always is measured from V_{max} toward the sending end of the line.

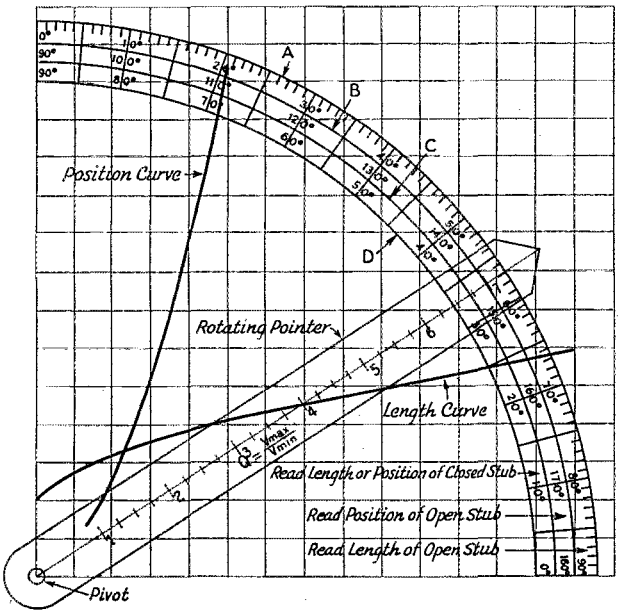


Fig. 11 — Calculator for determining length and position of stub when the ratio V_{max}/V_{min} is known. Directions for making a duplicate of the calculator and instructions for using it are given in the text.

Appendix

The admittance, looking into the line X distance from the load end, is:

$$Y_x = \frac{I_x}{V_x} = \frac{1}{Z_o}\left[\frac{1 - Ke^{-j\theta}}{1 + Ke^{-j\theta}}\right]$$

where $\theta = (2\beta_x - \psi)$, in which β = wavelength constant and ψ = angle of reflection coefficient, and K has the value given in the text. In trigonometric form:

$$Y_x = \frac{1}{Z_o}\left[\frac{(1 - K\cos\theta) + jK\sin\theta}{(1 + K\cos\theta) - jK\sin\theta}\right]$$

which upon rationalizing becomes:

$$Y_x = G_x + jB_x = \frac{1}{Z_o}\left[\frac{(1 - K^2) + j2K\sin\theta}{1 + 2K\cos\theta + K^2}\right]$$

or

$$G_x = \frac{1}{Z_o}\left[\frac{1 - K^2}{1 + 2K\cos\theta + K^2}\right]$$

$$B_x = \frac{1}{Z_o}\left[\frac{2K\sin\theta}{1 + 2K\cos\theta + K^2}\right]$$

If we choose a point on the line where $\cos\theta = -K$ it is noted that:

$$G_x = \frac{1}{Z_o}\left[\frac{1 - K^2}{1 - 2K^2 + K^2}\right] = \frac{1}{Z_o}$$

The place where $G_x = \frac{1}{Z_o}$ is where:

$$\cos\theta = \cos(2\beta x_s - \psi) = -K$$

or where:

$$\cos(2\beta x_s - \psi - \pi) = K$$

That is, where:

$$2\beta x_s - \psi - \pi = \pm\cos^{-1}K$$

or $\beta x_s = \dfrac{\pm\cos^{-1}K + \psi + \pi}{2}$ = place of stub if stub Z_o equals line Z_s.

For the case where G_x is equal to $1/Z_o$, the stub susceptance should be:

$$B_s = -\frac{1}{Z_o}\left[\frac{2K\sin\theta}{1 - K^2}\right] = \frac{-2K\sin(\pm\cos^{-1}K)}{Z_o(1 - K^2)}$$

$$= \frac{\pm 2K}{Z_o\sqrt{1 - K^2}}$$

If Q is defined as V_{max}/V_{min}, the value of stub susceptance may be written as:

$$B_s = \pm\frac{(Q - 1)}{Z_o\sqrt{Q}}$$

For a short-circuited stub,

$$B_s = \frac{1}{Z_o\tan\beta y_s} = \pm\frac{(Q - 1)}{Z_o\sqrt{Q}}$$

or

$$\beta y_s = \tan^{-1}\frac{\sqrt{Q}}{\pm(Q - 1)}$$

where βy_s is used to designate the length of the stub. For an open stub,

$$B_s = \frac{1}{-Z_o\cot\beta y_s} = -\frac{\tan\beta y_s}{Z_o}$$

$$\beta y_s = \tan^{-1}\frac{\pm(Q - 1)}{\sqrt{Q}}$$

VWOA Awards Marconi Memorial Scholarships

THE Veteran Wireless Operators Association recently presented Marconi Memorial scholarships to the top-ranking contestants in the annual nation-wide competition for high-school graduates conducted under the auspices of Science Service, which sponsors science and engineering clubs in high schools throughout the country. The competition ended in a tie, and as a result Frederic Corbin Leiner of East St. Louis, Ill., and Francis Herbert Horne of Johnstown, Pa., each will receive two years of free tuition at RCA Institutes School.

Fredric Leiner

Both of the winners are prospective radio amateurs. Frederic Leiner took the exam for his Class B ticket in November, 1941, but Pearl Harbor prevented his being assigned a call. Earl Masterson, W9WPB, introduced Leiner and a friend of his to the ham game. As Fred expresses it: "He helped us build a small regenerative receiver using a 6K7, 42 and 80. Besides copying amateurs until 4 o'clock each morning we picked up commercials from probably 80 countries, and in the meantime tried to dope out power supply, detector and oscillator circuits. By then we were in radio beyond all hope of recovery!"

Francis Horne

Leiner helped form a high-school radio club while attending the East St. Louis High School. He now possesses his Class A ticket and is active in WERS work, operating station WKBR-5.

The other winner of a two-year scholarship, Francis Horne, holds a commercial license and was formerly associated with b.c. station WJAC in Johnstown. Horne has helped other hams with their rigs, and was on the verge of going up for his ticket when the war interfered. His other hobby is flying and he has his own primary glider.

The Wail of the Kee Bird

Some Extraordinary Adventures of an AAF Ham in the Arctic

BY MAJOR J. W. HUNT,* W5TG-W5CCU

I HAVE been asked to write of some of my experiences while in the Arctic. I am a bit loath to do this, for fear some of you will think I am exaggerating. I can assure the skeptical that I am telling the truth, however, and should you who read this be assigned to that far northern land I hope you will take heed of the experiences I shall tell you about.

It all began about a year and a half ago. I was then the post communications officer, assistant signal officer, officer in charge of crash boats (involving fishing and oystering and a wee bit of floundering on the side), officer in charge of the communications to our bombing ranges on an island some 150 miles away (excellent swimming and fishing, along with duck hunting which was something to write home about), and a few other details. As you can see, I was terribly overworked.

However, I had become resigned to the hard life of testing new radio equipment on the crash boats over oyster reefs and testing our transmitting equipment at the bombing ranges after dark over very excellent flounder beds. Then, all of a sudden, I was relieved of duty at that field and ordered to Washington. I didn't mind this so much, but I did mind not being able to finish testing the new high-speed crash boat I was just going to take out on the bay when the message came and I was ordered back to headquarters.

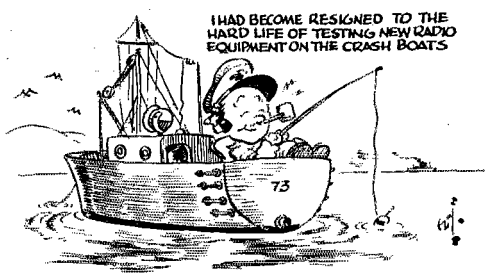
I will skip over the agonizing details at Washington. I spent two hectic weeks there, getting all my gear and equipment together. Many a night since I have awakened screaming, only to find that it was only a terrible dream — I was not really in Washington, after all.

Soon I found myself so doggone far north that the ground had some white cold stuff all over it. Later I came to realize that this stuff was snow. Down in Texas, we never really had believed such tales. In fact, I have never mentioned this discovery to my mother back in Texas for fear she would consider me a prevaricator.

It was indeed cold. I found that a strange thing happened to newcomers to that country. I had spots before my eyes, my stomach always ached about five hours after I ate a meal, and I was eternally cold. I found that, when a southerner first gets that far north, the blood turns to the consistency of sherbet. Alcohol dilutes it nicely, however, and it no longer semi-freezes. A few gallons a day will keep the uninitiated in very good condition.

But I digress. When I arrived, I was issued bags full of clothing. I received snowshoes, skis, strange boots and gloves, helmets and sox. I supposed that, sooner or later, I would learn what they were and how to wear them. It was sooner.

I had six men with me and we were placed on a plane and sent further north. There I really saw snow, because it was now the dead of winter. Nice and cool, too. I had on about three bags of clothing. I kept warmer that way, and besides I didn't load the plane down with so much baggage.



We were traveling smoothly along when suddenly the plane circled and landed in the snow. There wasn't a living thing in sight. Finally some weird-looking creatures came along. At first I couldn't figure out their nationality. All I could see was their clothing and the snow-covered mats of hair on their faces called beards. Some months later, however, I learned that they were Canadians or English or something like that.

We were taken to our camp. With some digging, we finally found our "shacks." They were only under some 15 feet of snow, so the digging took but a few days. Then we had a nice warm room with bath and all the comforts of home — almost. If we slept in our eider-down sleeping bags and wore our arctic clothing in the buildings, we were real warm. The baths were frozen up, but that didn't matter much. Since it is so cold up there, baths were not only unnecessary but unsanitary and very dangerous to health.

A few weeks after arriving we had the station in operation, and our true function at the place started. From that day on, life became very inter-

* Army Airways Communications System, Asheville, N. C.

The Kee bird is a fabulous creature well known to every ham and military radio operator in the Far North. Major Hunt — better-known as Jim Hunt, perennial hands-down liar's-contest winner at ham conventions — here reports his narrow escape from the Kee bird, as well as sundry other Gulliverian adventures.

esting. When it wasn't an engine breaking down, it was a colonel cracking down. Sleep was something that we remembered having heard pilots cussing about but didn't get any of much.

Then the giant Blue Termites (Arctic variety) started working on us. We first learned about them when they ate up one of our towers one

night. The entire steel tower was devoured. It seemed that the steel crystallized in the cold and the termites ate it with ease. They caused us no end of trouble.

The Blue Termites would eat our remote control lines, too. These lines had been laid upon the snow. Incidentally, the laying of these lines, while causing us no end of trouble, afforded the boys some real enjoyment. The reels of Signal Corps field wire we used were carried on racks placed upon sleds. These sleds were drawn by man power. Snowshoes were used and, as the distance was only three miles, not many of the men were lost in this undertaking. The exercise was fine, and all the boys were most eager to secure this detail. I have never seen so many appendices in bad shape, or so many cases of food poisoning, or sprained or frostbitten feet and hands, as would develop when the duty lists were posted for this detail.

The boys caught two baby Blue Termites. They were not over six feet long, so we kept them around for pets. I hated the things. They were eternally causing us trouble, and nothing we found would keep them penned up. Then one day one of the native Eskimos showed us a plant which the termites loved to eat. It stayed evergreen, even in the winter. So long as we kept a supply of this greenery in their pen the termites would remain content, sleeping in the balmy open at some 40° below zero.

It was not until later that I first encountered the terrible Kee bird.[1] This horrifying experience occurred after we had been transferred to another station. Several of us had flown over to the Pole one night (there was practically no daylight at that time of year, you understand) to Eskimo Joe's tavern. By the time we started home we were ready for almost anything. As we were flying along a terrible noise started up. It could be heard even above the roar of the motors. The pilot, who was an old timer, announced fearfully that it was the wail of the dreaded Kee bird.

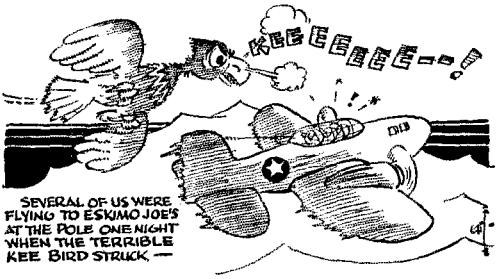
[1] For more details on the Kee bird, ask any ham who has been to the Far North.

Both motors instantly froze, causing us to make a forced landing. We came down behind a hummock of ice that resembled a house. Luck was with us, for it was really an Eskimo village. Some ten families lived in this strange community built over the ice. The natives lived on fish and seal caught through holes in the ice. They seemed a well-fed, happy lot.

After a few days the Kee bird quit his agonizing cries[2] and it was only a matter of a few weeks before we had the engines thawed out and were ready to take off again. This seemed to be our unlucky trip, however. No sooner were the engines started then the terrible Kee birds began crying again. Never have I heard such a terrible sound. The natives stayed huddled in their huts and shook with fear. Even the powerful Eskimo dogs shivered so hard they shook the thick hair off their bodies, and immediately froze to death.

Eventually the Kee birds departed, however. Again we thawed the engines, and this time we managed to get into the air and succeeded in returning to our base.

Many really amazing experiences occurred during my stay in the Arctic. One that I remember was our discovery of the true cause for those great crevasses in the ice. For long years it had been thought that these crevasses were caused by natural shrinking of the ice, causing great cracks to appear. Imagine our surprise, then, to find that the Blue Termites (Great Northern variety) are the real cause. These fierce things are about twelve feet long, and they live on ice. They have teeth on both their upper and lower jaws. The teeth along their upper jaws curve upward, extending about a foot and a half. The teeth on their lower jaws likewise extend downward below the jaws. These termites merely push their heads into a crack in the ice and open their mouths. The terrible teeth then serve as ice picks and crack off great chunks of ice, which fall directly into their open mouths.

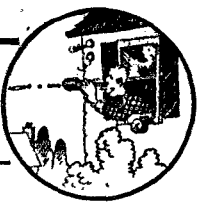


All in all, it was a very wonderful assignment. As I say, many strange things happen in the Far North. I found the Arctic to be a beautiful land of indescribable tints and colors. The Aurora never ceases to be a wonder of wonders, nor is your appetite ever completely satisfied.[3]

[2] The Kee bird's wail went like this: "Kee kee kee rist but it's cold up here!"

[3] If you have been up there and failed to see all that I have described, it must be because I went to very special places. Good rum, too!

EXPERIMENTER'S SECTION



Address correspondence and reports to ARRL, West Hartford, Conn.

PROJECT A

Carrier Current

HERE is a simple method of listening to the low frequencies on an ordinary broadcast-band superhet receiver without the use of a separate converter.

By inserting a properly tuned circuit in the grid circuit of the mixer stage and lowering the h.f. oscillator frequency, any frequency from 500 kc. to 50 kc. or even lower can be received (Fig. 1).

The receiver I used was a Sky Buddy. The oscillator circuit uses a split condenser, so that two added capacitors were needed to lower the frequency. I used a 0.003-μfd. mica fixed condenser (C_3) across the padder (C_2) and a three-gang variable b.c. condenser (C_4) across the main tuning condenser (C_1), connected with alligator clips.

The oscillator works fine from about 1000 kc. down very close to the intermediate frequency of 456 kc. Additional range is secured by varying the main tuning condenser.

For the mixer circuit I use three old-fashioned basket-weave inductances taken from an old t.r.f. b.c. set, with a small honeycomb coil in series for the lowest frequencies. The tuning condenser (C_5) is a four-gang affair with the sections in parallel. By taking, successively, L_1, L_2, L_3 and L_4 in series, any frequency down to about 80 kc. can be covered.

With the antenna hooked through a 0.01-μfd. condenser right on to the grid of the mixer, I am able to hear the 600-meter stations, airplane beams, naval stations and all the usual low-frequency stuff. By hooking the 115-volt line on to one of the primary windings of the basket coils through a condenser, I can hear all the line noise and QRN. I feel sure that, had there been a low-frequency oscillator in the vicinity, I could have heard it for some distance over the power lines.

This scheme should work with any superhet having a grid cap on the mixer tube, without making any changes in the receiver circuit itself. The only disadvantage is loss of the use of any r.f. stages and a.v.c. On some superhets only two condensers would be needed, as many do not use the split-condenser method of feed-back found in the "Sky Buddy."

I feel that the w.w. gang could use the circuit to advantage. The system seems to have more gain than I got from a regular low-frequency converter constructed a while ago. I got the idea of the low-frequency tuning from the comments on listening on 600 meters by W9FS in January *QST*. — *Leslie Merrill, W1NEI, RFD No. 3, Laconia, N. H.*

—···—

I would like some dope on c.c. transmission. The first I knew hams were using it was when I bought the July *QST*. It was my first *QST* since my entrance into the Army, so I am in the dark about c.c. regs, if any, etc. As a civilian I serviced the remote-control type of "juke-boxes," which used the c.c. method of operation. It was a new one on me when I picked up that *QST* and found that hams are using it. — *Pvt. Edward A. Zobec, W9EEC, Camp Cooke, Cal.*

—···—

I am using four 201-As in push-pull parallel, keyed in the grid circuit. The tank coil is center-tapped and coupled to the 115-volt line by means of a 0.004-μfd. condenser in series with the high side of the line. It is tuned with a two-gang 350-μμfd. variable condenser with the sections in parallel. The power supply is a motor-generator set, delivering 110 volts d.c. I have no filter in the output, which gives the signal a modulated tone of about 500 cycles. My receiver is a 4-tube t.r.f. a.c.-d.c. broadcast receiver with 262 kc. i.f. transformers substituted for the original coils. I hear the local radio range station on this, and think it is my fundamental frequency. I tune it with the regular condensers, then peak it up with the padders in the i.f. transformers.

I would like to communicate with anybody on radiation and on harmonic suppression, also field strength measurements. If anybody in this vicinity is interested in c.c., please look me up. — *Jack Berg, 218 So. State St., Springfield, Ill.*

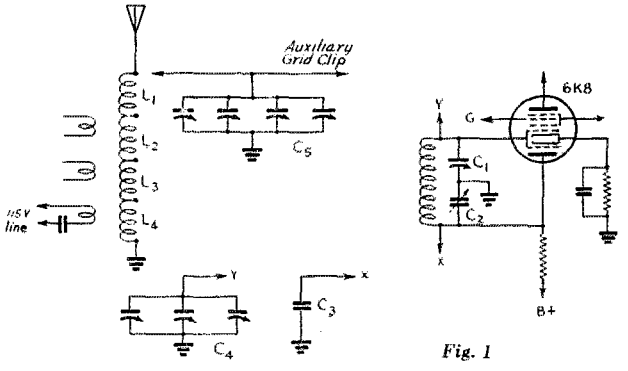


Fig. 1

I have been experimenting with c.c. in a small way and have built several transmitters operating on about 100 kc., one being a 25A7 in a Hartley circuit and the other a couple of 10s in a p.p. TNT. The latter had a range of about three miles by power line; the 25A7 considerably less. There are quite a few irrigation pumps running on a ranch near here, and the interference caused by them at present is terrible. I would like to hear from anybody in the territory around here interested in the same work. — *Arthur Solie, Rocky Point Route, Klamath Falls, Oregon.*

— • • • —

Have been following *QST* for a long time and never had much to say, though I do get in a chance between copies to read some of the really good articles. I have in mind Grammer's "Elementary A.C. Math," DeSoto on "Who Killed the Signal?" etc. Also am interested in c.c. at present. Am using Skyrider Marine for receiver and a single 6L6G transmitter, on 150 kc. Can you please insert my name with the information that I would be happy to QSO anyone operating on c.c. in the vicinity of Washington, D. C.? — *C. Ted Fisher, W3EOV, 443 19th St., N. E., Washington, D. C.*

— • • • —

Since I am interested in carrier-current transmission, I would like to know if there is anyone on c.c. here in Denver. My telephone number is GL9826 (Regis College). — *Pvt. Thomas W. Donavon, Regis College, Denver 11, Colorado.*

New Standard-Frequency Service of the Bureau of Standards

SINCE November 6, 1940, when fire destroyed the original National Bureau of Standards station from which standard frequencies were transmitted, WWV has been operating on a restricted schedule with low power. For the past three years a new and completely modern installation has been under construction at Beltsville, Md., near Washington, D. C., and the inauguration of this new station has just been announced. A new transmitting station has been built, 10-kilowatt radio transmitters installed, and additional frequencies and voice announcements added. The new extended services include: (1) standard radio frequencies, (2) standard time intervals accurately synchronized with basic time signals, (3) standard audio frequencies, (4) standard musical pitch, 440 cycles per second, corresponding to A above middle C.

The standard-frequency broadcast service makes widely available the national standard of frequency, which is of value in scientific and other measurements requiring an accurate reference frequency. Any desired frequency may be measured in terms of any one of the standard frequencies, either audio or radio. This may be done by the aid of harmonics and beats, with one or more auxiliary oscillators.

The service is continuous at all times, day and night. The standard radio frequencies are:

5 megacycles (= 5000 kilocycles = 5,000,000 cycles) per second, broadcast continuously.

10 megacycles (= 10,000 kilocycles = 10,000,000 cycles) per second, broadcast continuously.

15 megacycles (= 15,000 kilocycles = 15,000,000 cycles) per second, broadcast continuously in the daytime only (i.e., day at Washington, D. C.).

All the radio frequencies carry two audio frequencies at the same time: 440 and 4000 cycles per second. The former is the standard musical pitch and the latter is a useful standard audio frequency. In addition, there is a 0.005-second pulse, heard as a faint tick, every second. These pulses may be used for accurate time signals, and their one-second spacing provides an accurate time interval for physical measurements.

The audio frequencies are interrupted precisely on the hour and each five minutes thereafter, resuming after an interval of precisely one minute. This one-minute interval is provided in order to give the station announcement and to afford an interval for the checking of radio-frequency measurements free from the presence of the audio frequencies. The announcement is the station call letters (WWV) sent in telegraphic code (dots and dashes), except at the hour and half hour when the announcement is given by voice.

The accuracy of all the frequencies, radio and audio, as transmitted, is better than a part in 10,000,000. Transmission effects in the medium (Doppler effect, etc.) may result in slight fluctuations in the audio frequencies as received at a particular place; the average frequency received, however, is as accurate as that transmitted. The time interval marked by the pulse every second is accurate to 0.00001 second. The 1-minute, 4-minute and 5-minute intervals, synchronized with the second pulses and marked by the beginning and ending of the periods when the audio frequencies are off, are accurate to a part in 10,000,000. The beginnings of the periods when the audio frequencies are off are so synchronized with the basic time service of the U. S. Naval Observatory that they mark accurately the hour and the successive 5-minute periods.

Of the radio frequencies on the air at a given time, the lowest provides service to short distances and the highest to great distances. For example, during a winter day good service is given on 5 Mc. at distances from 0 to about 1000 miles, on 10 Mc. from about 600 to 3000 miles, and on 15 Mc. from about 1000 to 6000 miles. In general, reliable reception is possible at all times throughout the United States and the North Atlantic Ocean, and fair reception over most of the world.

Information on how to receive and utilize the service is given in the Bureau's Letter Circular, "*Methods of Using Standard Frequencies Broadcast by Radio*," obtainable on request. The Bureau welcomes reports of difficulties, methods of use, or special applications of the service. Correspondence should be addressed to the Director, National Bureau of Standards, Washington, D. C.

The Traffic Cop of the Air

An Interview with W. D. Terrell, Retired Director of FCC's Field Division

BY CLINTON B. DESOTO,* WICBD

AUGUST 31ST marked the retirement from active duty of the man who, more than any other in government service, has dominated the radio scene from the earliest days to the present.

That man is William Dandridge Terrell, for more than 32 years the head of the active field administration of radio law in this country. Appointed the first U. S. wireless inspector in 1911, before the nation even had any real radio law, he — to use his own phrase — has held the same job ever since.

Shortly before his retirement, we had the privilege of spending a morning with Bill Terrell in his FCC office in the Post Office Department Building in Washington.

That interview was more than a personal visit with a key figure in radio. It was a panorama of practically the entire history of the radio art.

Somehow, it's not so easy these days to think of radio as a "new" art. The existence of radio dates back practically half a century, and that's a long time. Especially in these present hectic hours, with new offshoots burgeoning so fast the parent art almost appears smothered by them, radio itself seems like a time-honored institution with origins stemming back into past generations.

It is an illuminating experience, therefore, to discuss the early days with a man who not only has witnessed the entire span of radio development with his own eyes but himself was the official head of the structure for the greater part of that time.

That's why we are using these pages to tell about that visit — and about W. D. Terrell.

Facing us across the expanse of the large and comfortable but characteristically un-ornate desk was the man who was director of U. S. radio for so many years. If you're an old-timer in the game, you probably won't need to be told how he looks. He hasn't changed much. The Bill Terrell of 1943 is still trim, sprightly, soft-spoken. He is whiter now, but there is iron left in his hair — and in his mind. His figure is just paunchy enough to give authenticity to his 72 years, but the old-time wisdom and candor and friendliness still are displayed on his face — and that glint of dour Scots humor still sparkles in his eyes.

It was an old-time radio ragfest. During that visit we traveled the road back to the stirring days when radio was young.

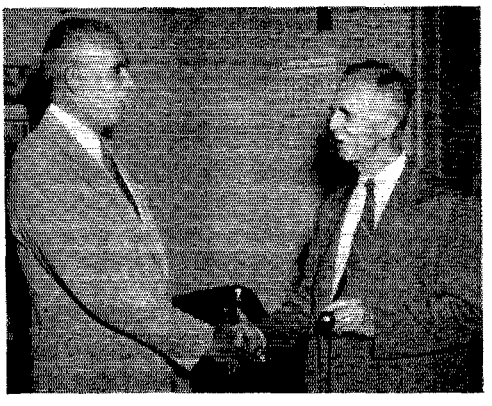
Mr. Terrell recounted many a tale of the old gear and the old days. He delighted in discussing the intricacies of the early contrivances — both those which represented real advances and those got up merely to circumvent someone else's patent monopoly. When he referred to the loose-coupler, for example, it was with the keenness and feeling of a second looey fresh from Signal Corps radar school expounding directional arrays.

We couldn't begin to repeat all the tales he told — or convey the quiet relish, the freshness of recollection. For it wasn't so much the stories themselves; it was the viewpoint — the air of savoring the now-trivial events that make up the legend of radio's past. Like the trouble Harry Lawlor, then operating the old New York *Herald* station in a building built on a pier at the edge of the harbor, used to have with his newfangled magnetic detector.

It was the most sensitive receiver of the day, but every time a boat docked it would bump against the pier, shaking the building — and, of course, the magnetic detector. The vibration would burn the tip of the contact wire, whereupon Harry would spend profane minutes adjusting for a new contact. Then would come the climax, when the other operator — who meanwhile had been rolling his traffic blithely along, unaware of the difficulty — was told that it would all have to be a repeat. (They didn't have break-in in those days, you understand.) Those were the only known occasions when the atmosphere in a radio shack reeked of something worse than the ozone created by the spark discharge!

There was one little story Terrell seemed particularly to enjoy. It concerned a very fancy and expensive British Marconi receiver — then supposed to be the best in the world — which the

* Editor, *QST*.



"Tell the amateurs I've always pulled for them and that I always will be pulling for them. They're a great asset to the nation," W. D. Terrell assures ARRL President George W. Bailey.

W. D. Terrell, for 32 years the chief traffic cop of the air, who retired on August 31st as Director of the Field Division of the Federal Communications Commission.

Mutual Telephone Company of Hawaii bought many years ago. It was a marvelous receiver, with a huge panel and a massive cabinet and countless knobs and switches. Mutual engineers unpacked it in glee and installed it with reverent care.

Yes, it was a wonderful receiver. There was only one thing wrong with it; it wouldn't work. Mutual tried for days to make it pick up a signal, but not a sound could they hear. They cabled London for advice. The reply was of no help. They cabled again. Weeks went by. The pile of cabled correspondence grew thick. Still the receiver couldn't be made to work. Finally, Mutual directed the Marconi people to send an engineer from London at their expense.

The engineer was dispatched on his month-long voyage. A few days before he was due to arrive, one of the boys in the Mutual lab began playing with the set again. He loosened one of the screws supporting the panel — and, to his amazement, heard a signal in the 'phones. The set was working! The only thing wrong all along had been that this screw was a trifle long and, projecting behind the panel, had shorted the main coil in the tuner.

That's the story — in condensed form. Bill drew the yarn out at length, savoring it all the while. It was the kind of thing that stamps him a true radio man. Only a dyed-in-the-wool brass-pounder, and preferably an old-timer, could extract full enjoyment from a tale like that. (And we'll lay money that, right now, you'll be doing mentally as we did: dredging up an anecdote from your kitchen-table days to match that one!)

No one is more conscious of the progress made in the radio art than W. D. Terrell, especially the advance of recent years. But the core of his affection is entwined with the old days when the game was new. He is steeped in its traditions; in his head and among his memorabilia repose much of its historical detail, a fact this writer has had ample occasion to appreciate in his own gathering of historical data on amateur radio.

Terrell loves to reminisce about the old-timers. We occupied a quarter of an hour discussing the whereabouts and the careers past and present of many of the best-known old-time hams whom Bill numbered among his friends — men like Grinan, Lemmon, Cooper, Hebert, Service, Runyon, J. O. Smith, Beale and many others. We talked, too, of some of the old-school inspectors, the supervisors of radio whose names became radio legend under his command — Kolster of the 1st District, Batchelor of the 2nd, Cadmus of the 3rd, Van Nostrand of the 4th, Detweiler of the 5th, Linden of the 6th, Lovejoy of the 7th, Lee of the 8th, Hayes of the 9th.

Yes, the old days in radio, when the game was young and adventurous and he was likewise — those are the days Bill Terrell loves to live in retrospect.

Eyes sparkling, he told of finding an old coherer while going over his accumulated store one day not long ago and taking it in to one of the bright young engineers of the Commission — a youngster fresh out of school, long on all the gadgets but apparently a trifle short on radio background. Bill didn't say so, but we guessed the lad had been throwing his engineering weight around a little.

"This is a brand new development," Terrell announced, proudly displaying the freshly cleaned coherer, its brass parts shining bright and its oak cabinet polished to gleaming luster. He went on to explain the principle of operation — how the iron filings cohered with the passage of the minute current from the signal, how the tapper made the particles decohere, and all the rest of it.

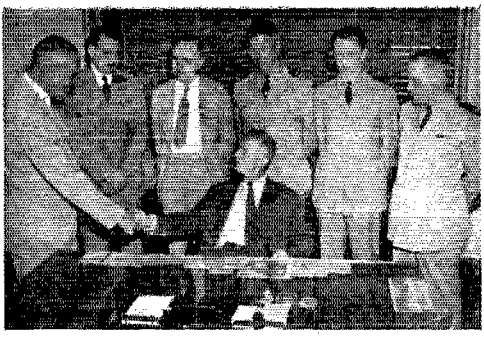
The bright young engineer was properly impressed. In fact, he became most enthusiastic and promptly showed the "new development" to one of his associates — an older man who knew his radio background. When he got through explaining it was a chastened young engineer who made his way back to his drawing table!

W. D. Terrell's love for radio is the inbred kind. From the first his life has been spent in the communications field. The first job he ever held was as a telegraph operator.

In 1889, at the age of 18, he went to work for Postal Telegraph at Golansville, W. Va. Two years later he was manager of the Alexandria office, just outside of Washington. In the course of another year his ability brought his transfer to the main Washington office, where he was successively operator, traffic chief and wire chief.

In 1900 the American Can Co. hired him away from Postal and placed him in charge of its leased wire service. Before more than a year had passed, however, he was back at his old job as wire chief at Postal, remaining there until 1903.

Then Uncle Sam called, and Terrell went to work for the government. On September 1, 1903, he entered the customs service, as telegraph operator on the Washington-New York circuit.



"Have a good time, Bill!" A group of well-wishers congratulate Mr. Terrell on his half-century of public service. *Left to right* — George W. Bailey, ARRL-OSRD, Clinton B. DeSoto, *QST*, George W. Turner, FCC, Lt. A. L. Budlong, USCGR (on leave from ARRL), Lt. Comdr. Wayne Mason (on leave from FCC) and Lt. Robert Brown (on leave from FCC).

He stayed in the Treasury Department until 1911. One day early that year he came across the announcement of a forthcoming Civil Service examination. It was for a new job which had never existed before — the post of "wireless ship inspector" in the old Department of Commerce and Labor.

Terrell liked the telegraph game well enough, but when he saw this announcement some instinct within him responded. It would not be correct to report that he said to himself, "Radio is the coming field, and I'm going to be the head of it"; such well-defined foreplanning rarely occurs.

But it is true that Terrell saw vistas in radio which weren't apparent to most of mankind. His telegraphing associates — including his own boss in the Customs — attempted to discourage him from trying for the job, saying that radio was a field with only a limited future.

It's a little surprising, then, that Terrell, whose actual knowledge of radio at that time was only slight, persisted in his resolution. But he filled out the application form.

Before taking the examination he thought he ought to learn something about radio. Unfortunately, there was no *Handbook* available then. As it turned out, however, his lack of technical knowledge wasn't a serious handicap; very few people in government then knew anything about radio, anyway. He passed without difficulty.

On June 5, 1911, his appointment as wireless ship inspector came through. The appointment was effective July 1st. That day W. D. Terrell went to work as a policeman of the air.

In the interval between receiving his appointment and the date his job became official, Terrell undertook to learn this radio art he was about to administer. There were no radio schools then, of course; you could go to college and learn electrical engineering and then try to figure out radio for yourself, or you could join the Navy and learn about radio there. Terrell compromised; he went down to Brooklyn Navy Yard and spent a month under the tutelage of a pair of chief gunner's mates. Their names, he recalls, were Schluter and Rice. He also spent some time at the Bureau of Standards and at the Navy Yard in Washington, D. C. But to Schluter and Rice he credits the foundation of his radio education. Rice later became one of his field inspectors, by the way.

Then, on July 1, 1911, he went to work as wireless inspector. He was stationed in New York and his jurisdiction was the entire eastern coast. His job was to see to it that ships on the Atlantic Coast obeyed the letter of the wireless law.

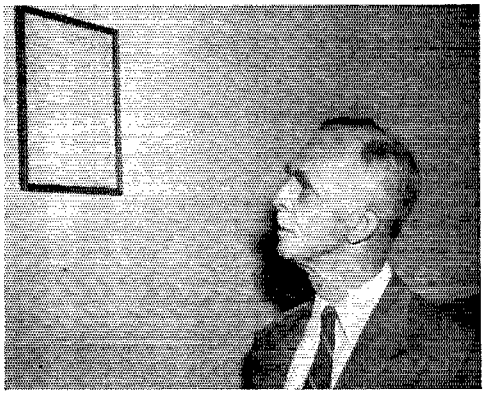
As it happened, however, the letter of that law wasn't very explicit. About all it did was require certain classes of ocean-going vessels to carry radio apparatus and operators. So one of Terrell's very first tasks was to help construct a satisfactory law. He was sent to England in early 1912, as one of the U. S. delegates to the London Radiotelegraph Conference. There the treaty was written on the basis of which, that August, Congress constructed the Radio Act of 1912 — the first comprehensive U. S. radio law.

It was then Bill Terrell's real job began. For the first time the Commerce Department had control over the air. The Bureau of Navigation girded itself for the task. Obviously, it was no one-man job. From the two men who comprised the staff in 1911, the organization grew rapidly. A dozen men were added in the next few months. At first they inspected only ship stations — and only the stations of those ships which entered the harbors of New York and San Francisco. Then inspectors were stationed at other principal coastal ports. Later the inspection of coastal land stations was added to their duties.

The Bureau never did get around to inspecting amateur stations, though — with perhaps one or two exceptions. There were too many of them, for one thing — and anyway, they seldom caused any real trouble.

"You could always count on the amateurs to coöperate," Mr. Terrell explained. "Oh, now and then there would be an irresponsible kid among them, but the older hams would keep him under control. Sometimes a newcomer would step out of line," he mused, "but we'd seldom have to take

W. D. Terrell inspects the first U. S. wireless inspector's certificate, issued to him on June 5, 1911.



action. We'd call him up and tell him to behave himself, and he'd stop. If he didn't, a word or two in the ears of one or two of the older fellows would take care of it. The amateurs always did a pretty thorough job of policing themselves. Even in the very early days, when there was no legal power maximum and the only limit was the size of a man's purse, we had very little trouble. Sometimes one of the boys would interfere with a government or naval station, and if it got too bad we'd call him in and have a talk with him — offer him some suggestions on how to tune and so on. Usually the trouble stopped right there."

The scope of the work grew swiftly. By 1915 the established system plainly had become inadequate and a major reorganization occurred. Terrell himself was transferred from New York to Washington as BuNav's chief radio inspector. Nine district field offices were set up, each with a full-fledged radio inspector in charge and as many assistant radio inspectors as required. More men were added to the staff, increasing the total to 35.

Then came the war, and the entire picture was redrawn overnight. All radio installations were placed under Navy control. The Department of Commerce (the "and Labor" had been eliminated in 1913, with the creation of a separate Department of Labor) still retained responsibility for inspecting ship installations and issuing licenses to radio operators.

There was plenty of work to do. The problem was how to get it done. Then, as now, civilian manpower was a shortage item. Before the war ended, Mr. Terrell was the only man left of the original staff. All the others had joined the armed forces — mostly the Navy. Terrell tried to go, too; in fact, he'd completed arrangements to enter the Navy, when the Secretary of Commerce intervened and convinced all concerned that he was needed more in his civilian post.

It was not until April, 1919, six months after the Armistice, that control of radio was relinquished by the Navy, and the Bureau of Navigation resumed its full functions. The problems of peacetime adjustment were big ones. Perhaps the biggest was that of amateur licensing. All prewar amateur station and operator licenses had expired, of course, and thousands of newcomers wanted tickets. All were frantic to get going when the amateur ban finally was lifted, on September 26th. So far short of the clerical help required to do the job was the Bureau that, even by issuing "provisional" licenses in the form of brief typewritten statements of authority, it took two months to break the jam and dispose of the applications on hand (an experience which has been regarded by the present FCC as a salutary lesson, by the way; witness their policy of continuing amateur licenses in force).

The next big problem came in 1921, when the broadcasting meteor first appeared across the firmament. Again there was no adequate law. The Radio Act of 1912 had made no provision for such a phenomenon, simply because nothing of the sort then could have been foreseen.

(Continued on page 94)

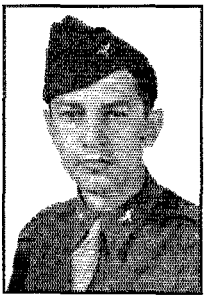
Gold Stars

EUGENE ARMSTRONG, W4AGS, 26, lost his life when the Standard Oil Co. tanker, *R. P. Resor*, was sunk in February, 1942. The loaded tanker was off the New Jersey coast when an Axis U-boat, with running lights aglow, fired a torpedo into its side and converted it into an inferno. One survivor reported that Gene had made his way from the ship through the thick oil floating on the water, but was too exhausted to climb aboard the life raft. When the rescue boat arrived, Gene had disappeared.

W4AGS became interested in radio at the age of 13. Under the tutelage of W4KB, he received his ticket a year later. His enthusiasm for radio continued throughout his high-school years. In 1937 he graduated from Port Arthur College, where he attained the highest average in his class, and then became radio operator on the Southern Steam Ship Company's *City of Philadelphia*, operating between Houston and Philadelphia. He transferred to the ill-fated *Resor* in June, 1941.

HERMANN C. ADAMS, W2HDD, 23, was killed in October, 1942, when the bomber he was piloting crashed to the ground near Columbus Field, Miss. He was coming in for a landing from a routine training flight with an instructor, when one motor went dead. The plane faltered, and a wing hooked into the ground. Because of the low altitude, they could not parachute to safety.

W2HDD built his first crystal set at the age of ten, and thereafter all his spare time was devoted to his radio hobby. He became a radio engineer for National Union Radio Corp. of Newark, N. J., but enlisted in the Air Forces soon after Pearl Harbor. He received pre-flight training at Maxwell Field and advanced training at Decatur Field. At the time of the accident he was completing his aviation training, and was to have graduated two weeks later. At the direction of Army Air Forces commander, General H. H. Arnold, Hermann's wings, the badge of achievement he would have received so soon, were presented to his mother in honor of her son's memory.



Official AAF SETC Photo

STRAYS

If you wish to keep up on your code speed and don't know whom to copy on regular schedule, tune to WSL at 10 P.M. each evening for some of the most perfect press copy an operator could desire. WSL may be received on 109 and 5,555 or 10,115 kc.—*DVRA News.*

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It has come to our attention that occasionally WERS operators have been refused photocopies of their station licenses on the grounds that such copies are illegal. Proof of the legality of photocopies of WERS licenses will be found in section 15.54 of the WERS amendments given on page 22 of *QST* for August, 1943. Show this to the photostat man, if he demands authority for doing the job.

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"Hydrolants" are being transmitted from East Coast radio stations by the U. S. Navy's Hydrographic Office. Coined from the phrase "hydrographic messages of the Atlantic," hydrolants are International Morse code messages giving warning of sunken wrecks, drifting mines, unexploded depth charges, changes in position of lights or buoys, and other data to help protect seafaring men from danger.

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According to Ralph R. Beal, research director of RCA, full-scale commercial television within the range of the average pocketbook will become a reality after the war. He predicts home receiving sets with screens from 6 to 24 inches in width and indicates that color telecasts also are a probability.

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Looking for a place to wear your League emblem? A neat arrangement is to solder the emblem on a metal belt loop, slip the loop onto your belt, and attach your watch chain to it.—*W8VD.*

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Aerovox has announced production of new ultra-small tubular oil-filled condensers for use where space and weight are at a minimum. The units meet all standard specifications for paper dielectric condensers used as mica alternates, and range in value from 0.001 μfd. to 0.01 μμfd. at 300 to 800 volt ratings. They are available with both terminals insulated or with one terminal grounded to the case.

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A new record-marking device which makes possible accurate individual timing of sound effects and music has been put on the market by Heroservice of New York City. Called the "Spot-O-Graph," it is designed in the form of an ordinary record but has a partition down the center on each side of which there is a minutely graded scale where all notations are made. The needle then can be placed exactly in the right spot.

A booklet, "The ABC of Electronics at Work," which gives the elementary principles of the basic ways in which electron tubes function, may be secured free by writing Westinghouse Electric and Manufacturing Co., Dept. 7 N 20, East Pittsburgh, Pa.

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A new publication, "Electric Instruments, Principles of Operation," presents a concise discussion of the characteristics of instruments, what makes them operate, and individual limitations of various types. It is available on request from the General Electric Co., Schenectady, N. Y.

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I noticed the following in *Radio Craft* for January, 1943: "I use a 48-inch, vertical antenna about 50 feet from the ground. The antenna is coupled to the set by 50 feet of twisted hair." Wonder which works best, blonde or brunette? At that, I think red hair would put more soup into the antenna!—*W2EAF.*

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The Ideal Commutator Dresser Co., Sycamore, Ill., has available flashlight-type rechargeable storage batteries to fit all popular two-cell size D cases, which might be of interest for transceiver filament supply, etc. Each battery can replace 400 or more dry cells by recharging periodically. A 1.9-volt lamp is used with the cells, which are spill-proof and easy to fill with liquid. Their capacity is 2 ampere hours and the normal discharge rate is 450 ma., or 600 ma. maximum. The cells are 1¼ by 4¾ inches in size, weigh 7 ounces, and come in transparent plastic cases. Chargers are available for single or gang use on either a.c. or d.c. sources.

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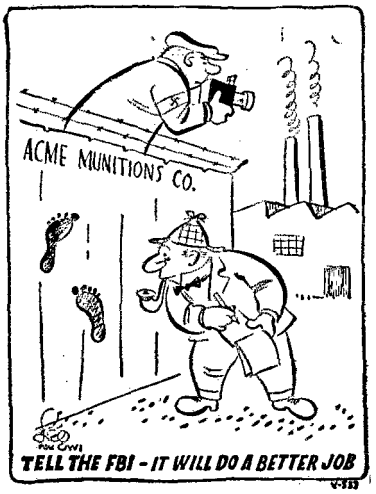

HINTS AND KINKS FOR THE EXPERIMENTER

COOLING THE PETERSON "POT"

REFERRING to the article by Arnold Peterson in September, 1939, *QST* on a high-*Q* oscillator for very-high and ultrahigh frequencies, the writer offers an adaptation of the "pot" oscillator.

When the positive high-voltage terminal is connected to the tank coil of a transmitter, precautions should be taken to keep the operator from coming into contact with the tank coil while the voltage is on. In a receiver, the use of a tank circuit such as Peterson has developed is very awkward unless the negative high voltage lead can be connected to the outside of the "pot." Shielding presents quite a problem if the tank is hot, and work on the rest of the receiver becomes hazardous to the nerves.

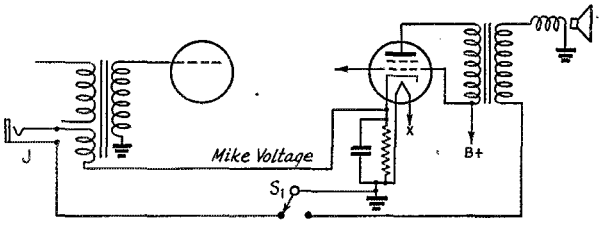

Fig. 1 — **Method of applying parallel plate feed to a Peterson oscillator, avoiding d.c. voltage on the "pot."**

Fig. 1 shows the method used on one of the Peterson oscillators to get it "house-broken." The filament connection is through a concentric lead. The adjustment of this connection is quite critical as regards oscillation control. A movement of about 1/64 inch will suffice to cause superregeneration instead of a pure d.c. oscillation. No values are given, since these will depend upon the frequency for which the oscillator is designed. However, experimentation with the value of the grid leak always is in order and might lead to a reduction of the critical nature of the filament-line adjustment. — *Frank D. Lewis, W1LKV (ex-W9AOG).*

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SOME HETROFIL SNAGS AND THEIR SOLUTION

NO DOUBT many have constructed the Hetrofil described in the September, 1939, issue of *QST*. If the writer's experience is anything to go by, some will have found results not quite as satisfactory as they had hoped. Perhaps these few notes will assist those who have found snags. The original circuit is shown in Fig. 2-A.

In the first place, the Hetrofil will virtually eliminate any single audio frequency if properly constructed, but it cannot be expected to deal with an unsteady note or one that is heavily modulated. Given a really steady unmodulated frequency, it can and will eliminate it.

Those who have found that a balance cannot be obtained will be interested to know that the most likely cause of the trouble is in the ganged resistors, R_2 and R_3; in fact, if one considers it for a moment, it would have been rather surprising if these items *had* tracked accurately. In practice they seldom do. Even supposing one had obtained a satisfactory pair, there would still be a slight variation in the capacities of the condensers to be reckoned with. By the addition of one further component, the difficulty is overcome. This consists of a potentiometer of 1000 ohms, R_7 in Fig. 2-B, connected in such a manner that, when moved in either direction from its central position, it adds resistance in one leg at the same time subtracting it from the other. A little thought will show that any failure on the part of the ganged potentiometers to track is thereby compensated.

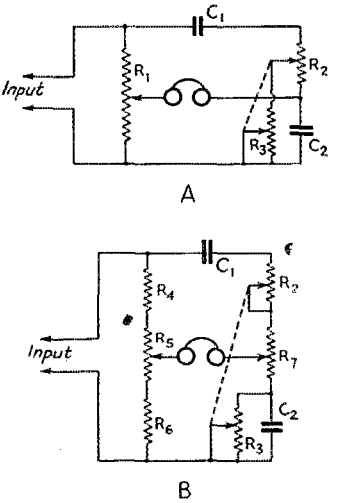

Fig. 2 — Suggestion for improving the performance of the Hetrofil. The original circuit is shown in A. The addition of the resistance, R_7, in B permits compensation for differences in characteristics of the ganged resistors, R_2 and R_3, and the fixed condensers, C_1 and C_2.
C_1, C_2 — 0.05 μfd.
R_1 — 5000-ohm potentiometer.
R_2, R_3 — Ganged 10,000-ohm potentiometers.
R_4, R_6 — 2000 ohms.
R_5 — 1000-ohm potentiometer.
R_7 — 1000-ohm potentiometer.

A further cause of failure to obtain a balance was found to be a difference in the power factors of the two condensers, C_1 and C_2, and this was especially noticeable on strong signals. This trouble was also cleared up by the addition of the compensating potentiometer.

It will be noticed that two fixed resistors of 2000 ohms, R_4 and R_6, and a 1000-ohm potentiometer, R_5, have been substituted for the 5000-ohm potentiometer, R_1, in the original circuit. This does not affect the operation in the slightest. The change was made because the items were the only ones available.

Without doubt, this little gadget will find an important place in the shack after the war, and in this connection, experiments are being conducted with a view to including it in the input circuit of a tuned audio stage. — *F. Dearlove, G2OQ in the RSGB Bulletin.*

EDITOR'S NOTE. — In the commercial Millen version of the Hetrofil, the trouble described by G2OQ is overcome by providing a "sloppy" shaft connection between the two ganged resistances. This permits one of the resistances to be varied slightly for compensation without moving the other.

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COMBINATION MODULATION AND FIELD-STRENGTH INDICATOR AND EXTERNAL S METER

THE diagram of Fig. 3 shows the circuit of a gadget which I have found very useful around the shack. With it I can check percentage of modulation as well as carrier shift. It may also be used as a monitor, field-strength meter or external S meter connected to a receiver.

The unit is used as a field-strength meter by throwing both switches to the right. Be sure that L_1C_1 will tune to the transmitter frequency. Use a whip antenna for pick-up. Best results will be obtained by placing the whip on the end of a wooden pole about ten feet in length. This will allow the antenna to be up high enough to pick up the signals easily. In this case a ground connection is rather impractical, although a ground rod might be stuck into the earth wherever a reading is taken.

By walking around the antenna, keeping the meter reading constant, the pattern of the antenna may be traced. If a headset is plugged into the jack, the person taking the readings will be able to listen for instructions from the transmitter operator at the station.

A similar antenna and a ground connection may be used when checking modulation percentage. With S_2 thrown to the carrier-shift position, adjust R_2 until the meter reads half scale. Now flip S_2 to the other position and the meter will read percentage of modulation, the half-scale point indicating 100 per cent. If desired, the meter may first be set to full scale. Full-scale reading will then indicate 100 per cent modulation, but it must be remembered that the meter may have a tendency to overswing.

I have checked the unit against RCA equipment in use in broadcast stations and have found that the scale is very accurate when properly set. However, because of the possibility of irregularities in construction, I would advise first checking it against some accepted standard.

Signal quality may be checked by merely plugging in a headset and listening for hum or distortion.

When the instrument is to be used as an S meter, S_1 is thrown to the left. The size of R_5 may have to be adjusted according to the number of tubes in the receiver. If the meter does not give the correct S reading, remember that lowering the resistance will increase the amount of meter swing for a given signal strength.

The whole unit, exclusive of filament battery can be built in an inclined-panel meter case. In operation the meter is sensitive to hand-capacity effects, so the use of a ground connection is recommended whenever possible. — *Irvin F. Miller, W5KSF.*

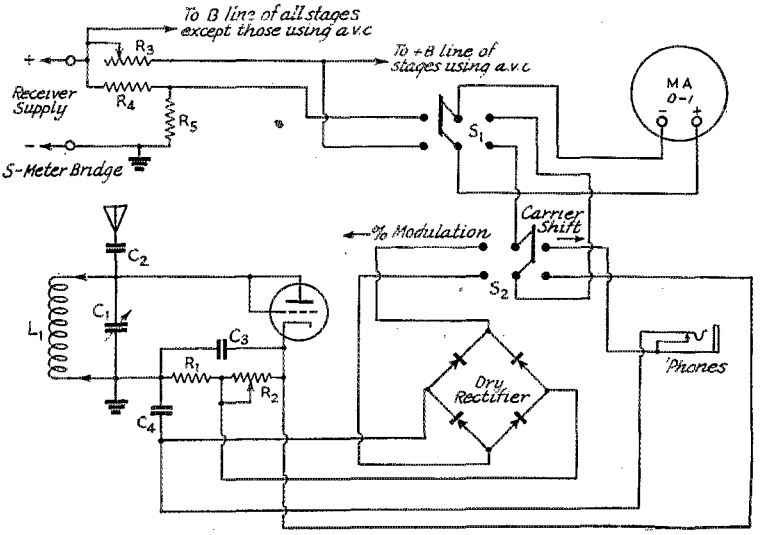

Fig. 3 — Circuit diagram of a combination instrument for indicating carrier-shift, modulation percentage or field strength. It may also be used as an external S meter connected to a receiver. The tube used is a type 1G4G.

C_1–L_1 — Any combination which will tune to the desired frequency.
C_2 — 100 μfd.
C_3 — 0.001 μfd.
C_4 — 0.1 μfd.
R_1 — 5000 ohms.
R_2 — 30-ohm potentiometer.
R_3 — 1000-ohm potentiometer, wire-wound.
R_4 — 2000 ohms.
R_5 — 50,000 ohms approximately (see text).
S_1–S_2 — D.p.d.t. switch.

HEADPHONE CONNECTIONS IN B.C. RECEIVERS

IN THE "Hints and Kinks" section of *QST* for January, there appeared a suggested arrangement for connecting headphones in the output of a b.c. receiver. While the idea may work, I think there are better ways of doing the job. It seems to me that a 2-watt resistor would be rather skimpy for the job in most output stages. A more serious objection, however, is the fact that the tube would be operating with its screen voltage considerably higher than the plate voltage, which isn't a very good idea.

A better plan would be to place the switch in the voice-coil circuit so that the voice coil could be cut out and an equivalent resistance substituted, as shown in Fig. 4. The headphones may be connected in all the time, since they do not impose much additional load on the tube. Alternatively, the volume control, R_2, may be fitted with a switch to open up the circuit. — *Roy Usher, VE4EA.*

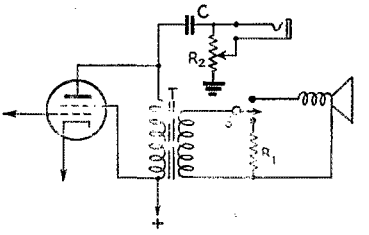

Fig. 4 — Circuit diagram showing another method of connecting headphones in the b.c. receiver output.
C — 0.01 μfd. or larger.
R_1 — Resistance to match speaker voice coil; 4 or 5 ohms, 10 watts.
R_2 — 0.1-megohm potentiometer.
S — S.p.d.t. toggle.
T — Receiver output transformer.

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GRAPHICAL METHOD FOR PARALLEL RESISTANCES

A SIMPLE way of computing the resultant of two resistances in parallel, or two capacitances in series, by graphical means, is illustrated in Fig. 5. A piece of rectangular graph paper or a series of equally spaced horizontal lines will serve as the scale.

To determine the resultant of any two resistances or capacitances, draw a line from one value of resistance or capacitance on one scale to the base of the opposite scale. Then draw a second line from the second value on the opposite scale to the base of the first scale. The height of the intersection of the two lines determines the resultant. Fig. 5 illustrates the case of 6-ohm and 3-ohm resistances in parallel, or 6-μfd. and 3-μfd. condensers in series. The resultant is either 2 ohms or 2μfd., as the case may be.

If the scales are divided into 10 units, the units may be considered to have a value of 1, 10, 100 or 1000, as the case at hand requires. For instance, capacitances of 600 μμfd. and 300 μμfd. in series will give a resultant of 200 μμfd.

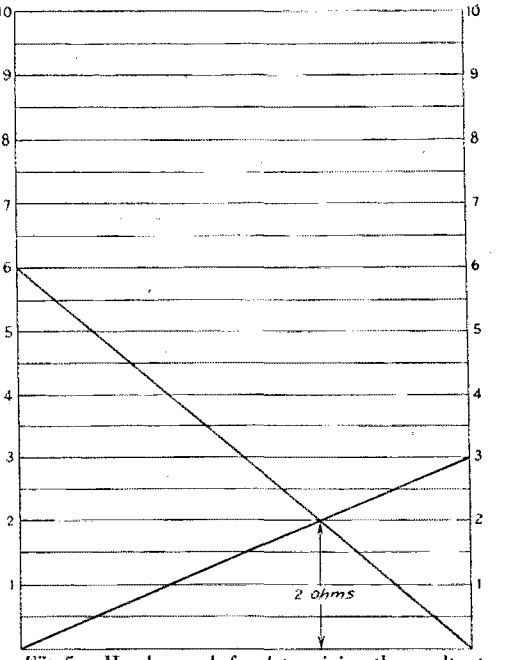

Fig. 5 — Handy graph for determining the resultant resistance of two resistors in parallel or the resultant capacitance of two condensers in series. The case of 6 ohms and 3 ohms in parallel is illustrated.

If the resultant of more than two units is required, the resultant of two may first be determined, then the resultant of the third value and the first resultant obtained, and so on. — *O. C. Crossland, W9IXV.*

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GANGING VOLUME CONTROLS

IT SOMETIMES arises that a ham has need of a special dual or triple volume control for which a satisfactory substitute cannot be found in the catalogs. By use of the following method, any values of resistance and taper may be combined in any number of controls up to four or five, depending on the length of shaft desired.

It so happens that the Mallory-Yaxley type of volume control is easily ganged in the home workshop. The first step is to remove the shell (including the cover plate) of the control which is to be in front. This is done by prying out the three ears holding the shell on the main assembly. The cover plate should be soldered to the shell at several points around the edge, to prevent it from moving.

Then measure carefully to find the center point of the cover plate. Scribe a cross on the plate at the exact center. With a pair of dividers, scribe a 3/8-inch circle about the center. As a substitute, measure 3/16-inch in four directions and trace around a volume control bushing or other similar-sized object. Punch the center mark with a sharp center punch and drill through carefully, using the smallest drill you have, to re-

(*Continued on page 90*)

CORRESPONDENCE FROM MEMBERS

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

TECHNIQUE IN TUNISIA

APO 34, c/o Postmaster, New York, N. Y.
Editor, *QST:*

. . . During the excitement of the North African campaign my membership ran out, but now that we have a little breathing spell the old ham spirit is going strong again.

Amateur training and ingenuity certainly show up in field operating, as well as in the rough-and-ready repairing done by the technicians in the field. The Army is finding out that a technician cannot be made in ninety days, and is beginning to appreciate the amateur more and more.

During the time the Axis was leaving Tunisia, I had a chance to examine much of their radio and wire equipment. They have some excellent plastic and synthetic rubber insulation on their cables and field wires.

The German aircraft radio equipment seems to be of rather old design. Their field and tank sets are much more modern, but not as far advanced as our equipment. For the most part they use unit construction in their equipment, with each stage in its own cast compartment and the whole thing bolted together. Practically all of the small parts are fastened to the chassis by screws or bolts, instead of rivets, and the most surprising part of their construction is the liberal use of aluminum machine screws.

The tubes used have very good shockproof construction, with well-spaced leads. When plugged in, they are surrounded by the socket in such a way that they are not easily broken. . . .

— *Sgt. L. H. Wilson, W9ABN*

TRANSMISSION-LINE TEXT

809 Minnesota St., Hibbing, Minn.
Editor, *QST:*

Have just finished reading the article, "Notes on Transmission Lines," in your August issue, and I want to congratulate W3JXY on his excellent presentation of this timely subject.

I would like to add that the reader with a fair mathematical background will find a rigorous derivation of the general equations as well as other interesting material in the text I used at the University of Minnesota — "Principles of Transmission in Telephony," by M. P. Weinbach, published by MacMillan. Despite the title, the material covered applies as well to power lines, telephone lines and v.h.f. lines. There is an excellent mathematical introduction, including a discussion of hyperbolic functions, the derivation of the general equations, applications to infinitely long lines, open-circuit lines, short-circuited lines and lines with a definite load impedance. In addition, there is a chapter on energy transfer and reflection phenomena. The fact that the ohmic resistance of the conductors and the leakage (or parallel) resistance of the line are considered makes the equations accurate for long lines, such as long antenna feeders, etc.

My reason for calling this text to your attention is that, while the presentation is complete because the entire volume is concerned with the derivation and application of the general transmission equations, the book is seldom mentioned in bibliographies and does not seem to be generally known to radio men.

— *Arthur L. Bennett, W9ADS*

ARCHITECTURAL THREAT TO AMATEUR RADIO

5621 Georgia Ave., Washington 11, D. C.
Editor, *QST:*

Having read a recent publication of the International Congress of Modern Architecture, I am beginning to realize that the fruition of their plans may mean the extermination of hamdom.

Their ideas are quite sound, and the cities of the future which they propose will be, no doubt, most desirable places in which to live. However, if we are to take the so-called model city of Greenbelt (a government-controlled experimental community on the outskirts of the nation's capital) as an example, I fear that we shall have to limit our ham activities to speculation and theorizing.

For no antennas are permitted in Greenbelt! All hams know the significance of such a statement, particularly after McMurdo Silver's article in June *QST*. How can any ham work without a radiator? Nor are you to think that they'll not try to enforce the law.

I knew several hams in Greenbelt who, after much friction with the authorities, resigned themselves to operating walkie-talkies on 2½ from their parlors or park benches. With such an arrangement, of course, they were not able even to work into Washington. The thought of erecting any sort of tower, beam, or long wire brings shudders to them. They attempted to work out with 10-meter antennas, camouflaged as much as possible, but soon were discovered. Any sort of sky wire had to come down. The particular irony of the situation was that one of the hams was employed by the FCC.

I am not in any way defending the present city system, and am very anxious to see the modern roomy city of tomorrow come into its own. We see however, the menace of ideas which, if anything can, will abolish amateur radio. We cannot trust self-government to win for us, for many of

us are acquainted with the blind prejudice of many b.c.l.s who would block us in all ways possible. They will soon forget our contribution to victory. . . .

It is the ARRL's place to obtain our rights for us, as they have so nobly done in the past. But I advise action now, as the proposals of the CLAM are far more attractive in the public mind than are 20-meter beams.

— *John Versace, W3JIA (Trustee)*

OVER THERE

Station Hospital, Camp Fannin, Tex.
Editor, *QST:*

After nearly a year over the big pond and through the invasion of Africa and then the Tunisian campaign, I am home again. *QST* was always passed on to some of the boys after I read it, and I know all copies were enjoyed by everyone who had a chance to get his hands on them. . . . I have been back a couple of months now, but didn't change my address before. I knew my mail was being sent to the hospital I had been in over there, and the nurses would see to it that, when *QST* arrived, it went to some poor guy from the Signal Corps.

I even left my Hallicrafters Sky Traveler there because I knew what it would mean to the sick and injured. And, believe me, that was my pet. It went through some pretty close battles. . . . I hope that I can find another one somewhere before I go back across. I am scheduled to go again, and I'm rarin' to go any time now.

Keep up your fine work. The staff at Headquarters will never be able to know how very much they are appreciated.

— *John T. Porter, W5AKZ*

REPORT FROM K6

1925 Keeaumoku St., Honolulu 4, Hawaii
Editor, *QST:*

Having just received my copy of *QST* and looked it over, it seems to me that the K6s should be heard from.

In December, 1941, when the war broke loose on us, I discovered to my disgust that I was classed as "too old" for service in uniform. Naturally, we old timers of World War I think that is ridiculous. We feel that, while we could not qualify as commandos or rangers, we could take over some of the "at home" jobs. However, as I could not get into uniform, I signed up as a civilian engineer with the U. S. Army Engineers and am still at that job.

Since I am not located in downtown Honolulu and have little opportunity of keeping in touch with the ham gang I don't know what all of the K6s are doing, but I have run across five or six of them. Three are working in civilian capacities with the Signal Corps and one is a commander in the Navy, assigned to the communications section. As far as I know, only one of the K6s "ran out" on us after the December 7th attack. I am sure all of the gang are doing worth-while work. After the war is over I shall collect all the information I can regarding their work and send it in. Ham radio played a part here, but that also will have to wait to be told.

I noticed on page 31 of the June issue of *QST* a picture of Capt. Lattig, K6UGK. He called at my shack on the morning of December 8th, and both he and the sergeant with him looked as though they had been doing a tough job.

December 7th seems a long time back, but it is not forgotten here. It seemed so utterly unreal that I could hardly make myself believe it. We were too stunned to be scared at first — then we got mad, and we still are mad. . . .

We have become used to the rigid blackout regulations and the other restrictions necessarily placed on us by the military rule under which we have been living. Restoration of partial civil control helped to some extent. . . . We still have rigid blackout and must be off the streets by 10 P.M. We may drive our cars (if we have any gas or tires) until then, provided we have approved blackout headlights. (They do not give any light, but they do make it possible for the other driver to see us coming). . . .

This letter has been written to let you know the K6s are still here, keenly looking forward to the day when we can get back on the air. After the war the hams are going to be a big factor in more firmly cementing and extending that friendship fostered among the United Nations by fighting shoulder to shoulder in the cause of freedom for the people of all nations.

— *Hugh C. Rea, K6OTH*

FROM A ZEDDER PILOT-HAM

122 Sheehan St., Gisborne, New Zealand
Editor, *QST:*

I am a pilot in the New Zealand Air Force and in the course of my travels I have met several W hams, including some I worked in the good old days on 20 meters. Needless to say, the conversation always works round to those days, and many are the lies of DX, etc.

Our two countries owe a great deal to the hams — although getting them to acknowledge it is another matter, speaking for New Zealand anyway. Nearly every radio operator in the Force seems to have been a ham.

I am sure that hams all over the world are expecting the ARRL to look after their interests after all this is over. Personally, I think we will have a fight for our existence. It is not pleasant to tune over our old bands and listen to the commercials plastered therein.

The ZL gang is well split up and scattered over the earth. I am continually meeting chaps I worked before the present inter-tribal brawl.

Here's hoping the present war will soon be brought to a conclusion and we can again send a CQ into the ether.

— *D. A. Leslie, Sgt./Pilot, RNZAF, ZL2UH*

THE SPIRIT'S STILL THERE

c/o Fleet Post Office, New York, N. Y.
Editor, *QST:*

. . . Getting around here and there, I have met quite a few hams. Some were on other ships and others were civilians in the localities where I have been. But the strangest thing of all happened in a port where I least expected to meet anyone interested in ham radio.

I was sitting on the dock, admiring a new antenna I had just put up and getting the same old feeling I would have if it had been a new antenna for 40 meters. While I was sitting there, a chap came over. I guess he must have noticed the rating badge on my arm, for he asked me if I was a ham. When the answer was in the affirmative he pulled out a 1942 edition of the *Handbook*, and then the questions began to fly.

Well, we sat there for a couple of hours, talking over old times and drawing circuits of the new rig, passing back and forth ideas for different circuits. A good two hours passed and I had even forgotten that I was a part of the Navy. For those two hours I was back home, with the rig going full blast. . . .

I guess that ragchew would have been going yet if the cook hadn't yelled, "Chow down!" That is about the only thing that could have got me away from talking about the old times. Though I can remember many a meal I missed because I wanted to stay on the air a little longer and contact that W6. . . .

The old spirit of ham radio is still there, just waiting for the signal to go. Keep up the good work.

—*Basile J. Guerra, RM2c, W2MBD*

SO ONE HAM MAY KNOW THE OTHER

451 Evergreen Ave., ATO House,
A.S.T. Program, East Lansing, Mich.
Editor, *QST:*

Having ridden on several troop trains, I have had the occasion to see a number of hams at railroad crossings and the like. Since we aren't allowed to talk to civilians, and sometimes may not even have the windows up, it's quite a hard job to sit there looking a ham straight in the eye and not be able to inform him of your status in ham radio. How about someone suggesting a hand signal to be recognized by all hams as a greeting when we pull into a city and see a car with "W8JOE-BLOW" written all over it?

What say gang, any ideas?

— *Pvt. Donald E. Wiggins*

FAR FROM HOME

APO 306, c/o Postmaster, New York, N. Y.
Editor, *QST:*

I can't express how glad I am to be able to get and read *QST*, so far from home shores. My company commander, being a ham, gets *QST* every month. He sees that all interested in radio get to read it. I have my own membership copies sent to my home so that I will have a complete file when I return.

During my stay over here I have already been in contact with two hams I knew on the other side. . . . It is swell to know that we hams are still sticking together and all doing a swell job in some line of communications. After this job is done I know we will all be glad to get back to hamming. The work we are doing now will also make more and better operators for the amateur bands after the war. Some of the boys who never had any radio experience before also will be going after their tickets when this is over. We all hope to do our job well and quickly so that soon we can spend our time on the ham bands again.

— *T/Sgt. Malcolm F. Merchant, W1MQK*

THE ACETATE BAND

Duke University, Durham, N. C.
Editor, *QST:*

Most of you saw the letter "QSOs on Acetate," which appeared in *QST* a few months ago, and a small majority of you acted upon it. At this time I wish to thank all fellows who sent records to me. I regret to say that I am no longer able to continue QSOing on the "acetate band," for I am now in Uncle Sam's Navy. I informed most of you of this fact, but there are still some who may be wondering why they haven't received a record from me. . . .

Now I am making another plea to all you record cutters to get into the fun and send records to W8VSY, W8SOF, W8WWQ, W8QJ, W8GNP, W9ACU, W9BJE and Robert Brandon in Tullahoma, Tenn. Let's see how many fellows we can get into the network now. . . .

Again I thank you who pounded brass and sounded pear-shaped tones on records for me.

— *Richard Wells, AS, USNR*

"DID MARCONI INVENT RADIO?"

National Press Bldg., Washington 4, D. C.
Editor, *QST:*

The article entitled, "Did Marconi Invent Radio?" appearing in your August issue, does not seem to be an accurate interpretation of the Supreme Court's decision in the case of Marconi Co. v. United States, announced June 21, 1943.

The writer of this article has apparently overlooked the fact that the court was not considering Marconi's original and basic patent, No. 586,193, granted July 13, 1897, and reissued June 4, 1901, as reissue No. 11,913. The court was considering a later issued patent, No. 763,772, granted on an improvement on the original Marconi system covered by the basic patent. It was one of three improvement patents granted to Marconi in 1904. It related to the use of two high-frequency circuits in the transmitter and two in the receiver, all four so adjusted as to be resonant to the same frequency or multiples of it.

The decision of the court does not undertake to pass upon Marconi's claim to inventorship of

(Continued on page 84)

OPERATING NEWS

GEORGE HART, W1NJM
Acting Communications Manager

CAROL A. KEATING, W9WWP
Assistant Communications Manager

Visiting Mobiles. Last month's remarks in this column seem to have let down the bars to restless mobile units which are beginning to appear in increasing numbers among networks of adjoining or nearby licensees. We pointed out then and we wish to point out again that it is not a good practice to allow mobiles to wander outside their licensed areas and participate in networks of other licensees, especially without joint permission from both radio aides concerned. One radio aide recently called us on the telephone to complain that a mobile of a nearby licensee had "visited" his area and succeeded in breaking up an otherwise smooth practice drill by insisting upon communicating with local units and in general making a nuisance of himself. "Is this legal?" he wanted to know.

The letter of the law is one thing; operating ethics is another. Mobiles should not be allowed to stray outside their licensed areas without the express permission of the radio aide, and should not be allowed to communicate with units of another licensee without the permission of that radio aide. If such permission is not obtained, local units may choose to ignore the transmissions of visiting mobile units and, if interference is caused, trouble can result. The practice is critical to the extent that abuse of it may bring forth amendments to the regulations stipulating that the area from which transmissions may be made must be specifically defined and rigidly adhered to. So make sure that a desirable mutual-aid purpose is being accomplished and that both licensees are agreeable before indulging in such practices.

This is by no means a reversal of our policy of encouraging coöperation among licensees. Mutual aid is possible only when its principles are agreeable to all parties concerned, but in like manner the wishes of each radio aide concerned must be respected and complied with.

Keeping Up Interest. One reason that has been given for excessive rag-chewing has been that "there isn't anything else to do." This may be a reason for a tendency in that direction, but it is hardly an excuse for the practice. As a matter of fact, it isn't even a good reason. Nothing to do? Bosh! There is plenty to do, or rather, plenty that could be done, in *any* WERS organization regardless of what state of perfection it has reached; and a perfect communications system, like a perfect vacuum, is a thing which simply does not exist.

In the life of a CD-WERS organization, there are three main stages. First is the installation stage, during which units are installed and manned by operators assigned to them. Second is the testing stage, the purpose of which is to establish lines of communication which will not fail during an emergency. Third is the drilling stage, during which units are formed into coördinated networks and drilled at length in the type of operation considered by the radio aide as best suited to the purpose of the organization. These three stages sometimes overlap each other, and each stage must be gone through again by a part of the system as new personnel is acquired and new units are put into operation; but once all contemplated units are installed, operators assigned and tests conducted until reliable communication can be maintained with necessary points, the first two stages are over.

The third stage can go on indefinitely. First of all can come practice in basic operating procedure as set by the radio aide, including methods of completing roll calls, handling traffic, closing the net, emergency close-downs, etc. When basic procedure seems to be near perfection, the radio aide can initiate a coding system for reporting information that may be of interest to the enemy. This alone will require considerable time practicing. Tests can be run to see how long it takes to code a message at one end and to decode it at the other, and methods developed to speed up the process. During test blackouts or other civilian defense mobilizations, the coöperation of air raid wardens can be requested in forwarding their incident reports over radio instead of telephone channels. In most communities the wardens are glad to coöperate in this respect, and it is a most desirable practice in that it acquaints both branches of civilian defense with the activities and requirements of the other.

The radio aide can dream up unusual situations in which the organization might find itself during an emergency. For example, the control unit might go off the air suddenly and without warning, in which case an alternate control unit should be designated to take over the net without delay; or the control unit might not come on the air for a drill, in which case an alternate should call the roll and report to control when he comes on. Operators should receive definite unit assignments, but each operator should be made familiar with the operation of other units in his net so that he can operate any other unit should the occasion demand; and each operator should have a crack at operating the control unit during a regular drill for the same reason. In addition, each unit that can be heard by all other units of a net should be designated to act as net control occasionally so that this could be done if the situation should demand during a real emergency. Failure of the equipment at the location of any fixed unit

should receive the immediate attention of the control unit. If possible, a car should be sent with supplementary equipment to investigate the cause of the failure, or a mobile sent to that location to carry on communication until the regular equipment is restored to action. Mobiles should be on the move during drills and alerts to locate quickly the scene of any incident and to relay warden reports, if necessary, or to allow the warden on duty to talk direct to control describing the situation.

The above possible situations provide plenty of material for practice. There are many more which could be worked up, especially those which might develop in connection with natural disasters. During regular drills within one's own CD-WERS organization, aid raids, hurricanes, earthquakes or floods can be supposed to have struck the community and operation carried on accordingly — but be sure that all transmissions indicate that it is merely a test, so that possible listeners will not misunderstand. Once the first two stages of organization are completed, there are any number of ways in which interest can be maintained and perfection of the third stage approached as time goes on. Even when the organization presumably has reached peak efficiency it is still necessary, in order to maintain that peak, to continue at least weekly drills, and these can be made interesting by the radio aide's ingenuity in thinking up irregularities which might occur during an actual emergency.

The inevitable conclusion is that the leader of a CD-WERS group who complains that there is nothing to do during drills but chew the rag is the victim of a desire to do nothing else, and that any real emergency will find his organization literally fumbling in the dark, with plenty to do then but no knowledge of how to do it. The volunteers participating in this service want to feel that they are serving a useful purpose, and rightly so; so keep them constructively busy. It means work for the radio aide, but if he hadn't expected to have to work hard he wouldn't have accepted the job.

Honor Roll

The American Radio Relay League War Training Program

Listing in this column depends on an initial report of the scope of training plans plus submission of reports each mid-month stating progress of the group and the continuance of code and/or theory classes. All Radio Clubs engaged in a program of war radio training are eligible for the Honor Roll. Those groups listed with an asterisk teach both code and theory.

Cuyahoga Radio Association, Cleveland, Ohio.
*Milwaukee (Wis.) Radio Amateurs' Club.
*Shorewood High School Radio Club, Milwaukee, Wis.
Starved Rock Radio Club, Peru, Ill.
Toledo (Ohio) Radio Club.
*Tucson (Ariz.) Short Wave Association.
*Withrow High School Radio Club, Cincinnati, Ohio.

What Constitutes Rag-Chewing? The term "rag-chewing" has been used with an unfavorable connotation so many times in this column that it has come, like "pleasure-driving," to be almost a bad word. Actually, it is one of those practices which are all right in their place but which during wartime have no place, at least not on the air. Unfortunately the term itself does not entirely cover the intended meaning, and "ham chatter" is likewise unsuitable because it denotes an unfavorable attitude toward the radio amateur. So why not call it simply "non-essential conversation," and thus imply a definition with the term?

This, of course, embraces all possible forms of "rag-chewing." It also embraces extended over-the-air technical discussions which might just as easily be conducted in person or by telephone, such as, "I went down to Schultz's radio store to get a new HY75 but they said I had to have a priority so I said nuts keep your tube," or, "I found that if I increase the plate voltage the signal is stronger but this makes the tube get red hot so maybe it's not such a good idea" — decorated with such side remarks as, "Wait until I go out and put some rocks under the wheels so I won't go down the hill," or, "Can I be excused from drill? They're calling me for supper and we have fried chicken tonight."

A limited amount of technical talk perhaps could be considered permissible, but the trouble is that amateurs, once they get started talking on a technical subject, just cannot put on the brakes, especially if they are talking about something they have built. Better to eliminate it altogether and make transmissions sound something like this: "1 from 5, your readability 5, strength 9, some interference from another net, no traffic here, go ahead." In making tests the station testing should number his tests and have them referred to by number, instead of saying, "Now I'm going to take off one feeder of the antenna, how does it sound now, now I'll pull the antenna around in your direction . . . . etc." Wouldn't it sound much better to say, "This is test number one, test number one, 1-2-3-4-5-4-3-2-1, test number one, please report comparative signal strength, go ahead," and discuss the details afterward?

The semi-formal or completely formal net drill is preferred because it sounds better and is more efficient and impressive than informal or haphazard operating practice. What we want in WERS are networks that click off their business with precision, speed, accuracy and efficiency, and without hesitation, clearing of throats, hemming and hawing, or stuttering. To reach this objective requires practice — a lot of it. But the greatest enjoyment that can be experienced in WERS is pride in the conduct of a snappy net drill. If you can honestly feel that a disinterested but critical listener would gain the impression that your net sounds businesslike and efficient, then you need have little fear of being accused of "chewing the rag."

— *G. H.*

Meet the SCMs

W3GCU

This picture of W. Raymond Tomlinson, W3GCU, the hard-working SCM of Southern New Jersey, was taken in one of his few quiescent moments. Born in Philadelphia in June, 1902, he has held the call of W3GCU since February 1936, although his interest in ham radio dates back to 1934. He has held ORS and OBS appointments and has been active in numerous SS, ORS and QSO parties, as well as in Red Cross Field Day activities. At present he is editor-in-chief and circulation manager for the *DVRA News*, the monthly club publication of the Delaware Valley Radio Association. In addition, he is in charge of construction for the various units in the Hamilton Township WERS set-up, WKPX. Other organizations to which he belongs are the Fraternal Order of Eagles Aerie No. 100 in Trenton, and the Motion Picture Operators' Local, IATSE and MPMO of U. S. and Canada No. 359. His vocation is that of a motion picture projectionist for the Trenton-New Brunswick Theatres Co. Like so many of the rest of us, Ray, longs for the day when he can devote all of his spare time, outside of domestic and professional duties, to his hobby of amateur radio.

BRIEFS

W8FRC, who appeared in "Briefs" in April, 1943, *QST*, has the following total of war contributions to date: Sold enough amateur radio gear to purchase $1000 in war bonds, and donated 400 pounds of steel to the war effort.

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Here's something to tickle the ribs of you cipher-busters! W9WLK, Dwight Stebbins, 206 East 6th St., Morris, Minn., believes he has devised a system of coding messages, without the aid of machinery, which is absolutely unsolvable by anyone not having the key to the cipher. He offers a $25 reward to the first person to send in the correct solution to the following:

OLAREPDZTGMBOYTHRUHCILMRLPTZUGSBTYE
HUUILIRPZPGCBAYOHUUNLEROPIZAGEBDYTHS
LTRNPSZTGPBNLARZPLZULDRTPPLTRL

LCUDLNLLTPUSTEHOAVLRNAHPANLVTIHRTESE
TSLLGCEOPAEDTHUNLTRIMSNAHOIEIDTSTSNST
GLCEEYPIBTA

TSNRLZLEATPLUAITTNIAHUOSFDTSLNUIHPTLW
LHETPYRDTSTAOANFIDSNLSTISTLAEOSPTLTAH
ETAURTIMFARNOAITABRSOLDESTZEQILSTFAST
LTRAETHHGZNLPOABSLTYISSHOLMINSEIAIUIPR
FRTZHIMNAPNRZLLOLMISSNPNIETCSALEIURIAL
OHHTSNPLNMOLTRHISMLECIHW.

BRIEFS

On Saturday, August 14th, the NBC program entitled "Not For Glory" dramatized the activities of the Fort Wayne (Ind.) WERS in performing emergency service during the recent Mississippi flood. The broadcast began with a W9 calling an XU and a ZU, just as they were ordered off the air. This was followed with a description of ham radio, how the Fort Wayne gang built their WERS units and got their license, and how they participated in the flood emergency. The program concluded with the presentation of an OCD citation to the members of WJGV.

— *Benjamin L. Toy, LSPH.*

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In connection with the brief in last month's issue regarding obtaining QSLs from K7BC, we regret to report that Sgt. Edward R. Stevens, the well-known operator of K7BC, was killed in a plane crash on July 21st.

—•••—

The Syracuse CD-WERS station, WKBS, has a unique method for keeping the operators "on their toes." At each test period, recordings are made of all transmissions to and from the control station. These recordings then are played back at the following meeting of the group, giving the operators an opportunity to listen to themselves as others hear them.

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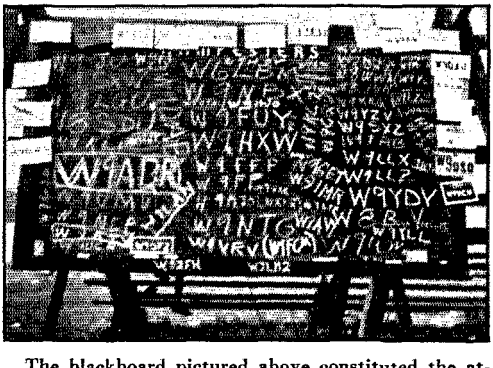
The Associated Radio Amateurs of Bremerton, Wash., are really all-out for victory. All active members of the club either are in military service or working under Civil Service. The club has $275 invested in war bonds and is buying more regularly. At the present time the organization is applying for a WERS license.

—•••—

All hams at Scott Field, whether instructors or students, as well as those who held commercial licenses or were otherwise interested in radio before coming to Scott Field, have been invited to join a new ham club there. The club is being organized under the supervision of Lt. Henry Spillner, jr., W2NCY. He is being assisted by brother officer-hams W9EDS, W11GM, W9KHY and W2LZU. Those who join are promised a look at the field's control tower in action and the radio set-up inside the giant bombers at the hangars, and possibly also a chance to do individual research using the school's equipment.

—•••—

About 260 picnickers turned out for the tenth annual Hamfesters' Radio Club picnic on August 8th. Highlights of the day, besides the usual races and ham chatter, were a pie-eating contest, a baseball game, and a WERS demonstration by the operators of WHHI. The following hams were present: W9ABR, AJO, AVE, AVY, BIX, BOX, CQV, DAB, DSO, DXU, DWP, EXB, FJ, FCM, FFP, FOD, FUY, FVU, FWU, GAK, GET, GJO, HJO, HOV, HTZ, HWN, IMR, JJP, JU, KBO, KLQ, KLV, KTY, LDD, LGU, LLX, LMZ, LUT, MRQ, MCH, MCR, MJO, NBX, MLP, NMU, NNQ, NTG, OFZ, PNV, QHZ, SIJ, SXW, SXZ, UMU, UCN, UMV, VCV, VRV, VAN, WBS, YWQ, YES, YDV, YLL, YQH, YZV, ZFH, ZGN; W3JON, BUU; W6LBM; W8BV, SDU, WWX.



The blackboard pictured above constituted the attendance record at the tenth annual Hamfesters' Radio Club (Chicago) picnic held on August 8th.

ELECTION NOTICES

To all ARRL Members residing in the Sections listed below:

The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office. This notice supersedes previous notices.

In cases where no valid nominating petitions have been received from ARRL members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are set ahead to the dates given herewith. In the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in West Hartford on or before noon of the dates specified.

Due to resignations in the Missouri, Eastern Florida and San Joaquin Valley Sections, nominating petitions are hereby solicited for the office of Section Communications Manager in these Sections, and the closing date for receipt of nominations at ARRL Headquarters is herewith specified as noon, Friday, October 15, 1943.

Section	*Closing Date*	*Present SCM*	*Present Term of Office Ends*
Western Fla.	Sept. 15, 1943	Oscar Cederstrom	Oct. 1, 1943
Missouri	Oct. 15, 1943	Robert C. Morwood (resigned)	.....
Eastern Fla.	Oct. 15, 1943	Carl G. Schaal (resigned)	.....
San Joaquin Valley	Oct. 15, 1943	Antone J. Silva (resigned)	.....
Hawaii	Oct. 15, 1943	Francis T. Blatt	Feb. 28, 1941
Sacramento Valley	Oct. 15, 1943	Vincent N. Feldhausen	June 15, 1941
Nevada	Oct. 15, 1943	Edward W. Heim	Nov. 1, 1941
Oklahoma	Oct. 15, 1943	R. W. Battern	Nov. 1, 1941
Alaska	Oct. 15, 1943	James G. Sherry	June 14, 1942
Southern Minn.	Oct. 15, 1943	Millard L. Bender	Aug. 22, 1942
New Hampshire	Oct. 15, 1943	Mrs. Dorothy W. Evans	Sept. 1, 1942
West Indies	Oct. 15, 1943	Mario de la Torre	Dec. 16, 1942
Maine	Oct. 15, 1943	Ames R. Millett	June 7, 1943
San Francisco	Oct. 15, 1943	Kenneth E. Hughes	July 5, 1943
South Carolina	Oct. 15, 1943	Ted Ferguson	Aug. 25, 1943
West Virginia	Nov. 15, 1943	Kenneth M. Zinn	Nov. 21, 1943
Md-Del-D.C.	Nov. 15, 1943	Hermann E. Hobbs	Dec. 1, 1943
Connecticut	Dec. 1, 1943	Edmund R. Fraser	Dec. 13, 1943

1. You are hereby notified that an election for an ARRL Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of the By-Laws.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as given opposite the different Sections. The Ballots mailed from Headquarters will list in alphabetical sequence the names of all eligible candidates nominated for the position by ARRL members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more ARRL members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is suggested:

(Place and date)

Communications Manager, ARRL
38 La Salle Road, West Hartford, Conn.

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

(Five or more signatures of ARRL members are required.)

The candidates and five or more signers *must* be League members in good standing or the petition will be thrown out as invalid. *Each candidate must have been a licensed amateur operator for at least two years and similarly, a member of the League for at least one continuous year, immediately prior to his nomination or the petition will likewise be invalidated.* The complete name, address, and station call of the candidate should be included. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of the closing date given for receipt of nominating petitions. There is no limit to the number of petitions that may be filed, but no member shall sign more than one.

4. Members are urged to take initiative immediately, filing petitions for the officials of each Section listed above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

— George Hart, Acting Communications Manager

ELECTION RESULTS

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

Vermont	Burtis W. Dean, W1NLO	Aug. 16, 1943
East Bay	Horace R. Greer, W6TI	Aug. 16, 1943
Indiana	Herbert S. Brier, W9EGQ	Aug. 16, 1943

At the (Louisville, Ky.) Amateur Radio Transmitting Society meeting during July. *First row, l. to r.* — "Doc" Mather, W9GOM; "Stu" Gates, W9CNE; Horace Kincaid, W9RPF; "Dad" Downard, SCM, W9ARU; Ed. Raible, W9BGA; Bill Knoble, W9ZLF. *Second row* — Dick Bush, W9BUE; Geo. Yunk; J. B. Wathen, W9BAZ; C. J. Elder, W9KBR; W. T. Mitchell, W9BVT; Bill Hague, W9YXF; Earl Bacon, W9KZA; Chas. Frederick, W9IST. *Back row* — Earl Young, W9AEN; Ed Simmon, W9FKM; Glen Cook, W9TXC; Tony Ambrose, W9CDO; Jerry Hollinseed; Harry Smith, W9QKA; Morris Dillow; Bill Dover, W9DFW; Giles Allen.

Comments SCM W9ARU, who supplied the photo: "From the size of the ears on all concerned, it looks like a flock of elephants waiting for their keeper. W9ZLF took the picture, as you can see from the wire leading to the heel — his heel, I mean! The fellow in the center row — W9YXF — has that sorry puss for a reason. He got his license on December 6, 1941 — and he has a kilowatt!"

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — JJN reports arrival of new baby YL, born May 29th. W2MNK, W2KEE, and W2KWB are trying to get WERS started in Elkins Park. They are starting some wired-wireless rigs. IXZ is teaching radio in a West Coast Navy school. KT is still at MIT. Although he has not been in contact with the hams there he has met many model airplane enthusiasts. JKH is at Fort Knox, Ky. He has applied for a WERS license for his 2½ meter equipment. The transmitter ends up with an 815. He is an instructor at the Armored School, but has spare time for radio. Ex-HGE is now W4IGE. He was with M. and M.T. Co., but changed to Eastern Air Lines in Miami, Fla. He is flight radio officer in the military transport division. JBC was home on leave for a week. He is 3rd cl. tech. in the S.C. IJN is back from California. GML is lt. (jg) teaching at Brooklyn, N. Y. He will be remembered by many as Don Cianela, very active in the USNR. DMQ is jumping off the dock Aug. 28th. The Frankford Radio Club meets the last Sunday of the month and finds the change brings out many more than twice-monthly meetings. HPK is working at new Budd Aircraft plant. GET reports a recent addition to the family — a girl. There is considerable WERS activity brewing in Delaware County. CRO is the man to see for info on Delaware County WERS. The lads away from home want more news in this column. Keep it coming in! 73, *Jerry Mathis, W3BES.*

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Herman E. Hobbs, W3CIZ — BWT, who lost his famous antenna in one of the recent storms, has re-rigged its supports and hoisted it back into place. He says he doesn't know home when he arrives, now, without the familiar appearance of the antenna down. How about some of you recently appointed licensees sending in a few items for the boys who are away? 73, *Hermann E. Hobbs, W3CIZ.*

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU — Asst. SCM, Ed G. Raser, W3ZI. Asst. EC & Radio Aide for Hamilton Twp. WERS, H. Dallas Fogg, W3ASQ. EC for Somerville & vicinity including Southbranch, P. S. Case, W3ABS. Hamilton Twp. WERS still progressing at good pace. ABS reports Hillsboro-Branchburg Twps. WERS application still in hands of FCC. It has been erroneously reported here that Somerville was to be included under this license. Somerville will not be included under this set-up, but there are several Somerville amateurs who will be licensed to operate under this set-up. ARN graduated Bliss Naval Training School, Tacoma Park, Md., was promoted to RT2c and assigned to advanced training school for radio technicians at Naval Labs, Bellevue, D. C. GMN was last heard from at Army X-ray school somewhere in the South. Bill West, old Bordentown five-meter celebrity, may now be addressed S/Sgt. William West, Co. A, 1st Platoon, 551st S.A.W. Bn., Drew Field, Tampa, Fla. Bill kept the well-known call GHK on the air on five and forty. He now holds radiotelephone first class ticket, has been in the service for over two years in radar work. IDY and EEQ recently enjoyed two weeks vacation; EEQ visiting folks at home after being in Omaha for over a year. BAQ was also home on vacation, and FTU visited Trenton recently. ITU and former SCM, CCO, spent a week with folks at home. Les was to make another tour of western camps on technical revision upon his return to duty. Major VE included Trenton in his short furlough from Pine Camp. HTJ recently obtained release from Eastern Aircraft to accept a position with RCA Research Labs, Princeton. Ed Beemish, of Beemish & Marotte, is now with the repair department of American Radio Co. BWF is now with Fineburgs, Philco distributors, as radio technician. T/Sgt. IOW last known to be somewhere in the South Pacific. BEI is with NY ship Camden, building and wiring main control boards for naval ships. Our heartfelt sympathies to Walt, former SNJ SCM, who has been flat on his back for past eight months with compound fracture of right leg, suffered when his car rolled forward and pinned him against his garage. Walt has recently renewed his subscription and ARRL membership for the 22nd consecutive year. The DVRA is contemplating sponsoring the Rutgers radio course for the benefit of its members, and others who may wish to attend, for the coming fall season. JNO is now located at 255 Tioga St., Trenton. Recent reports say IDY has also changed his QTH. Morristown has been licensed under the call WKIW to operate WERS. Reports have reached this office that there are other communities who have received their WERS licenses, but we do not have any info on any of them. What say, fellows, let's have the dope! 'Till next month, best luck and 73. *Ray.*

WESTERN NEW YORK — SCM, William Bellor, W8MC — Had a letter from Pfc. Jim Lee, an ex-SWL of Rochester, who tells of meeting quite a few hams out where he is stationed at Camp Chaffee, Ark. Among them were 6KQT and 3AFC. QLI has now been appointed EC for Corning, N. Y., and is working hard towards a WERS set-up for that area. Your SCM recently received a visit from an emissary of the highly successful Syracuse, N. Y., WERS group, in the person of Mr. Ken Thomas, secretary of the unit. He brought some of the equipment they are using up that way. The originality and ingenuity shown in the building of the equipment was amazing — most parts being made from salvaged broadcast sets and yet wrought with such care and workmanship as to rival factory-made equipment. This was all accomplished with a large percentage of non-ham trainees and a small number of hams to start with. Keep your eyes on this group; they are really setting the pace!

CENTRAL DIVISION

ILLINOIS — Acting SCM, George Keith, jr., W9QLZ — DBO has received discharge from the Army and is back at his old QTH. OXA, now capt. in Air Corps, has a new jr. opr. MJZ is RM1c in a bombing sqdn. KUM is with state police radio system. JSU is with Air Corps somewhere in California. CXT received discharge from Marines to accept appointment to Annapolis. Hamfesters' Radio Club of Chicago report the usual pie-eating talent was present at their recent picnic. CAT is with Signal Corps and is completing training at University of Missouri. YBY works nights helping build LST boats. JAU is with radio intelligence in Australia. CDG is trying to keep civilian receivers perking. TAY wishes the neighbors could hear something on their receivers besides b.c. stns. News from Illinois clubs would be appreciated. In this case, "no news is bad news" for QLZ. 73, *George, W9QLZ.*

INDIANA — Acting SCM, J. P. Gilliam, W9SVH — YDA reports that in addition to the XYL's new Class B ticket, she presented him with a new YL operator. YWE has gone high hat on us and grabbed himself a new second-class radiotelegraph ticket. S/Sgt. Erv Hurley writes from Alaska. YMV has moved to new QTH at U.S. Maritime Service Radio School, Huntington, Long Island, N. Y. SVH travelled to Ft. Wayne and discovered, the hard way, that the radio club had moved to a new QTH in the Chamber of Commerce building. The Indianapolis Radio Club is now meeting every Friday at the fire station at New York and Alabama streets. They now have their CD-WERS license, WKPZ. Ft. Wayne CD-WERS operation during the recent flood was dramatized on NBC on August 14th. A very good plug for those boys and for ham radio in general. EHT writes from Great Lakes. QTH is H. M. Kirts, A/S, Co. 1015, USNTS, Great Lakes, Ill. He reports that code-speed certificate, license, AARS record, and ESMWT cards are all helping him to get in radio. Elkhart County CD-WERS was heard in Mishawaka on July 27th, and contacted same on August 9th. Consistent communication is carried on between Elkhart, Bristol and Goshen, using transceivers at Bristol and Goshen. EXL is county communications officer, with FWS as deputy radio aide and county EC. Have plenty of operators, but need more equipment. AKJ is moving to St. Louis for job as theatre sound engineer. Congrats, OM. WXI has moved to Bryan, Texas, and SAG to Bayonne, N. J. Sorry to lose you fellows. Unfortunately, some communities in Indiana show extreme complacency in regard to CD-WERS and CD in general. In some cases it's the fault of the hams; in others, the CD officials. If your local CD officials are lukewarm on CD WERS, you are missing a good bet by not getting in there and warming them up. It can be done and has been done. Don't forget that your community may be the one which makes impossible a county-wide or inter-county relay. Write to the OCD, ask for OCD publication 5221. Study it, and then get in there and pitch. Let's think about it, fellows! 73, *W9SVH.*

MICHIGAN — SCM, Harold C. Bird, W8DPE — Lansing reports on their WERS activity that they have 20 licensed operators with 18 units in service. Since beginning operations in January they have been on the air 32 times; have worked in conjunction with the control center eleven times — total of messages handled during time 156. Total of manpower hours is 580. WKCJ, control station with power of 20 watts to a HY75, has a coverage of 12 miles with a good readable signal to the mobile units. Worked as far as Mason, Mich. Oakland County Radio Club reports City of Pontiac license not yet received. However, six units are completed and six more will be shortly. Every Thursday night the club is holding practice sessions in procedure so that when the time comes for testing there will be no time lost. They also want to be able to train new personnel for this work and feel they must know it thoroughly themselves, before taking this step. Dara held its annual outing and reports a very nice turn-out. Ken Conroy reports that they are starting a series of talks, given by each member of the club, at various dates. The first talk will be given by CLL, who is now with the FCC. They report no activity on WERS although several members are part of the set-up. FX is trying to locate equipment to be used on long-wave test equipment. CSL is interested in WERS for his community and is asking for dope. Saginaw Valley talking WERS now. FWU still living in hopes of pounding brass again soon. Does lot of listening on the long-waves Mt Clemens' boys are assisting the local police department by working as engineers in their off time. This is proving very valuable to them in that community. The local police system there serves during blackouts for their communication, if necessary. That is all for this month. Appreciate hearing from any part of the state to help this column along. Remember, we have men from Michigan who would like to hear what you fellows are doing, so why disappoint them? They enjoy reading about you fellows, according to letters received here. Come on, fellows, give out! BCNU, 73, *Hal.*

OHIO — SCM, D. C. McCoy. W8CBI — Every obstacle mentioned by George Hart on page 7 and 8 of August *QST* has been encountered here in Ohio. In an article in the August issue of *Electronic Industries*, I note that Ohio stands fourth in the United States for the number of stations licensed. We are exceeded by the more densely populated and "closer-coupled" areas of Massachusetts (with 21), New Jersey (with 19), New York (with 15), and tied with Pennsylvania (having 13). According to my last check of licenses issued in Ohio, we have 20. A situation comparable to that which we amateurs face in establishing a WERS system would be for your municipality to lack a fire department. Then, starting with passing the legislation for its establishment, we must then secure the equipment, man and train the organization, and finally have a fire department. This must be done with volunteer help, working long hours on their regular jobs, and who receive no funds for the work and who are working under wartime conditions. Little wonder that the task has seemed impossible at times. Here in Dayton, fine coöperation has been received from local officials and local amateurs. Those who have served as deputy radio aides have borne a major share of the hard work and red tape. Without this, there would be no WERS in Dayton. Returning to the state-wide situation, some of you are still struggling with the first stages of getting your WERS system established. Perhaps you have not been as fortunate in securing the coöperation of all concerned. You are still struggling with red tape, local politics, lack of interest and coöperation from local officials, and the other problems. The only solution to these is more hard work and perseverance. Local amateurs may just be lukewarm to WERS. Local amateur groups may be sulking because they cannot control WERS operations, or they may be bickering among themselves. To these I say, shame on you! Snap out of it. Let's forget personal interests and ambitions, and get this job done. Some of us have now made the effort on WERS. We have found some of these bugs. These have been called to the attention of the ARRL, the state council, FCC, OCD and others, and we have already secured help. Some of the things ARRL has been successful in obtaining for us are: arrangements for radio aides to give the 3rd class 'phone exams to new personnel, extension of all amateur operator licenses (see July *QST*), additional WERS test periods (see August *QST*) and authorization of the use of WERS for emergencies other than ARP (see August *QST*). The writer has found FCC at Washington, district monitoring officers, and the RI at Detroit extremely helpful and coöperative. Operators' permits come through from Washington in remarkably short time. Cases of illegal operation have been run down and dealt with. Excellent coöperation has been forthcoming on 3rd class permit exams. The state council officials have been most helpful by explaining WERS to local officials, creating interest in it, and ironing out some types of local problems when called upon for help. A word of encouragement to those still struggling with the first or later stages of getting their WERS system established and/or going for your efforts so far. There is an old saying — the darkest hour is just before dawn. Perhaps just a little more effort or pressure is all that is needed right now. Keep plugging and don't give up the fight. Now, what of the future? So far we have done a good job here in Ohio. This statement is based on the accomplishments weighed against the known difficulties of getting the job done. On a percentage basis, our job may not be considered so good. Over 50 points have been designated by the state council where WERS systems should be licensed. We have 20 licensed systems in various stages of development. Some of these are in places where a system was never contemplated. There the local amateurs of officials have had broad enough vision to realize the necessity for WERS. Some of our uncovered points are large communities where WERS is really a *must*. Something has to be done at these places. The EC, the local amateur club or some energetic individual amateur should get busy and do something about it. Again, thanks for the fine job and hard work which has been done so far. However, now is not the time to relax and bask in the glory of what has been accomplished. Rather, it is opportune to redouble our efforts and finish what still remains undone. The future of amateur radio requires every one of us to keep moving. The boys who are fighting our battles overseas are looking to us to fight this battle for them on the home front so that their hobby will still be here to enjoy when they come back. The ARRL is on the alert to protect our interests — see K. B. Warner's article on "Frequency Allocations" in August, 1943 *Electronic Industries*. What are you as an individual amateur doing about it? What are you going to do about it? 73, and success to your efforts to better our job by the end of 1943. — *Dan.*

DAKOTA DIVISION

NORTH DAKOTA — SCM, John W. McBride, W9YVF — KIX, who has just completed a year with Eastern Air Lines, is now in research in Boston. OYM is staff sergeant with tank destroyer outfit in Africa. UGM is also in Africa. Art Peterson and Jimmy McGuire from Devils Lake and Washburn are now located in Sacramento, Calif. KOY and PRH are radio ops at Fort Lincoln, Bismarck, N. Dak. EVP and family, of Camp Meade, Sturgis, S. Dak., visited KOY at Fort Lincoln. Lt. MLE in USN spent a couple days with family and mother at Lake Dorset, Minn. He also visited K6PLZ in Minneapolis; both are brothers of KOY. K6PLZ plans to move his family to Grand Forks before going back to Hawaii. RPJ sends a nice report from Sacramento, as does YOY. RPJ has purchased a home in California. Your SCM will appreciate a report from you wherever you are. We are trying to get a complete list of hams, both instructors and students, here at the Sioux Falls Army Air Forces Technical School. 73 and lots of luck. *John, YVF.*

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — There is the usual scarcity of news this month, but will pass on what dope did come in. Ex-LMY, Dressen of Mitchell, is taking basic training in the U. S. Maritime Service at Sheepshead Bay, N. Y. He will go to Huntington the latter part of August, and then to Gallups Island. ZXZ is at Sioux Falls AAF tech. school as a civilian instructor. GEU is with CAA at Fort Worth, Texas. Pvt. La Vern Mack, LSPH, writes from Camp Kohler in Sacramento, Calif., that he attended NYA classes at Rapid City and got class C from there. He is in training as an operator and is waiting for the end of this war to talk to the gang on the air. Ex-PLF, Roy Gull, formerly of Pierre and now with Colonial Radio at Buffalo, dropped in on gang at Pierre for a short visit. He has a very fb jr. op. WLP is now a grand-dad since his son, a Navy lt., became a proud papa. Still looking for some news from the R.C. gang. 73, *Phil.*

NORTHERN MINNESOTA — SCM, Armond D. Brattland, W9FUZ — OOK, now sgt., is at AP Hill Mil. Res. in Virginia. TEF at Atlantic City Coast Guard school is now RM3c and is serving as junior instructor in shop work. JNC is back from Alaska and on c.w. with Northwest Airlines in Minneapolis again. MTH, now a lt. with CAP, is wing adjutant. RPT, assistant communications officer at

wing CAP hq., has been busy training hq flight in code. YLZ is now operating at WCCO. GVO was back from Dayton Field visiting friends in St. Paul. Reports are nil these days and if such continues, maybe a recess will be in order. 73, *Army*.

DELTA DIVISION

ARKANSAS — SCM, Ed Beck, W5GED — Ex-CIU visited for several days recently, in Little Rock. ARX, INL, and JIC have gone in for WERS in collaboration with the CAP at Ft. Smith. GWT is still doing his bit with the Army in India. HYS is doing war work on the West Coast. JAL keeps himself busy pounding brass for the signal center at Camp Chaffee. ITO was last heard from while taking a slight rest from Navy duty. JIC still puts an occasional gadget on the rig and voices a claim to the title of juke-box king. QI and JBU are employed by the same concern and the OM is interested in test equipment. HNK is in the Air Corps at Jefferson Barracks and has been a proud papa for several months. ICY is again back in Smackover after retiring from service in the Army. GGW and XYL passed through Little Rock, on their way to the Gulf, and visited briefly. Ex-DRZ, now 4HKZ, is at present a commissioned officer in the Signal Corps and is enjoying the scenery of Great Britain. The nod for the month goes to the remainder of the gang around Ft. Smith for being the first to actively engage in WERS work in the State. The set-up obviously is not a mammoth affair, but after collaborating with the CAP gang, they did get units built and tested. Keep up the good work, fellows, and pass along the dope. That's all there is, there isn't any more, gang, so 73 and all the best and don't forget to report your doings! — *Ed.*

TENNESSEE — SCM, James B. Witt, W4SP — FMP would like to know why there is not more dope on the gang in the services from Tenn. His is the first letter that has been received from any of the gang in the service. Any of you fellows, whether in the services or in war industry, please drop the SCM a line with news of yourself and others. FMP is stationed at Winter Harbor, Maine. PGJ sends in nice report from Kingsport. Bob Blair, LSPH, is with the Army Signal Corps in North Africa, doing a fb job. FFF, formerly of Kingsport & Johnson City, is with the air transport command and doing swell. He has a new XYL. The following EC registrations were received from Kingsport, and all have restricted radiotelephone tickets and are WERS: F. S. Haney, A. C. Brown, P. W. White and H. F. Frazier. CXY is trying to get the Knoxville gang to cooperate with him in the State Guard and would like to see several of the gang enlist in the State Guard. Let's have more reports, gang!

MIDWEST DIVISION

KANSAS — SCM, Alvin B. Unruh, W9AWP — QEF, formerly WARC president, is now serving in the Navy. IXV turned several inventions over to the Dept. of Commerce, and also won a prize from a radio magazine. He now lives at Hooser. RAT is with TWA as maintenance engineer in Kansas City. KG is operating for Mo. State Highway Patrol, at Lee's Summit. He says it is interesting, but he misses the DX contests. CKV worked in wheat harvest while waiting to teach a new class of CAP. WAZ got married and went overseas. TYR and YAL are in the Navy. VEL says the spiders have taken over the haywire in his basement. RMJ resigned from KANS staff to accept job as electrical test technician for Boeing. KFH, who is RM1c in Navy, was home on furlough after a tour of duty on a destroyer. Clark Small (op license only) has been added to the Wichita gang, and seeks information on WERS. FWY writes a swell newsy letter. He is asst. radio engineer (P-2) at Phila. Signal Depot. Vinton reports fishing with YUQ while in Washington, and chinning with BOE and NOG, all formerly of Manhattan. OZF, ex-Topekan, also is with Sig. Corps in Phila. It has been reported that N9LQW, formerly of Junction City, is a lt. (sg) stationed in Washington. Several members of the old Kansas Cyclone network on 160 'phone have a round-robin letter going and will try to maintain contact until . . . FWY would like address of WQN, who is in the Navy. Ex-TCT spent furlough in Kansas and Texas after considerable experience as Navy pilot in Solomons. Previously, he was RM on shipboard. 5HHF joined Boeing radio staff as technician. He holds commercial first class radiotelephone license. AWP is operating part time at KGPZ on c.w. bands in addition to regular job at Boeing. Your cards and letters are welcome — will try to answer all of them. — *Abie.*

MISSOURI — Acting SCM, Letha Allendorf, W9OUD — The Navy takes precedence in this report since two of my four letters of the month are from boys in that Service. LTW says that he and NVZ are in the V-12 branch of the Navy and are assigned to Iowa State College. There are quite a number of hams in electrical engineering and they consider it a fine opportunity to operate the college station WOI. LTW has his telephone and telegraph first. During the summer of 1942 and in June, 1943, before he was called to active duty, he worked as radio operator clerk for the Federal barge lines. Jack wants to see something about AXB and AEJ in *QST*. Sorry we can't supply any dope on AXB, but how is this for AEJ: Bill joined the Navy in March and was in Farragut, Idaho, in boot camp for three months; he spent another month in Michigan City, Ind., in pre-radio course, studying to be a radio technician for the Navy; was advanced to RM1c, and was sent to Stillwater, Okla., for eight months of primary training. Bill wants the address of QMD. SXV tells what he has been doing since Dec. 7, 1941. At that date, the ship on which he is radio op was in the South Atlantic with stops scheduled for Calcutta, Rangoon, Singapore and Manila. Took seven months to make the trip. In Feb. '42, he was at Rangoon during heavy air raids and for five days no cargo could be discharged because no one was left to take it ashore. He got to Calcutta altho four ships were sunk around him. He ran into more air raids in Egypt in August, '42, but of course the boy from Missouri had to take a little trip down to Cairo to see if there really were any pyramids and sphinx and such things. NSU and mother are visiting in West Plains with a brother. A couple of weeks ago, a California soldier stationed at Camp Crowder dropped by to see OUD. He asked politely for the SCM, expecting an OM. "Well, I'll be darned," said he, when he saw that it was a YL. How about more letters from more of you? Lots of luck, and 73.

NEBRASKA — SCM, R. E. Olmsted, W9POB — Although WERS is our only operating activity, no reports of new licensing or development have been received since last month. DTT advanced in code class. VQO, who has been on the teaching staff of NSTS, has "jined up," but no word as to his camp QTH. This month marks the downfall of another good man and superlative amateur, UHT, who will be wed. Time and place are a military secret. FAM was in a train wreck on the UP. YDZ is now first-class radio technician at Lakehurst. YNO is Naval op in the South Pacific. BZR is attending radio school at Davis College. LTL writes again to compliment this column and say he is very busy with college work in Texas as an Aviation Cadet. JBK writes that a college engineering course at Niagara U. is no picnic when it must be completed in nine months. Bill adds that reading *QST* is his only diversion. YOP (as reported by the Needle and Tongue Club) has resigned his job with CAA maintenance and is en route to Alaska to do the same kind of work for PAA. W. A. Wessel, JYW, an ARM1c in the USN, would like to correspond with any of the gang he used to work, especially around Nebraska City, Nebr. His QTH may be obtained from ARRL. That is about all, except to advise you that the ERC classes of the Signal Corps will soon end here at Milford and your SCM expects to return to work in the PO Department at Wauneta, Nebraska, about September 15th. So address all future reports and communications to that place. No sooner had my report been locked in a mailbag, when I received a joint letter from EAT/KGLZ and OED, which must be included in our column. On July 13th WERS license was issued to Brainard, Nebraska, under the call of KFWC. LEF is at the wheel and YCG is in the crow's nest. THK spent August first shooting the ham breeze with KYD, ROE and EAT. Our congrats to DXY, who is now a full-rigged commander, USNR. JNN still working for Fairbury Windmill Co. RCH and FDG are doing service work for Ward's and Gamble's, respectively, in Fremont. VKG still manager of WU. QOU still in business at North Bend. KFC doing radio service at Scribner. MPP is on the lam, whereabouts unknown. RDT, talkie operator at Beatrice anticipates a change in employment to USA. GUD is serving with the Army at Selfridge Field, Michigan, and was recently married. UZH, who has been employed at the Mead plant, is getting the ncd from the Army. SHF and XYF visited with OED recently and lamented the good old days. TYG is chief radio inspector at an aircraft plant in New York State. As a final shot, OED offers this item to record a real optimist — he received an order for SWL cards last month, cash in advance. — *Pop.*

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — GUP, ARM1c, writes that he is doing considerable flying and is looking forward to the day when he can resume hamming. His present QTH is Norfolk, Va. Irving Small and Arnold Simons, both Class A hams and WERS operators for WJLH, are now in USN. NAM, 2nd lt. in the Signal Corps, was a visitor at WJLH during test period. EAO, state radio aide, contacted WJLH station from his portable-mobile unit of WMHC. Messages were handled for other warning districts. NEK, d.r.a. of New London warning district, has several units in operation, with satisfactory results. NRR has been transferred from Philadelphia to Boston. Our congrats to GRS and XYL on their new arrival. Harper and IGT, operating WJLH pm units, are using car door for reflector with excellent results. WJLH oprs surprised critics by putting a signal through from Shelton to New Haven over some high hills after four attempts. However, it was necessary to resort to a three-element beam. A very successful demonstration was then conducted and the town officials were very much pleased. GB has voted to appropriate expenses for the taking of movies of WERS units and operators in action. IGT, an expert in this field, has already shot several units. BW, WERS op at Branford, reports hearing Stamford and New York WERS units in operation, as has IND of Hamden. Due to lack of reports, we are unable to report on other districts. What say, gang?

MAINE — Acting SCM, G. C. Brown, W1AQL — Thru the combined efforts of AUC, ATS, DHD and the town officials, Bar Harbor has a smooth-working WERS. The town purchased three MRT-3 transceivers with J-type antennas. Headquarters are in the fire station, and all mobile units are contacted from this point. This should be a cue for the rest of the State to get busy and see what can be done along WERS lines in other communities. The station call at Bar Harbor is WKAB. Again this month the Maine Section extends greetings to an additional list of out-of-state boys: 1KTY, 4FMP, 8MWF, 8RHS and 8QQY who are in the Navy. AWY has recently been discharged from the Army. GMD, BTY and HYI have been reappointed EC for their respective areas. Received a nice letter from FJP which states that he is civilian radio sound instructor for the Navy at Key West, Fla. BYI is in Boston with Navy. DEO recently moved his family to Hampden. There is an opening for an EC down Damariscotta way. If any of the gang there would like to take over the job, drop a line to your SCM.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — A few more new ECs in this Section: MTQ for North Easton, HMK for Malden, Lindsay Russell (LSPH) for Needham and Dover. Anyone else willing to act as EC for his town, step right up; all that is needed is a post card and membership in the League. KBQ reports that he is the radio aide under the call of WKNM, issued in June to the City of Haverhill, and this covers Georgetown, Amesbury and Newburyport. He has as his associates IWR and ANM. They have 17 station units with 5 more to come, 10 hams and 12 WERS ops are helping out, and 40 more are being trained. LLW was drafted and is now in the Army. BVL is now working for the Sylvania Electric Products Co. in Danvers. IYU is also teaching radio to the WACs in Boston. GYZ is now a lt. in the Navy and is working in Boston. We are glad to report that JXU, a lt. colonel, is home after spending 18 months in the South Pacific. He is spending a little time at Fort Banks Winthrop, where he is being treated for malaria. We recently had a phone call from HX who is now a capt. in the Army Air Corps. He was home for a short stay after flying all over the map; he says he loves it. MLL and XYL have bought a new home in East Natick, where he has a lot of room for antennas, etc. NOX was turned down by the Army so he is going to college in the fall. ZW is now working in Washington, D. C. MTV expects to go in the Army in August. GFW is now a lt. in the Marine Corps, stationed somewhere in the South Pacific. WI says he is now back working at the Theatre, having spent 11 months teaching at a reserve school. NKW is enjoying QSL swapping and post card QSOs. We wish to acknowledge a very nice letter from LNN who is attending the Army high speed radio operators school at Omaha, Nebr. 9UEW is there too. MBG has signed up in the Coast Guard Reserve (T). NQA has changed his QTH in Boston and I believe he is now a married man. MAL says he changed his radio shack into a brooding house and found a hen trying to hatch a 6L6. WS and CTR are working on WERS for their towns and hope to tie in MAL's town too. LKM writes from Ft. Mason, Calif., where he is a sgt. in the Signal Corps, and he has been in the A.T.S. as radio op. He met KQF at Treasure Island who is getting all set to be shipped overseas as a repairman in the Amphibious Force. He is rated as RT1c and expects to make chief soon. JNX recently got married. LKM would like to see some news about some of the old 5-meter gang. What say? BTL writes from Hammer Field, Calif., where he is a lt. in the 4th A.F.R.D. RR is in the Navy and now in the Pacific. CUY is in the Navy and at last report was in Newfoundland. BTL says he met CHG for the first time in 6 years, and he is located at Camp Pinedale. Frank Freeman, who was trustee for KMF, is now in the Army. The North Shore "Air Blitz" gave OCD stiff test. Says a newspaper clipping: "Army officers watched with keen interest the first use of an ultra-short-wave hookup for communications in a blackout. Nine communities, Salem, Lynn, Beverly, Marblehead, Swampscott, Lynnfield, Topsfield, Manchester and Gloucester, were linked on the short-wave circuit, which was devised to ease the load on phone lines during the emergency."

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — Another slim mailbag this month, gang. How about some news? With air contacts removed, the only news channel left is the mailman. JOP is radio inspector with FCC, stationed at Millis, Mass. Jim says about 90 per cent of the personnel are hams, and that spare time is the postman's holiday — code practice oscillators, wired wireless, etc. IZW, formerly with FCC, is now a civilian technician with Signal Corps in Sandusky, Ohio. LTA is attending OCS at Ft. Monmouth. JWM, JDI and JQJ are ops at WTAG, WORC and WAAB, respectively. From Westfield, the grapevine tells us that BVR has been conducting a course in theory and code, grooming his pupils for ham tickets. He was assisted by LNH and hams Frank Piatek and George Townsend, latter two calls not known. Some of the class are already serving in communications in the armed services. WERS news is nil this month except for the local gang. NAQ is retiring from his position as asst. elec. supt. for N. E. Power Co., and will move to Albion, Me. The gang at WJPG are building ten new units for WERS. All will use long-line oscillators with 6J5s and separate receivers. Guess that's the dope for this trip. How about some news by the 15th of each month? 73.

NEW HAMPSHIRE — SCM, Dorothy W. Evans, W1FTJ — Just for a little change this month, an ex-SCM, BFT, is at the mill pounding out the news for this month. BFT was fortunate to get 10 days' leave, and happened to get home in time to write this report. BWR and KKL are both engineering with Submarine Signal Co. in Boston. JDP and XYL, MWI were recent visitors in the Granite State. JDP has a civilian job at Fort Monmouth. HOV, KYG and JSL are now wearing the gold bar as 2nd lieutenants in the Signal Corps, after graduating from OCS school. MLO is now a cadet at West Point, having recently obtained the appointment. JT finished his year at Treasure Island and is now busy as a RT1c. He says he enjoys the work so much that he intends to stay in it after the war. Your SCM, FTJ, is now the president of the YLRL (Young Ladies Radio League). JBA was recently home for a little leave after three years at sea. AWU to chief radioman is a promotion recently reported. Let's hear from you boys in the Service about how you are making out. It's pretty hard to find news, so keep Dot posted, huh fellers?

RHODE ISLAND — SCM, Clayton C. Gordon, W1HRC — GBK, Norman Unsworth, RM2c, of Smithfield, R. I., has been reported missing by the Navy. This is the first news we have had of any of our R. I. amateurs having anything but good luck and, pending further news, we shall hope that he may yet turn up ok somewhere. LYE is reported home on furlough and graduated from school with honors. He is now teaching some of the secret stuff. Because the post office department made some new regulations, while we still live at the same place on the map, the address now reads: 70 Columbia Avenue, Gaspee Plateau, Providence 5, R. I. While the Gaspee Plateau is not official, we prefer to show it, since there are two Columbia Avenues, one in Cranston and one in Warwick, both served out of Providence 5 post office.

VERMONT — SCM, Clifton G. Parker, W1KJG — The gang will welcome news of AHN who has returned to the States. His address is now Lt. R. E. Osgood, Air Defense Dept., AAFST, Orlando, Florida. Dick Evans (LSPH) is now at Scott Field, Ill. BD is physics instructor at the University of Vermont. The Burlington Amateur Radio Club has a full program in spite of restrictions, with a ham-fest meeting starting off the season on September 10th

Since the last issue, am advised LJZ and KUY were married July 10th at Mexico City. LJZ is teaching in a school at Barrington, R. I., and KUY is stationed at Albrook Field, Canal Zone. This will be the last news item from your acting SCM. By the time this is in print, your new SCM, Burtis W. Dean, W1NLO, of Burlington, will have the reins in his capable hands. From the excellent work he has done in connection with amateur activities in the Burlington area and at our hamfests there, we can well be assured of interesting and pleasant things, particularly with a resumption of amateur activity on the air. My thanks to the gang for all their fine coöperation in anything which had to be done over the past few years.

NORTHWESTERN DIVISION

OREGON — SCM, Carl Austin, W7GNJ — EC: 7JN. No reports this month, so here's what scandal I can remember and imagine. HXG is electrician, doing installations on war boats, and is also interested in ACS. BEE's oldest son, a M/sgt., Air Corps, was killed in action in New Guinea. He was awarded the Purple Heart, posthumously, which no doubt is a slight comfort to BEE. GSI is enlisting, and will be connected with radio servicing and installation, somewhere in Idaho. ARZ (the rat) is quitting GNJ, and taking over KBND, leaving HHH as chief mechanic. HVX made a trip to Bend. CZJ has moved bag, baggage, and xmtr to Chicago. ITZ is carefully superintending the diet of FTA, to reduce a slight bay window. DXF has been heard of in the vicinity of Pendleton, so he is evidently still travelling inspector for CAA. A card from "Frank," either HJI or AOY, reports all well and that he is impatient for the end of the war. Leo Mickel, LSPH, scty. CORK, says the club is planning a new fall class in code and theory. FXS is dividing his time as cost-accountant and transmitter engineer at KOAC, since they have been short of operators there. EOY, as asst. prof at an Oregon college, is working for the Kaiser shipyards in Portland. He helps install radio equipment and serves as radio operator on the shakedown trial runs. DE, chief engineer at KOAC, is busy at his regular job and is doing emergency teaching of electrical engineering and supervising in the ESMWT classes over the State. 73.

WASHINGTON — SCM, O. U. Tatro, W7FWD — EC. Olympia WERS took part in a public demonstration at Stevens Field on Aug. 16th. The following hams participated: DDY, ERU, FWD, FWR and IWM. Only two transmitters were used; one was at "control center" in front of the grandstand and the other was in the field where the "bombing" occurred. Received nice press and radio notices. GP is working for the Army Air Forces as an aircraft inspector in charge of the inspection of radio, electrical and flight instruments, installations and tests. CQI is a chief engineering aide at the Puget Sound Navy Yard. HPQ is a lieutenant in the Signal Corps. WE is working in the shipyards. GUG is with the Signal Corps as chief radio telephone operator at Anchorage, Alaska. HRC is with the telephone co. in Seattle. HNS, now a first lieutenant and also a proud papa, is located at Port Orchard from California. BVM also became papa of a little girl recently. HIN, now RM1c, reports working at a point with HAD, GVK, BIR and EYE as well as 6UAO, PWB, 8UGV and 2HYN. He is meeting hams from all over the world who are all glad to see the old fellows holding down the home front. "Keep up the good work," says he. 73, *Tate.*

PACIFIC DIVISION

EAST BAY — SCM, Horace R. Greer, W6TI — EC: QDE; EC u.h.f.: FKQ; Asst. EC u.h.f.: OJU; OO u.h.f.: ZM. On August 19th, EE, radio aide for WERS, City of Oakland, called another successful meeting of the WERS gang. The following were present: RRK, BBJ, QJT, WP, BUY, PB, JFA, RJP, TNM, IJA, TWL, HHM, AXF, MNG, TFV, DDO, JJ, HJE, GIU, TIM, ZM, SQ, FKQ, PLB, RCE, MIX, NZJ, RBK, GZT, AUZ, SFT, KZN, HJM, AEX and EE. PB gave a very interesting talk and Claude M. Christie, coördinator for OCD, City of Oakland, thanked the gang for the outstanding service so far given OCD. He said they are counting on WERS, in case of disaster, for key communication service. Mr. Christie was assured by EE that WERS would more than fill the job anytime that it was called on. Yes, gang, the WERS crew in East Bay are on their toes, and to date they have really done an outstanding job. All tests so far have proven once again that ham radio has what it takes. Another day closer to victory. — *TI.*

ROANOKE DIVISION

VIRGINIA — SCM, Walter G. Walker, W3AKN — There is very little news for the Section this month. The summer lull and the press of other duties are probably keeping the boys from sending in reports on activities. It is my sad duty to report the passing of one of the local hams, George W. Hobday, W3IQ. He died from a heart attack in July while on vacation in the western part of Virginia. We will all miss Hob, for he was one swell fellow. FQP writes from Norfolk to say that the Norfolk boys are going to apply for their license in WERS. He hopes to get a blanket authorization for the whole Hampton Roads area. This is the first attempt on the part of any of the Virginia communities to file for WERS. I hope for more news from you boys for the issue next month. 73, *Walt, W3AKN.*

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, Stephen L. Fitzpatrick, W9CNL — PPA, PDA, MOH, DKK, SBG, QCX, APF, JSW and W5GXL are employed at the Craig Signal Corps School of Radio located at Craig, Moffat, Colo. EHC reports that he may soon return to Wright Field; he still will be attached to Signal Corps aircraft maintenance agency. He says, "The school where I've been officer-in-charge closed (owing to having completed its training program) on August 7th and is now being dismantled. I'm slated for some other type of duty, probably to be attached to Air Service Command. EZL reports DZB visited with him recently and they had a brief reunion after two years. FNL is with the Army on duty in the Pacific and wouldn't mind it so much if he could set up some ham gear. OMZ is back at his home base in Salt Lake City after more schooling with the Air Force. HBU is stationed on a submarine in the Pacific. ZMI was a proud father earlier this year, and expects to go into the Army soon. HIJ is still teaching school for the Navy in San Francisco. EZL still pounds brass for the Army and finds tennis a good pastime when off duty. BQO reports that the new officers of the AAROD are WYX, president; BJN, vice-president, and BQO, secretary-treasurer. Robert Haase is in foreign service with the Navy. TFP has been added to our instructors' staff at Colorado University Extension Center, which will have new classes starting September 13, 1943. Classes include one in code, one in elementary radio theory and one in advanced radio theory. All classes meet twice a week and two hours a session. The instructors are: code — BQO and YXU; elementary radio theory — TRR; advanced radio theory — CAA and TFP. All classes are 10 weeks except advanced which is 15 weeks. Mr. and Mrs. Burr Betts, former students of our code and theory classes, took their amateur examinations. FXQ and ESA are now members in the AAROD. JKC, USN at radio station Astoria, Oregon, visited in Denver. Bell Radio Amateurs had picnic August 28th. BQO has new QTH: 2641 So. Race St. BQO had a chat with AYV of the USN when he was in Denver on short visit. VDV is joining the USN in the fall. MGX rides the Streamliner into Denver. WYX is intending to go to the western slope after peaches — that grow on trees, this time. He says that he has been ragchewing in forestry radio. GMB is a tech. sgt., service MB., Pearl Harbor. 3JIN received a new rating at Lowry Field. AIG, en route to Princeton for further schooling as an ensign, stopped off for a visit at ARRL hdqrs. Are there volunteers for ECs? Best regards.

SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — GOX, now a sgt., is getting 15 months of college electrical and communication engineering. He says they are covering so much in that short time that if you drop a pencil in class you miss six chapters and 46 formulas before you can pick it up. FMW is in the communication section of an anti-aircraft outfit in California. CIU is stationed in South Dakota, taking a course in radio operation and mechanics. Let's hear from some of you other fellows. 73, *Larry.*

EASTERN FLORIDA — Acting SCM, Frank C. Fassett, W4BYR — KK, EC for Dade County, has returned from vacation. He reports Dade WERS has taken over general communications in that area, including Red Cross, etc. Seven xmtrs and seven rcvrs were completed, both of which involve precision shop design. Need for enlargement on original layout is evident and modification of present license, to add 50 more portable-mobile units, will be applied for. New shop facilities will be available as soon as equipment can be moved from central control hdqtrs. to new location,

address censored. Technical and procedure groups will have finished training and will be ready to take over as soon as installations are complete. TZ says his QTH is 80 Sydney Ave., Deal, N. J. RQ, EC for Upper Pinellas, reports 4 additional restricteds just forwarded to FCC, 2 of 'em for YLs. EYI, EC for Lower Pinellas, sez that "Bing" Crosby, LSPH, has just been blessed with a new junior op. EWS is now in Miami. CWR and JM both visited in St. Pete recently. All in our Section were saddened by the recent accidental death at GE in Schenectady, N. Y., of Leo Morris Albert, DZT, St. Petersburg. The gang mourns the loss of Leo, who was a good citizen, a fine amateur and a swell fellow. DES sent a card from Oklahoma City and the other from San Antonio, Tex. Letter from HAD indicates that he is still in Seattle, but expects soon to hit for the snow regions. ERU has returned from Blanding under transfer back to MacDill. CXL returned to Tampa from Beaumont, Tex., to wind up affairs, including sale of property. Bad news for Tampa, but he turned over a lot of gear to Hillsboro WERS which was fb. FSG reports the following activity in this section: Capt. J. W. Hollister, jr., 1st Signal Co., has just completed inspection of all detachments and posts of his company. Additional recruits are needed, not necessarily radio men, but chauffeurs, message bearers and general utility men. The services of the Miami detachment, with Lt. F. G. Norton in command, have been promised the Red Cross in the event of disaster relief work in that area. A new signal co. detachment has been organized at Daytona Beach, and J. E. Thornton of WMFJ is senior in charge. WERS units are being increased from 3 to 13. Lt. Dave Brown, 1st Signal Co., Tampa, is on leave of absence at Bay Pines Hospital. Sgt. D. R. Perry has been put in charge. Four WERS units have been donated to the Fort Pierce detachment, in charge of Pfc. T. A. Fresh. West Palm Beach detachment is building additional equipment in preparation for disaster relief activity. Fort Myers detachment have loaned WERS equipment to Everglades company which is in process of building. Exams for restricteds were given by Capt. Hazelton as follows: Titusville, 5; Sanford, 4. Fellows, take a look at page 38 to 41 inclusive, July 1943 *QST*. Lack of listing of W4s from our Section indicates that we are not doing our part toward keeping hdqtrs. informed re activities of our gang in the various services. I'll volunteer to keep a card index on our fellows in the service and inform hdqtrs. if you will get behind me and send me the dope. All will agree that we owe that much to the gang of this Section who are active in serving in our interest. This information will be most valuable, too, after the war. The sixty-four dollar question is, "Who will volunteer to act as EC for Duval County?" No word from Jax again this month. Also failed to receive word from Orlando, WPB, Fort Myers and Sanford.

WESTERN FLORIDA — SCM, Oscar Cederstrom, W4AXP — MS paid the gang at aircraft radio a visit. UC took a hop in a plane. Aubrey Seale took commercial exams at New Orleans for the higher grades of 'phone and telegraph licenses and passed with flying colors. The amateurs met again this month at the WCOA studio and all had a good time. AXP took his new kayak out for the initiating rides and got some good ducklings out of it. A wedding of interest was solemnized this month at the Naval Air Station chapel. Roger Mangold and Ruth Woodruff, both of Wenatchee, Wash., took the plunge. The Section and the amateurs extend their best wishes. The groom is one of our rising young hams and a Navy radioman. Charles Swick is now at Clinton, Nebr. BCZ and 3IPD are now ops at WTAL at Tallahassee. BCZ took comm. tel. 1st. Snowden has been on road for state vocational program. It is time to decide whom you boys want for SCM for the next two years. I will have had it five years at the end of this term. I feel that this job should be swapped around among new hands every so often. It is your Section, and you should take an active interest in it and in the man you choose for SCM. Thanks for fine reports and 73. — *"The Old Maestro" AXP.*

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, H. F. Wood, W6QVV — Once again it becomes necessary to try to make up a message for you out of thin air. Why can't we get reports from the groups around here? Remember that a lot of your former ham friends read this and they would like to know what goes on, who is keeping the home fires burning, etc. Please send me some material each month, by the fifteenth, so we can all keep posted on your activities. Los Angeles WERS is going forward in good shape — the monitoring stations have been set up and manned, certain control centers have been energized and regular drills are being held. A complete schedule for the initial tests for each of the controls has been set and about the time this is read the whole system should be in full operation. A great deal of stress is being placed upon proper procedure, and so far we have been complimented on very excellent conduct. We are drilling all of our operators thoroughly, so there will be no slips. Some of the reports that I have read on the operations, as carried on by certain groups indicate that not enough thought and planning has been given to this most important phase. Practices must be in strict conformance with the rules and regulations This is not ham radio as we like it, but there's a mighty big job to do, and it depends on each one of us to do our part properly. If we feel that we can't do the job without clowning or jeopardizing the whole future of ham radio, it would be far better to resign now than to be forced to resign for good. 'Nuff said, watch your step! URB writes from Australia that he wants to be remembered to all the Glendale ham club and he sends his best regards to them and to the Burbank gang. He would like to hear from all and sundry. Write him, as he gets pretty lonesome "way down under." AM reports that Long Beach has leased several of the pieces of equipment from the boys there, in readiness for WERS work. Have not had any detailed reports from the Inglewood, Culver City, San Gabriel or other groups. Other hams that we heard from seem to be traveling, so this will be all for now. 73 es CUL, *Ted.*

ARIZONA — SCM, Douglas Aitken, W6RWW — News is at a minimum this month, and wish a lot of the gang would realize that this is your column. If you do not drop an occasional card with dope on yourself or others you know about, it's going to become pretty brief. The Tucson Short Wave Assn. visited a local airfield and had a glimpse of the latest in military equipment. GS says some of it is pretty nifty, but that any ham would immediately work it over! MLL has 4 stations in his wired wireless net now and seems to have worked out most of the bugs, key clicks being the hardest to lick. He uses m.o.p.a. with good results. SQN is new EC for the Verde Valley district. KSO is the father of a new YL op. IYZ, NRP, KMZ, MLL and 5HMX staged another one of those get-togethers across the line in Old Mexico. UKB has been transferred to the coast. Which about does it for this month. How about dropping a card right now, before you forget? Vy 73, *Doug.*

WEST GULF DIVISION

NEW MEXICO — SCM, J. G. Hancock, W5HJF — Francis Gormley (LSPH) is quite active in State Guard at Santa Fe, and is trying to get some WERS going over the State. He needs lots of help. JWA has received his Class B and hopes to take Class A when he reaches a U. S. port again. KCW has built a swell p.a. unit and spends his spare time razzing the SCM about propagandizing WERS. HJF and George Nickolds have a good AF wired-wireless set-up going, after trying everything in the book that wouldn't work. Harold Wheeler (LSPH) is now one of Uncle Sam's $50-per men. KKS is still building bombers in California. Bill White, a World War I veteran, and a victim of undulant fever, is suffering from a serious infection of hamitis. Let's see that he doesn't suffer what a 3×4-inch ticket won't cure. A QSL to Portales, N. M., will reach him! 73, *Jake.*

BRIEFS

Among equipment listed for sale in ARRL's Apparatus Bureau, a Missouri ham included his "5 XYLS." Life must be hectic in his household at times!

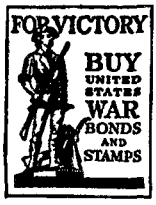
— • • • —

GI6TK reports that he spent a FB weekend in June with W6OYD at one of the U. S. Army camps in Northern Ireland. While there he also met the following American hams: W6UUJ, W6ASM, W6LD, W8AVA, W8KCG, W9ROD and W9NOP.

— • • • —

In General Radio's current catalog, you will see the following footnote: "See 'Direct Capacitance and its Measurement,' by R. F. Field." This seemed to be a little muddy to me at first glance. Hi! — *W9ADS.*

TO THE MEN AND WOMEN OF NATL CO INC



YOU WILL BE INTERESTED TO KNOW THAT YOUR [redacted]* RECEIVER # [redacted]* CONVEYED INFORMATION FROM A NAVY PBY PATROL PLANE THAT RESULTED IN THE SUCCESSFUL NIGHT ATTACK ON A JAPANESE CONVOY IN THE MACASSAR STRAIGHTS, IN WHICH TORPEDO HITS AND CLOSE-RANGE GUN HITS WERE SCORED ON SEVERAL ENEMY TROOPSHIPS AND DESTROYERS, MENTION OF THIS FACT IS CONTAINED IN THE COMBAT REPORT OF THE DESTROYER "PAUL JONES", WHICH USED YOUR EQUIPMENT WITH COMPLETELY SATISFACTORY RESULTS IN THIS AND OTHER ACTIONS IN THE SOUTH PACIFIC. THE NAVY NEEDS MORE OF YOUR RELIABLE COMMUNICATIONS EQUIPMENT.

E. L. COCHRANE REAR ADMIRAL USN
CHIEF OF THE BUREAU OF SHIPS

TO THE MEN AND WOMEN OF NATIONAL COMPANY

YOU WILL BE GLAD TO KNOW THAT [redacted]* RECEIVERS OF YOUR MANUFACTURE PLAYED A PART IN OUR RECENT VICTORY OVER THE JAPS AT ATTU. A COMBAT REPORT FROM THE COMMANDING OFFICER OF A U. S. AIRCRAFT CARRIER IN THAT ACTION STATES: "OUR COMMUNICATION EQUIPMENT IN GENERAL WORKED VERY SATISFACTORILY. PRACTICALLY ALL TRANSMISSIONS COULD BE RECEIVED ON ANY OF THE FOUR [redacted]*. NUMEROUS MESSAGES OVER THE VOICE RADIO FROM GROUND OBSERVATION PARTIES ASHORE ATTEST THE VALUABLE AID GIVEN AT CRITICAL MOMENTS." OUR FIGHTING AIRMEN NEED MORE OF YOUR EFFICIENT COMMUNICATIONS EQUIPMENT FOR FUTURE SUCCESSES. THEY KNOW YOU WILL NOT FAIL THEM.

JOHN S. McCAIN REAR ADMIRAL USN
CHIEF OF THE BUREAU OF AERONAUTICS

Thanks for the telegrams. We are building the best communication equipment that we know how and we are mighty glad to know that it meets the test of battle.

The MEN *and* WOMEN *of* NATIONAL COMPANY

*Type numbers of National Receivers have been deleted.

The Month in Canada

NOVA SCOTIA—VE1

From L. J. Fader, 1FQ:

IER, Wes Street, who is in the RCCS Reserve Army, has recently received a promotion to the rank of lance corporal. 1GC, Ian McLeod, formerly of Lunenburg, is now located in Halifax with the Maritime Telephone and Telegraph Company. He is also a member of the RCCS Reserve Army. Ex-1EF, Len Foster, has received another promotion in the RCCS Reserve Army, and is now a lieutenant. Len was in the American Army in the last war. 1FB, John Roue, former QSL manager for the VE1 District, is back home for a short stay. John is a lieutenant in the Canadian Navy, special services branch, and has been stationed in Newfoundland for the last couple of years. 1CR, Reg Rogers, of Sydney, was a visitor in Halifax recently. While we, unfortunately, didn't see him personally, we always will remember his fine hospitality. Reg was one of the best known of the VE1 'phone men on both 10 and 20 meters. His son is in the RCCS.

We regret to report that Archie MacPhail, 1JA, had the misfortune recently to fall and break his leg. Archie is an instructor in the Signal Corps of the Army, and is located at Sydney. It seems he returned to his duties after having a two-week furlough, and at noon hour of the day he returned, he fell down a flight of steps at the school. We all join in wishing him a speedy recovery. 1DC, Burt Horne, formerly of Moncton, is now located in Halifax, where he has joined the staff of the Dominion Sound, a branch of the Northern Electric Company.

1KH, Don Leonard, has been seen in Halifax recently. Don is a squadron leader in the RCAF. He was stationed in Ontario and also in the West for some time. His home is in St. John and he has operated also from Newfoundland and Halifax. 1MF, Mac Mills, has been trasnferred to a station in Ontario. Mac is in the RCAF and was for a time an instructor on the link trainer machines. 1KJ, John Harris, has recently received a promotion in the RCAF and is now a flying officer. John is in charge of a branch of the Signals in the Eastern Air Command at Halifax. 1HK, Barclay Dowden, who spent some time overseas, with the RCAF, is now located somewhere in Texas, where he is taking a course. Barc is a flight lieutenant in the Air Force, and has not been home for about two years. 1HG, Harry Grant, is a lieutenant in the Canadian Army, in charge of the Motor Transport in his unit. Harry was a DX man on the 20-meter c.w. band, and was quite well known.

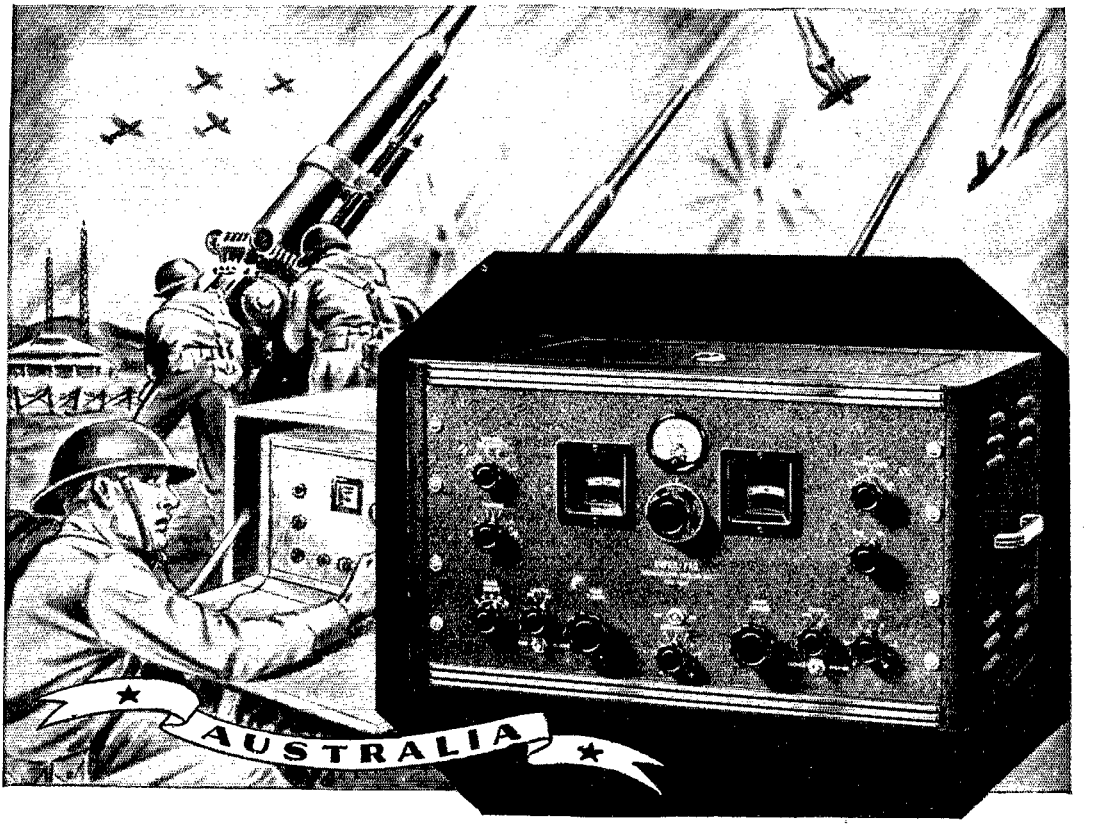
I recently had a visit from Des Wail, who used to operate on 20-meter 'phone from his father's station 3MP, at Smith Falls, Ont. Des joined up shortly after the outbreak of war and is a gunner in the Canadian Navy. He has been all around the world, and was a gunner on board the Liner Empress of Canada, when it carried troops to the Far East. It was sunk shortly after Des was transferred to another ship. He has recently returned from spending a furlough at his home.

Banner Edwards, 3PD, who hails from Ottawa, stopped by for a visit. Banner recently returned from Gaspé, where he was in charge of the naval radio station, and is at present spending a well-earned furlough at home. On his return he expects to join a Canadian destroyer. Banner has covered quite a bit of the Western Hemisphere since joining up, and has visited Alaska, the Aleutian Islands, as well as having made a trip through the Panama Canal.

We regret that we got slightly mixed up in regard to the whereabouts of our good friend George Craft, 1JC. It had been quite some time since we had heard from him. I am glad to see that he still reads *QST*, and was able to correct the error. Thanks George.

I spent a recent week-end on a concert party tour of Prince Edward Island and also visited the RCAF station at Scoudue, N. B. While in Charlottetown, I paid a visit to Keith Rogers, 1HI, whom I had never met before personally. He mentioned having had a phone call recently from Gordon MacGregor, 3GT, who is with the RCAF as an instrument mechanic. Gordon was formerly in Ingersoll, Ont. I also bumped into John Harris, who has recently been assigned to the RCAF station at Summerside, where he is the signal officer. Going across on the ferry from Nova Scotia to the Island, I was very much surprised to find that the captain of the boat was no other than our good friend Ed Terfry, 1CF,

(*Continued on page 78*)



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HAMMARLUND

(Continued from page 76)

who used to be located in Parrsboro. Since the outbreak of war he has spent a year on the Great Lakes, and has been on the present run for two years. Many of the boys will remember him on the 20-meter 'phone band.

ALBERTA—VE4

From W. W. Butchart, 4LQ:

SARCEE CAMP this summer proved quite a drawing card for VE4 Hams. During the first two-week period of camp I was able to dig up the following: 4HQX, Bill Stunden, of Calgary, is major paymaster for the Calgary Regiment, Tanks; 4JP, Reid Elliott, of Alliance, is a second looey in the Calgary Tanks; 4GD, Jim Smalley, is a sergeant in RCCS (Res.), Calgary; 4CY, Sammy Litchinsky, of Calgary, is a second looey in the same unit as GD; 4AAD, Jack Freeman, of Edmonton, is district signal officer for M.D. 13, Calgary; 4XE, Dick Bannard, is WO1, RCCS, Edmonton.

With this report we are adopting Bill Stunden's suggestion that, wherever possible, in these reports we will mention both the call and name of the ham concerned. In this way it will be a bit easier for you chaps to associate calls and names to better advantage. We must admit that after almost four years of war we begin to lose track of names and calls among the ham ranks!

4HQ. Bill Stunden, of Calgary, is very much interested in 16-mm. movies, with sound synchronization, etc., and he tells us that he has some pretty nice equipment gathered together now for his work. Bill, by the way, does his own processing of black-and-white movie film and secures excellent results. Bill adds with a sigh, that he'd sure love to get on 75-meter 'phone again with the trusty old 807 final!

4CY, Sammy Litchinsky, finds plenty to keep him busy, what with his duties as an officer in the Reserve Army, and his photographic hobby. (It took just CY about 5 seconds flat to join GD and LQ when he caught sight of them rag-chewing on the Brigade Parade Ground at Sarcee!)

4JP, Reid Elliott, of Alliance, looked a very tired boy the evening we saw him tramping in with his squadron after the famous "Battle of Sarcee." And wasn't the mud the most disgustin' stuff, Reid?

4AAD, Jack Freeman, of Edmonton, had a skunk (of all things) for a bed-mate one night at Sarcee. Jack vacated his quarters in an awful hurry when the "little kitty" moved in!

4XE, Dick Bannard, of Edmonton, operated a No. 1 "wireless" set in a Universal Carrier in the big "Battle of Sarcee," and reports that the rig worked very well considering the difficulties they were up against. The fact that the Carriers are completely shielded for radio accounts for some measure of success in that line. Dick spent a goodly portion of an afternoon mired down in a mud-hole until rescued by some trucks.

As Signal Officer for the Edmonton Fusiliers, I was kept very busy during the whole time at camp, but consider the training period a complete success according to results obtained from my outfit.

4ZI, Elwood Irwin, of Barons, drops us a line to keep us advised of the doings down around that neck of the woods. He got a card from 4PZ, formerly of Barons, now in Montreal with the RCAF. PZ observes, that Montreal is OK as long as you can "Parlez Vous," but according to the picture on the said card he "ain't doin' so bad either!"

4AQP purchased WZ's Super Skyrider, and also joined the Reserve Army. He expected to be at Sarcee for two weeks in July.

4ARC has painted his house. 4ZI claims that WZ is preparing for big events in the future. (More news on this later!) ZI himself has kept busy trying to figure out the new "sky-hooks" he intends to raise after the ban is lifted. 4EO, Bill Savage, of Lethbridge, passed ZI on the street the other day, but Bill was riding one of the fire wagons to a fire, and as ZI remarks, "You just can't flag-down one of those things!"

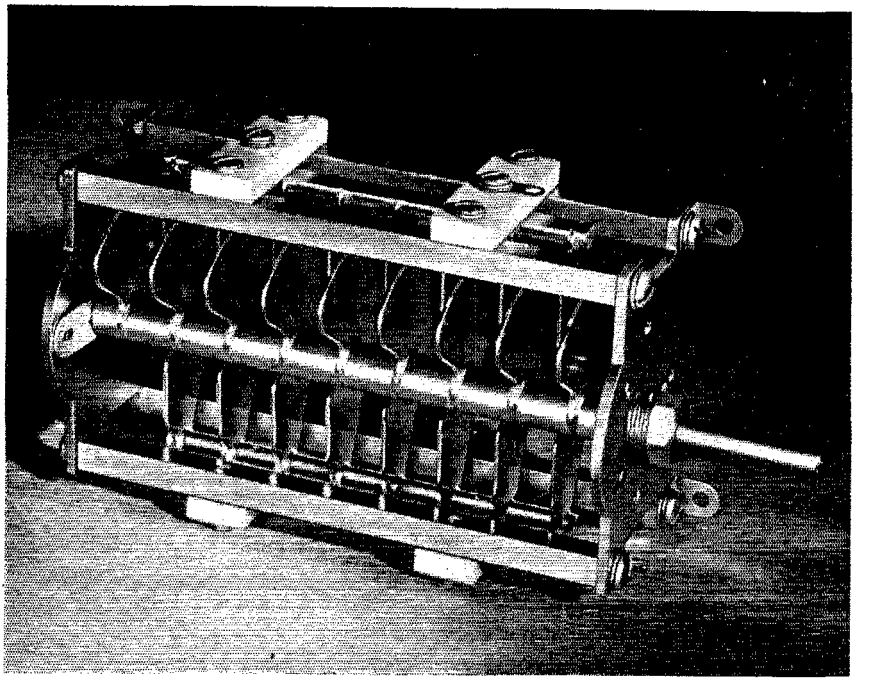
4WJ and 4AIQ, Ernie and Elva McNair, of Calgary, returned to that city from Ottawa for a short visit and GD says they both look FB.

4WY, Mickey (Turpie) Dodds, of Edmonton, and her young daughter are both doing well. Her OM is still stationed down east and hasn't been able to get west to see his offspring.

4ADW, Jack Gooderidge, of Edmonton, took the fatal step about a month ago. The happy couple have been honeymooning in Edmonton since. We understand that

(Continued on page 80)

DESIGN FLEXIBILITY



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HAMMARLUND

(Continued from page 78)

Jack is very enthused about married life. 4AKK, Bob Lamb, of Edmonton, remarks caustically that "he's just the same old Gooderidge!" Congrats to Jack and his brand new XYL.

Remember 4LX, Alf Kettenbach, of Rockyford and Calgary? Well, Alf's making his QTH in Calgary at present and doing well. Sorry that time didn't permit a visit with you, Alf.

4SN, Pop Smalley, of Calgary, ran the "Gyp-Joint" for GD while that worthy was taking his training at Sarcee. Yeah, boys, GD was back on the air again, and did he ever enjoy himself, even if it was only a lousy No. 1 "wireless" set!

The *Edmonton Journal* of July 22nd carried a picture of Squadron Leader Jack Charles, of Lashburn, and the caption noted the fact that Jack and a Free French pilot in his squadron were credited with shooting down the 1000th German plane in the squadron, for which they split a 300-lb. prize. Jack is the son of 4AM, of Lashburn, who, by the way, was in the RFC during the first World War.

Via 4ADW, Jack Gooderidge, we learn that 4AGZ, Don Stewart, of Edmonton, now flying officer with RCAF, has been moved to the North African theatre of operations. Don is with a radio technicians group, and by now has probably seen and heard much of the war in the Mediterranean. ADW says that Don mentioned in his last letter prior to moving to Africa, that he had met 4ADD, Art Craig, of Edmonton, pilot officer with the RCAF, on leave in London. So now we know where Art is located. (Or do we?)

Flight Sergeant Tom Logan, of Edmonton (call unknown), recently reported home from overseas and now is stationed at Calgary. He manages to get home to Edmonton on some week-end leaves.

4EA, Roy Usher, of Edmonton, has just left on his holidays and as far as we were able to gather, he intends to spend them in the Kootenay Valley in B. C., but we're just skeptical enough to think that EA will wander a bit further afield than that!

5EP, Don Vaughn-Smith, of Vancouver, is now a WO2, having recently been promoted from staff sgt. He is located in Vancouver with the RCCS.

On arriving at Vulcan to spend a short holiday, I found that both of my old side-kicks of the "Haywire Net" (4IN, Bill Lawrie, of High River, and 4AEV, Norm Lockhart, of Vulcan) had been there just previous to my arrival. We did learn that IN carries the rank of sergeant now, and that he is still on the Pacific Coast with the RCAF. AEV stands a good chance of finishing his air-crew training after being "grounded" for 6 months.

We had a visit the other evening from 4AC, Frank Meadows, of Brandon, Man., who now is making Calgary his QTH. He enlightened us as to the whereabouts and doings of several of the Brandon gang and we are glad to pass along these items:

4AFV, Gert Elliott, teaches code classes at Brandon. The OM, with the RCAF, attached to the RAF in India, has been promoted to squadron leader. 4AFY, "Kayo" Shopka, now with the RCAF, has been overseas and has been returned to No. 3 Wireless School, Winnipeg, as an instructor. By the way Kayo brought back an English XYL with him! 4AU, Les Sedore, is with the RCAF at No. 1 Wireless School, Montreal. Les says that the RCAF have still got him on the "learning" end of radio, rather than instructing. 4DO, Sid Williams, is with the RCAF, attached to the RAF on maintenance work in England, and enjoys it thoroughly. Previous to this assignment he had been on radar work, and found things in that line a bit slow to suit him! 4MK, Harold Cahoon, is now a traveling radio technician for TCA with territory from Manitoba to the Coast, so we understand. 4AFB, Art McGill, of Goldfields, is on an operating job with the TCA at Vancouver.

As for 4AC, himself, we might add that Frank has been in the ham game since 1919. He was originally licensed 4AL, way back in the early 20s (now do any of you OTs know whom we are talking about?), and has had the call 4AC since living in Brandon. It looks as if Calgary will have another very active rig on the air after the War as AC, his XYL and one of his four daughters will have their tickets. Thanks for all the dope, Frank, and also for a very pleasant visit.

(Continued on page 82)


In War...
In Peace...
OUR BUSINESS IS
MAKING LOUD SPEAKERS
Now being used for military communication, detection and similar war time uses...
built to those high standards of precision, durability and performance born of habitual peace time practice.
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(*Continued from page 80*)

And just as we were about to fold up for this month and shoot our news along to the CGM, along comes a very FB letter from 4AOZ, Slim Marsden, of Milo, with some nice juicy news, but I'm afraid it will have to stand over 'til next month, as the column has reached proportions far in excess of our expectations! See you next month, gang. In case any of you chaps have news to shoot along to me the address is: 10740–107th St., Edmonton, Alberta. 73, VE4LQ.

BRITISH COLUMBIA—VE5

From Jack Sibson, 5BQ:

HAVEN'T heard from nor seen very many of the boys this summer and, when I have, they didn't seem to have any news. I hope to see more of you this month.

5OM and 5BQ had a two-week holiday near Shawingan Lake, Vancouver Island. Had lots of fun swimming in a nice cold river, and changing the direction of the antenna on the b.c. receiver. Also went to visit Don, 5EP, Gwen, 5NG, and daughter in Victoria.

5ES, Roy Sharpe, is kept pretty busy in his victory garden. 5KU, Bill Deakin, has moved to Lethbridge and is still with TCA. 5HU, Ted Sharpe, is working in the radio division of CPA.

Prisoners of War

Sgt. Thomas T. Weir, W7GDM, informs us that he was captured by the Germans in Africa early this year, and is being held in a prison camp in Germany.

Missing in Action

The Navy Department has officially reported these amateurs to be missing following action in the performance of duty: Norman Unsworth, RM2c, W1GBK; Charles G. Crowley, ex-W4UY; and Gilbert J. Howie, jr., W8TWH.

Ex-W4UY was the radio officer on a freighter in the merchant marine. W8TWG was a radio technician on the *Triton* at the time it was sunk.

Silent Keys

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

W2CLS, John T. Wilcox, Carlstadt, N. J.
W3IQ, George W. Hobday, Hilton Village, Va.
Ex-W4CQT, Cadet William G. Lee, jr., USN, Macon, Ga.
Ex-W4DZT, Leo Albert, Schenectady, N. Y.
W6RDG, Henry M. Luellwitz, Beverly Hills, Calif.
K7BC, ex-W7BB, Sgt. Edward R. Stevens, Sitka, Alaska
Ex-W8GBS, Norbert Petricca, Amsterdam, N. Y.
W8SVE, Clarence R. Wheeler, Syracuse, N. Y.
W9CL, James L. Gwynn, Des Moines, Iowa

The Army had a transmitter but no receiver

Have you ever heard the story of the Army's first experiment with short-wave radio?

It begins back in 1925 when Colonel Loughry, stationed at the Presidio in San Francisco, asked Ralph M. Heintz to submit a quotation on a short-wave transmitter. The cost was estimated at $600, and in spite of the Colonel's eloquence, his senior officers were not persuaded that short-wave was promising enough to merit that amount of money.

But Colonel Loughry was not so easily defeated. There was a $375 reserve in the Presidio mess fund. The Colonel decided that the military value of short-wave was worth risking the unauthorized transfer of this idle money. Then he and Ralph Heintz combed the Presidio junk pile, salvaging generators and other material from condemned trucks.

Came the day when the transmitter was ready to go on the air, and only then was it realized that the Army lacked a receiver capable of bringing in its new transmitter! So officers in Washington arranged to go to the home of a local amateur to receive the Army's first short-wave message.

* * * * *

The Signal Corps and Heintz and Kaufman, Ltd. have both come a long way since this incident in 1925. The pioneer work of Heintz and Kaufman with high frequency transmission showed the need for specially designed tubes, and Gammatrons were developed to fill this need.

Through continuous research and improvement, Gammatrons have maintained their position of leadership in their field . . . their reputation for high efficiency at very high frequencies, for ease of neutralization, for long life, and for mechanical and electrical stability.

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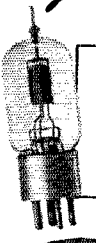
Gammatron Tubes



HK-24—The long, capped tantalum plate confines the entire electron stream for useful output, and the grid is closely spaced to the filament for short electron time-flight. The result is high efficiency at very high frequencies. (Plate dissipation 25 watts, maximum power output 90 watts.)

Splatter

(Continued from page 8)

associated "wireless" with the menace of gunpowder and compelled him to keep the garden hose handy on the operating table. Following a sojourn at McGill University Weitzer came to the States, where interest in aviation brought him to Fairchild Aviation. He resuscitated a discarded Curtiss JN, but after a short season of illegal flying the unlicensed Jenny cracked up in the haste of taking off to evade a Bureau of Aeronautics inspector. Once out of the hospital he was employed as designing engineer by a series of radio manufacturers, including Western Electric. Back in amateur radio as W2FSP in 1932, throughout the years he has always since been active in his home workshop — out of which activity developed the article on p. 9. Now in the CAP, he is pushing construction of 2½-meter WERS gear. At present he is employed as research engineer in the laboratory of a well-known company engaged in the manufacture of electronic and aircraft equipment.

To which we add a cordial repeat welcome (see "Splatter," p. 16, January, 1943) to Paul J. Palmer, W8UGR (p. 35).

• • • —

FEEDBACK

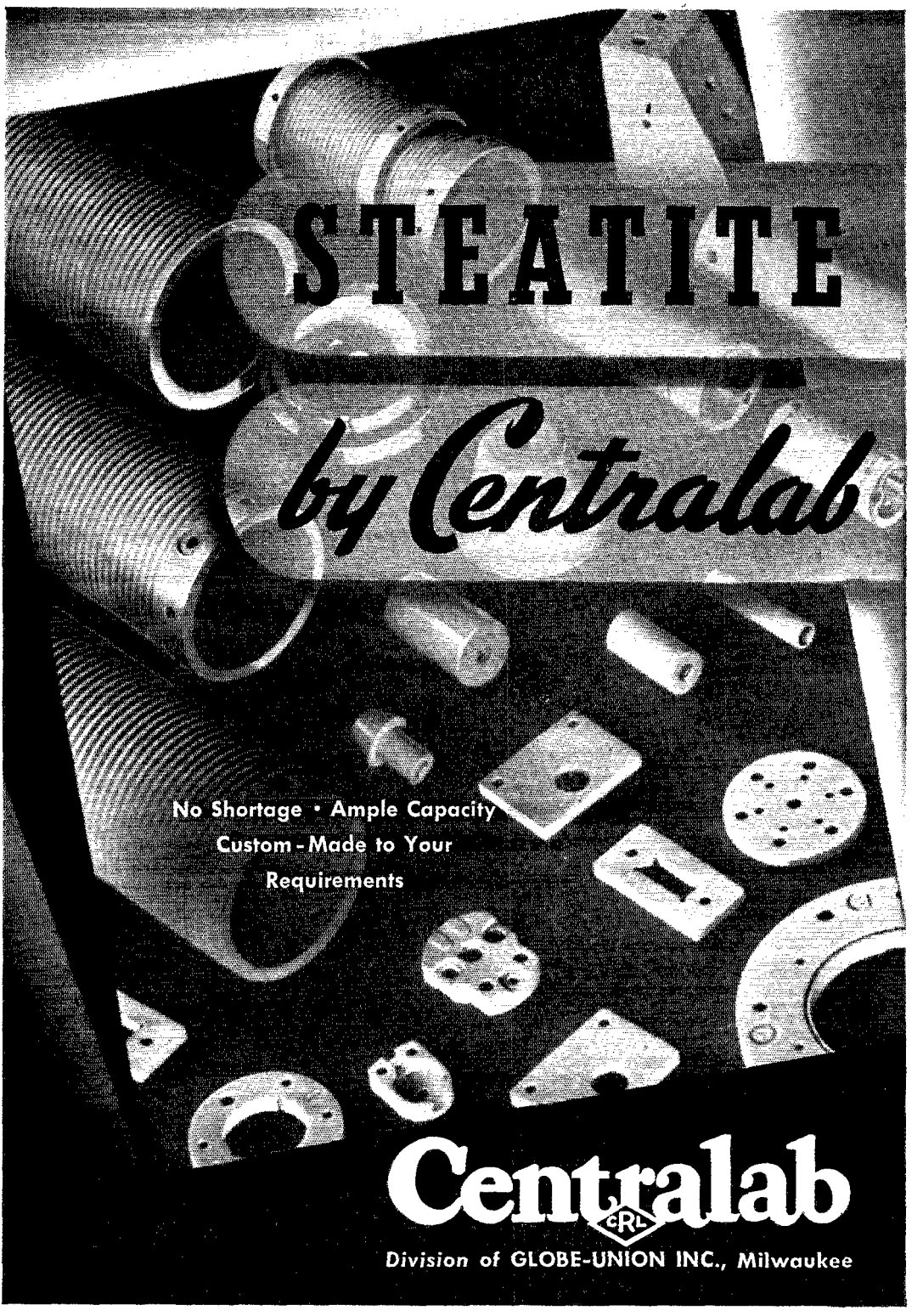
EVERYONE knows that it's hard to get information about Russian doings these days, but you'd think they'd have told us that they'd abolished the Tverdyi Znak before we got our article on the Russian telegraphic alphabet (p. 19, March, 1943) into print. Even though it may sound like one, the Tverdyi Znak isn't a military secret. It never was secret; it was only mute. Now it isn't even that. Here's the dope: The article as published contained the incorrect statement that the Russian letter Ъ is mute and indicates only that the consonant preceding such a letter is hard. However, it seems the letter originally given this usage (the Tverdyi Znak) has been abolished. The Russian Ъ should be pronounced BEH.

Correspondence

(Continued from page 64)

"radio," but is concerned only with a later improvement. The court said: "Marconi's reputation as the man who first achieved successful radio transmission rests on his original patent, which became reissue No. 11,913, and which is not here in question. That reputation, however well-deserved, does not entitle him to a patent for every later improvement which he claims in the radio field."

In referring to Marconi's earlier work, the court said: "Between 1896 and 1900 he demonstrated on numerous occasions the practical success of his apparatus, attaining successful transmission at distances of 70 and 80 miles." Thus, Justice Rutledge was referring to the invention of the later patent when he stated: "Before his invention, ether-borne communica-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Custom-Made to Your
Requirements
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(*Continued from page 84*)

tion traveled some eighty miles. He lengthened the arc to six thousands."

The Supreme Court has never passed upon the validity of Marconi's original patent, No. 586,193 (reissue No. 11,913), and, since the patent expired many years ago, it is not likely that the Supreme Court will have an opportunity to consider it.

No published court decision has been found in which a court has made a holding that Marconi was not the first and original inventor of the system disclosed in his original patent No. 586,193. The reissue of this patent (reissue No. 11,913) has been adjudicated in three reported cases, as follows:

1) In the case of Marconi Co. v. DeForest Co., reported in 138 Federal Reporter 657, the validity of the patent was challenged on the ground that Marconi was not the first inventor. Judge Townsend, in a carefully considered opinion, reviewed all of the prior publications relied upon to invalidate the patent and found the patent to be valid and infringed. Of Marconi's work, Judge Townsend said: "The exact contribution of Marconi to the art of spark telegraphy may be stated as follows: Maxwell and Crookes promulgated the theory of electrical oscillations by means of a disruptive discharge. Hertz produced these oscillations, and described their characteristics. Lodge and Popoff devised apparatus limited to lecture or local experiments, or to such impracticable purposes as the observation of thunderstorms. Marconi discovered the possibility of making these disclosures available by transforming these oscillations into definite signals, and, availing himself of the means then at hand, combined the abandoned and laboratory apparatus and, by successive experiments, reorganized and adapted and developed them into a complete system, capable of commercially utilizing his discovery."

2) In the case of Marconi Co. v. National Electric Signalling Co., 213 Federal Reporter 815, the defense also insisted that Marconi was not the first inventor, but Judge Veeder, after reviewing the results of "a period of speculation and experiment" prior to Marconi's work, stated: "But no one had described and demonstrated a system of wireless telegraphic apparatus adapted for the transmission and reception of definite intelligible signals by such means. This was the state of scientific knowledge and practice when in 1896 Marconi applied for his patent." Judge Veeder also found that Marconi was "the first to discover and use any practical means for effective telegraphic transmission and intelligible reception of signals produced by artificially formed Hertz oscillations."

Instead of using the Marconi coherer, the apparatus manufactured by the defendant employed either an electrolytic detector or a crystal detector. Judge Veeder held that the electrolytic and crystal types of detectors were not "imperfect electrical contact" devices (as the coherer was defined in the patent claims) and did not function in the same manner as Marconi's coherer. The

this man is wasting his time . . .

. . . unless the component parts specified in electronic engineering are equal to the task the design requires of them. The man-hours spent in new developments deserve the best components. The performance of the most intricately conceived circuit is no more dependable than the tubes contained in it.

The complete dependability of Raytheon Tubes is a long-established fact in both civilian and military experience. Whether the need be for standard tubes, or for tubes of special design, Raytheon meets the most exacting requirements.

Since Pearl Harbor the Raytheon laboratories have hung up a remarkable record of achievement in new — and in some cases, unprecedented — tube designs, and the Raytheon Manufacturing Company is producing them in heretofore undreamed-of quantities!

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DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES AND EQUIPMENT FOR THE NEW ERA OF ELECTRONICS

(Continued from page 86)

patent was found to be valid but not infringed.

3) Marconi's reissue patent was also involved in the early stages of the litigation in the case which was recently decided by the Supreme Court. The U. S. Court of Claims considered this patent in its decision in the case of Marconi Co. v. United States, reported in 81 Court of Claims Reports 671. Here also the apparatus being used by the Government employed crystal detectors, and the Court of Claims followed Judge Veeder's opinion in the case referred to above and found no infringement. The court declined to pass upon the question of whether or not Marconi was the first inventor of the system shown in his basic patent, but the court did say ". . . the combination of the Marconi patent appears to be the first one that went into practical and general commercial use for the purpose of communication through electric signals transmitted without wires."

The world has recognized Marconi to be entitled, more than anyone else, to full credit and honor for developing the art of radio communications from an experimental and laboratory state to a practical, useful invention. The recent decision of the Supreme Court on an improvement patent did not undertake to detract from this honor and credit.

— *Ralph B. Stewart*

THE ENGINEERING MIND

2424 N. Linder Ave., Chicago, Ill.

Editor, *QST:*

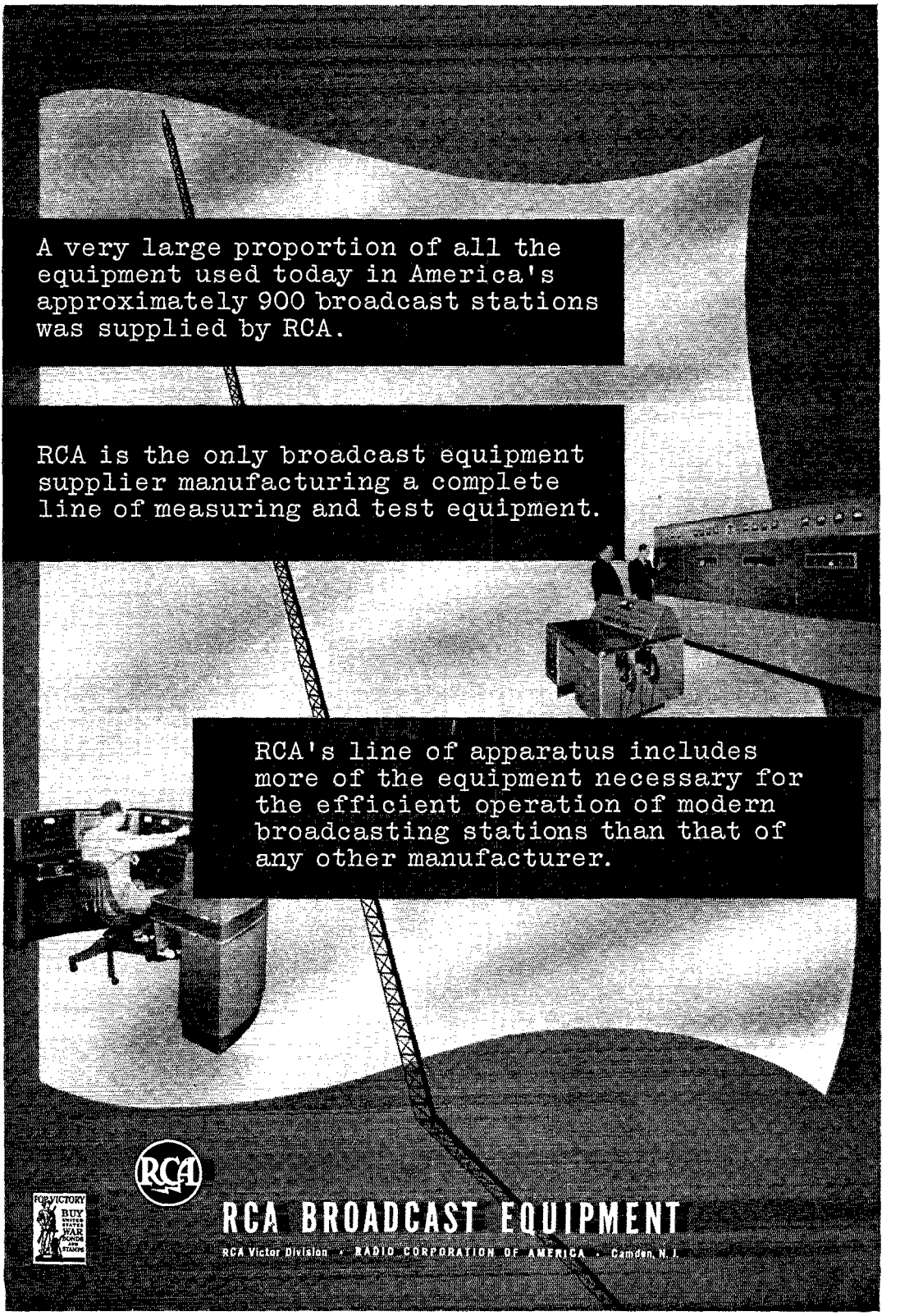
Some time ago, during my travels with the Navy, I stopped at the radio repair shop of a naval installation and noticed the following little message posted on the wall, just above all the test instruments. I believe it will bring some bright smiles to the faces of most amateur radio operators who are practical radio men. The title was, "The radio engineer." It read: "A radio engineer is a person who passes as an exacting expert on the basis of being able to turn out with prolific fortitude infinite strings of incomprehensible formulae calculated with micromatic precision from vague assumptions which are based on debatable figures taken from inconclusive experiments carried out with instruments of problematical accuracy by persons of doubtful reliability and questionable mentality for the avowed purpose of annoying and confounding a hopelessly chimerical group of esoteric fanatics referred to all together too frequently as practical radiomen."

— *F. J. Duke, RT1c, USNR, exW9OV*

SOMEWHERE IN THE MIDDLE EAST

Editor, *QST:*

It sure was swell to get an issue of *QST* after all these months, and I want you to know I've read it from cover to cover. It's great to see such a big issue, too — and in these times of partial activity! I certainly agree with W5HHV, for our manufacturing friends *have* stuck by us. A lot of the ads were even more informative and interest-


A very large proportion of all the equipment used today in America's approximately 900 broadcast stations was supplied by RCA.
RCA is the only broadcast equipment supplier manufacturing a complete line of measuring and test equipment.
RCA's line of apparatus includes more of the equipment necessary for the efficient operation of modern broadcasting stations than that of any other manufacturer.
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BUY UNITED STATES WAR BONDS AND STAMPS
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RCA Victor Division • RADIO CORPORATION OF AMERICA • Camden, N. J.

(Continued from page 88)

ing than usual. Many of them made me not a little homesick for the old rig again, and started me thinking about a few things to do to modernize the old haywire when we return.

Speaking of the rig, I just became aware of FCC Rules 99 and 101 for the first time, and straightway dispatched a letter of inquiry to the W1 field office. I sure hope I still have a rig, and that my folks may register it even at this late date. Anyway, I'm thankful I'm an ARRL member, for had I not got my *QST* I would no doubt have had my folks "outside the law" for the duration! My friend, W1MIR, is the only licensed ham of my home town, and at present he's an op somewhere with PAA. . . .

I've combed the "Amateur Activities" and "In the Services" sections carefully, and see quite a few calls and names that are familiar. I hope to see more about the Maine boys in the next issue, and the VE1s, too. It sure will be a happy day when we can get on and chew the rag with the Canadian gang again. I read with interest the reports of the hamfest parties here and there, and look forward to getting together with the gang at the Hotel Bradford and having "good old George" (W1KH) for master of ceremonies again! Boy, will that be a happy day, too!

Say, I guess you can call this one of the contributions to W6SN's suggestion of a "Ham Lovelorn" column. But I *do* miss my hamming, even though we are still in radio. It's not comparable with the old days, so we can just . . . keep on doing our bit for the service, and truthfully say, "I'm thankful I am a ham."

Good luck to all, keep the *QST*s coming, and we'll see you after the duration.

— *Sgt. Tech. Samuel H. Beverage, W1MGP*

KEEPING IT ALIVE

4118 Cherokee Drive, Madison 5, Wis.

Editor, *QST:*

. . . I like the way that *QST* is being kept up in spite of the practical cessation of amateur radio activities. If it continues to be as good a magazine as it is now, I expect to continue subscribing no matter how long the war lasts. The ARRL is the only organization of any importance that will be able to back up amateur radio after the present fracas is over, and we want to keep our organization and our hobby alive.

— *Leslie D. Downs, W9YSZ*

Hints and Kinks

(Continued from page 61)

duce errors which might be caused by "walking" of the drill. Gradually increase the size of the drill until the ear of the coverplate falls off. The hole should now be finished with a small rat-tail file. If drilling or reaming is continued, the unbalance of metal on the two sides of the drill will move the drill considerably to one side of center. The final appearance and performance will depend

Worthington For President!

Favorite Son Worthington's name has just been introduced. Around and around the convention floor go the delegates, a'whooping and a'hollering, hell-bent for putting Worthington across.

TO BRING the dramatics and color of America's biggest show—a presidential convention—to the folks back home will be another peacetime assignment for Electro-Voice Microphones. Announcers' broadcasts will be heard clearly and distinctly above an adjustable volume of background noise that may be retained, if desired.

Fitting easily into the hand or attached snugly to the face, weighing barely more than a whisper, these new Electro-Voice Microphones are incomparable from the standpoint of stability, articulation and reduction of background noise. We'd like to tell you more about this radically different microphone design . . . show it to you. Manufacturers of war equipment may receive full particulars.

Make your present equipment last. Submit your Electro-Voice Microphone to your local distributor for TEST and REPAIR at the factory.

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(Continued from page 90)

upon how accurately this hole is measured and drilled.

The next thing is to remove the shell from the other control. Then remove the C washer which holds the shaft in place. The shaft and wiper assembly may now be removed (being careful not to lose the roller contact), followed by the resistance strip. This leaves the front plate and bushing. The bushing should be cut down to about 1/8-inch long, leaving only two or three threads on it. This plate and the rear shell of the front control may now be assembled with a 3/8-inch nut. A washer or two probably will be required between the two, to take up the space where the bushing is not threaded. Now replace the resistance strip in the rear control and insert the wiper shaft through the bushing.

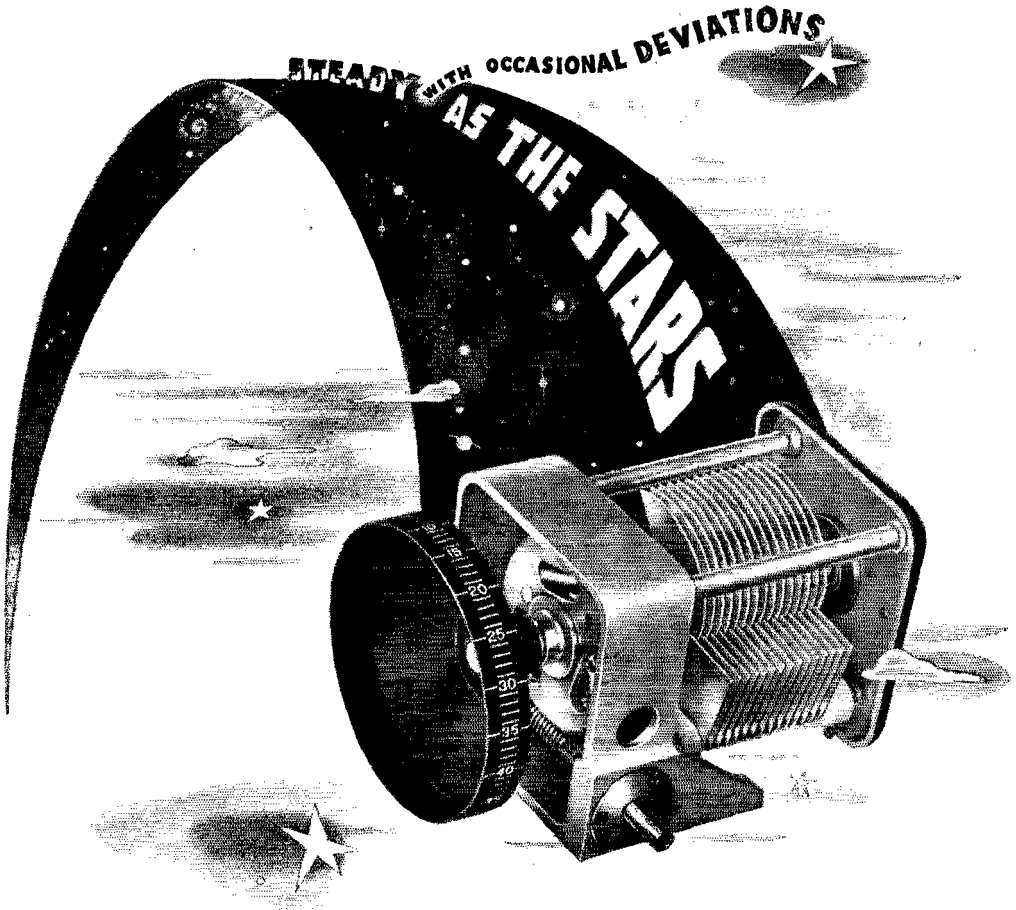
The shaft and wiper of the front control should now be removed and the wiper assembly pried off the shaft, being careful not to crack the phenol fiber insulation. The hole in this piece should be reamed out to 1/4-inch. Go easy when nearing the final diameter. Ream from both sides and try it on the knob end of the shaft at intervals, stopping when it can be just wedged on without forcing.

The next move requires some dexterity. Insert the roller contact in the rear wiper assembly. Hold the control in the left hand, pushing against the wiper (back) end of the shaft with the index finger to provide about the same spring tension as a new control would have. Slide the resistance strip and front plate of the front control into position onto the shaft. Then, holding the tension to its final value, scribe the location of the end of the bushing on the shaft. Remove the shaft (watching the roller contact), clamp the shaft in a vise, and saw a slot around the shaft about 3/16-inch or so deep at the scribed mark to accommodate the C washer.

Now comes the final assembly. Re-insert the shaft and slide on the front wiper. Align the two wipers to the same relative position on the shaft, then turn both wipers to about middle position. With the roller contacts placed in both wipers (holding the control shaft up will help to keep them in place), slide on the resistance strip and front plate of the front control. The position of the front wiper should now be adjusted to exert about the same pressure on its resistance strip as the rear one, with the control held together. A drop of cellulose cement on the front wiper will hold it in place on the shaft. If the wiper is tight enough, this should not be necessary; if it is done, however, the wiper and shaft should be cleaned with carbon tetrachloride. After the alignment of the two wipers is checked, the C washer should be snapped on the shaft and clinched. Now the ears on the front control may be bent over and the rear shell attached in the same manner.

A switch may be attached to the gang with no modifications.

If reasonable care is exercised in its construction, a workable unit with good tracking of resistance can be obtained which is suitable for hetrofils and Wein bridge, *R/C* oscillator circuits, and L, T & H pads. — *Cpl. David A. Kemper, W2NTX.*



Like the course of the stars across the heavens, Cardwell progress has been sure and steady. Occasionally, we try a different path or make a mistake, but when that happens, we generally discover something new to add to the desirability of Cardwell Condensers.

Unvarying, however, is Cardwell Quality. The years have brought changes in the line, and our condensers have found countless new applications in military and civilian life. Cardwell Quality remains, as always, the *Standard of Comparison*.

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81 PROSPECT STREET BROOKLYN 1, N. Y.

Traffic Cop of the Air

(Continued from page 57)

The job of maintaining order in a situation which held all the elements of chaos was one calling for the highest order of skill and diplomacy. Fortunately, the men then charged with the responsibility of administering radio — Terrell, and his chief, Secretary of Commerce Herbert Hoover — had those qualities.

A coöperative arrangement involving sharing of time and facilities was worked out with the broadcasters. Incredibly enough, it worked. First the only wavelength (Bill Terrell insists on referring to wavelengths in talking of those days, because that was what they called them then) assigned for broadcasting was 360 meters. Soon 485 meters was added for the use of stations broadcasting agricultural reports, one of the early essential b.c. services.

Then, along about 1922, Secretary Hoover decided that the future of broadcasting might be jeopardized if people were to grow tired of the interminable "canned" music from poor quality reproducers which characterized the early b.c. programs. He asked Terrell to set up a special class of stations, giving them extra privileges as an inducement to perfect their programs. Terrell worked out a plan which called for the assignment of 400 meters to what were called "Class B" stations — the requirements being a minimum of 500 watts of power, no "mechanical music," studios free of reverberation, etc. Such stations were given the equivalent of clear channels. The plan was put into effect — successfully.

At first, broadcasting as a service was conducted by manufacturers of receivers to promote sales. Then a few department stores put in stations to advertise their wares — and from then on the new field mushroomed. Broadcasting had been born and weaned, and was on the way to becoming an infant industry.

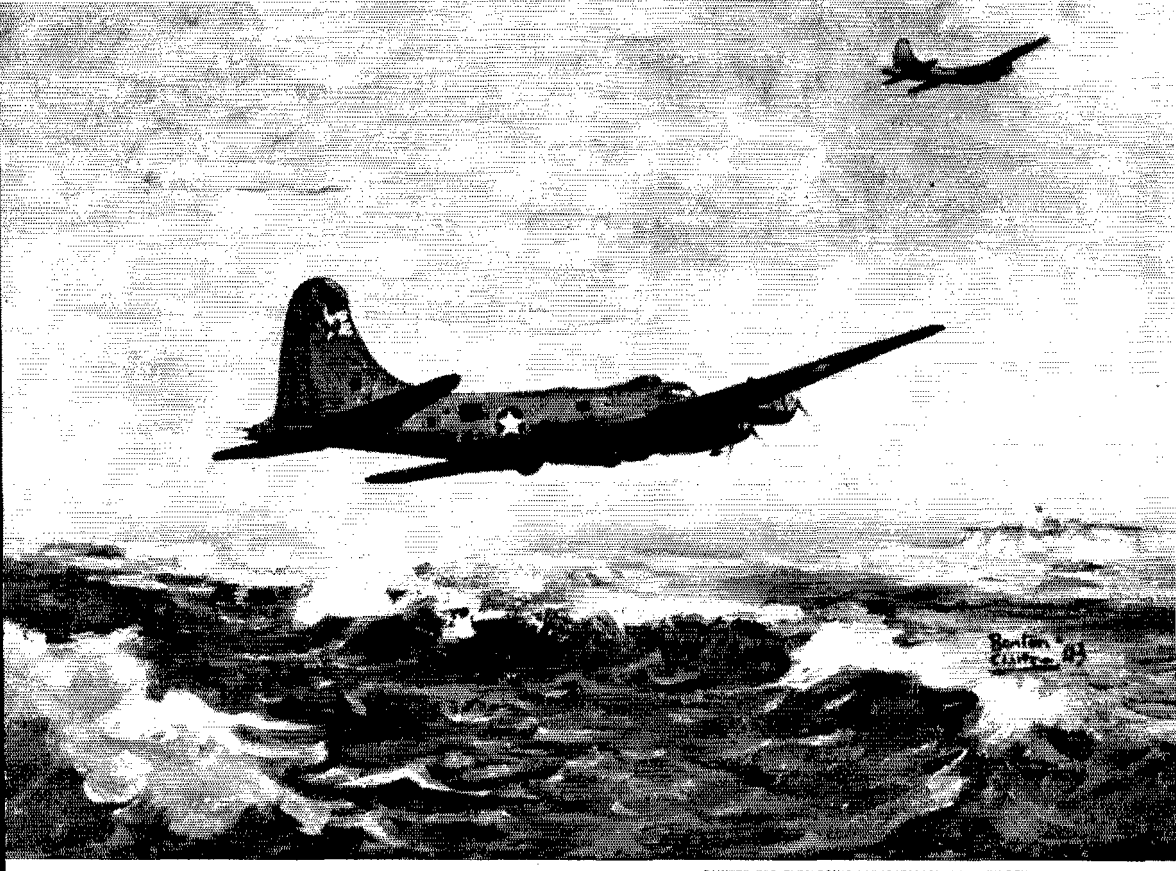
Mr. Terrell still looks back on those days as the most difficult of his career, and he discussed in detail the hectic early days of broadcasting. We talked about the other services, too. But always the conversation reverted to amateur radio.

One of his favorite themes is the way he could rely on the amateurs always to police themselves.

Even though amateur stations generally outnumbered those of all other services combined by about three to one, the number of amateur stations inspected always was the lowest for any service in a given year. In a typical year, for instance, there would be something like 10,000 or 15,000 inspections of ship stations, perhaps 1500 or 2000 for broadcasting stations, 500 or 1000 for commercial land stations, etc. Yet in the same year only a couple of hundred amateur stations would have been inspected.

It had to be that way, of course. Had the hams required as much supervision as the rest of the radio world, the job of the inspection service would have been an intolerable one. The outcome might have been at least the severe restriction if not the abolition of amateur radio.

(Continued on page 96)



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The 'Game Goose' gets home... again

● **The old girl's done it again. She's laid her eggs where they'll count most—and in spite of hell and high flack, she'll soon be smoothing her ruffled feathers at home.**—The capacity of America's fighting men and machines to absorb punishment, as well as dish it out—to come back again, and again, and again—is no accident.

Electronic Laboratories is proud of the ***E·L*** equipment that is helping the 'Game Goose,' and every American fighting plane, get home again.

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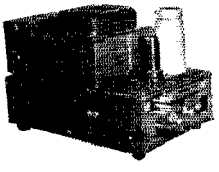
Wherever electric current must be changed in voltage, frequency or type, ***E·L*** Vibrator Power Supplies and Converters offer many definite advantages, for peace, as well as for war.

For Operation of Emergency Two-Way Radio Equipment from 115 Volts AC Line or DC from a 6-Volt Storage Battery—E·L Model 619 Vibrator Power Supply. Input Voltage, 6 Volts DC or 115 Volts AC; Output Voltage, 300 Volts DC at 100 MA. and 6.3 V AC at 4.75 Amps.; Output Power, 60 Watts; Dimensions, $5\frac{7}{16}$" x $2\frac{13}{16}$" x $5\frac{11}{16}$"; Weight, 10 lbs. Other E·L Vibrator Power Supplies are available with different combinations of input voltage and output wattage.



Electronic

LABORATORIES, INC.

INDIANAPOLIS

E·L ELECTRICAL PRODUCTS—Vibrator Power Supplies for Communications . . . Lighting . . . Electric Motor Operation . . . Electric, Electronic and other Equipment . . . on Land, Sea or in the Air.

(Continued from page 94)

Back in the very early post-World-War-I days that possibility was a serious source of concern, both to government officials and the amateur leaders themselves. In fact, in 1919 the ARRL Board of Directors drew up a proposal to appoint deputy inspectors in the status of "dollar a year" men to share the enforcement load. Later a similar plan was recommended by the First National Radio Conference. But nothing ever came of these proposals, the reason being that amateur radio's collective sense of responsibility always proved great enough to keep the situation well under control even without the use of direct enforcement methods.

Amateur matters came to the fore in the Bureau of Navigation's picture again in 1924, with the opening up of the short waves. Until then, hams nominally had been restricted to the region around 200 meters. But when a few amateurs working under special experimental licenses had shown that the shorter waves would work, ARRL demanded amateur short-wave bands.

It was then that the far-sighted policies of W. D. Terrell with regard to amateur radio displayed themselves to the fullest. His attitude, rather than being one of restriction, was to find out from ARRL what the amateurs wanted and then to give it to them. He believed that we would ask only for what we needed, and that we would use wisely what we had.

"For one thing," he explained, "I had absolute confidence in Hiram Percy Maxim. I knew he couldn't be associated with anything but a responsible group."

In the end, as everyone now knows, we got our short-wave bands.

Meanwhile, the radio art as a whole was growing on a logarithmic curve. In 1914 the Bureau had issued only 339 commercial operator licenses and 1172 amateur licenses. In 1921, 2722 commercial tickets were issued and 6207 to hams. By 1930, the number of commercials had risen to 5255, with 11,541 new and renewal ham licenses. Comparatively, the Division's field force, which numbered only 20 in 1914 and from 25 to 45 immediately after World War I, was up to 131.

Even that tells only a small part of the story, for the Radio Act of 1927 had transferred to the

A NEW TECHNIQUE *that is* SPEEDING VICTORY

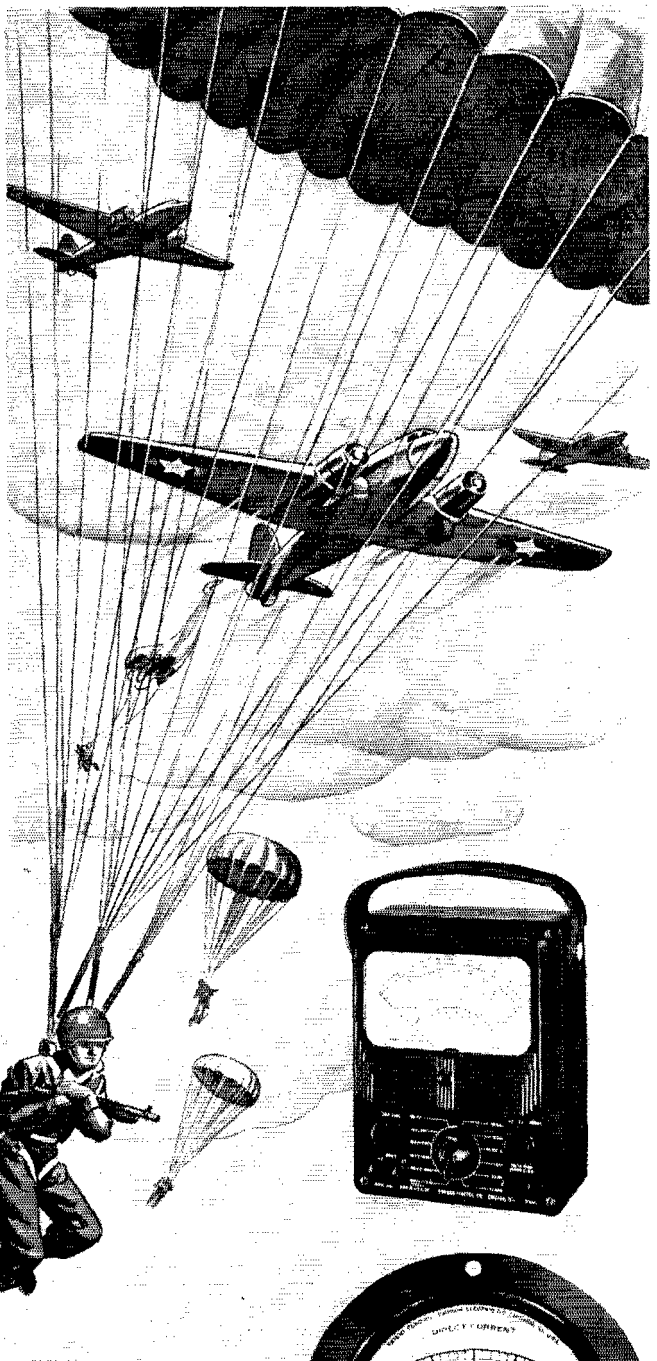
LITERALLY a one man army, the paratrooper strikes fast and hard—almost anywhere. He represents a new and deadly technique of modern warfare, one that America is utilizing to the fullest.

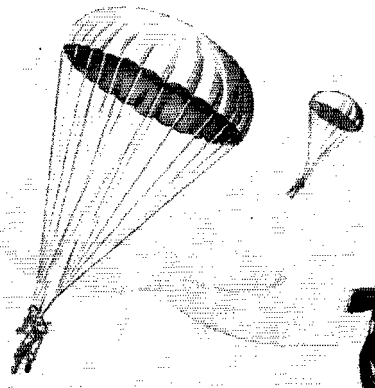
Industry, too, has learned new techniques. New short cuts, new refinements in design, new ways to build faster and better the tools and weapons our fighting men need.

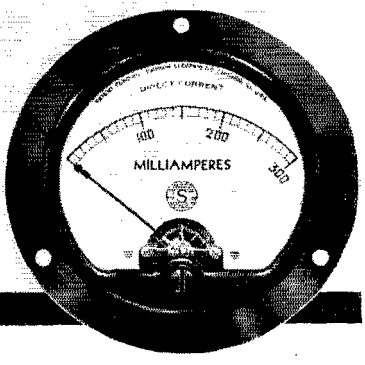
Simpson electrical instruments and testing equipment, for example, offer a basically superior type of movement which required a slow and costly method of construction only a few years ago. Today, in the Simpson plant, this greater accuracy and stamina is a matter of mass production.

Tomorrow the many things industry has learned under the impetus of war will build a brighter, happier world. The harder we work on the job at hand, the sooner that tomorrow will come.

SIMPSON ELECTRIC CO.
5200-5218 Kinzie St., Chicago 44, Ill.







Simpson

INSTRUMENTS THAT STAY ACCURATE

Buy War Bonds and Stamps for Victory

(Continued from page 96)

Federal Radio Commission many of the duties of radio administration earlier performed by the Department of Commerce. After 1927 it was primarily the policeman's job that remained for the Radio Division and its Director.

In 1932 the control of all radio administration was given to FRC, and the Radio Division of the Department of Commerce became the Division of Field Operations of FRC. It was a change in name only, however, for W. D. Terrell and most of his organization went along, and continued to do their old jobs much as they had done before. The management had changed, but they still were working for the same owner — Uncle Sam.

In 1934, when Congress in an expansive mood replaced FRC with FCC and gave it control over all wire communications as well as radio, Terrell again went along. The title changed and he became Chief of the Field Division — but it was the same job, and he continued to do it superlatively well. That's why Bill Terrell is correct — if not precise — when he says that he has held the same job for more than forty years. Titles changed, but the job was always the same — the tremendously important one of keeping U. S. radio traveling a straight road.

In fact, so successful was his performance that in 1941 when he reached the age of seventy — compulsory retirement age for all federal employees — President Roosevelt by special order continued him in office. In an official letter from the FCC to Mr. Terrell on his retirement, Chairman James Lawrence Fly said, "We especially thank you for your last two years on active duty, undertaken at our request and with the approval of the President . . . thus giving us the benefit of your expert advice and assistance during the most difficult period of adjustment to war conditions when your help was urgently needed."

It's easy to get people to talk about Bill Terrell in Washington — as elsewhere, for that matter. Their judgments are surprisingly uniform. He's always been fair to everybody, they'll say. Usually he took no sides; he'd listen to what everyone concerned had to say, devise the best workable solution — and then administer that solution fairly but firmly. Always considerate, he'd listen until every partisan had stated his case in full before coming to any decision. Nor did anyone fool him with folderol, either legal or technical. He knows his subject thoroughly.

Always he had the finest of *esprit de corps* in his organization. This, too, was recognized in the FCC letter, which concluded: "Not the least of your services has been the selection and training of younger men who will now carry on the tradition of competence and integrity which you have established, and who will seek to maintain the high standards you have set."

Bill Terrell always has been a good friend to amateur radio — so good a friend, in fact, that at times he has been instrumental in saving it from itself. Back in the early postwar period, for example, when the ARRL Board of Directors of the time, in an excess of zeal over the possibilities of c.w., proposed an immediate outlawing of

(Continued from page 98)

all amateur spark transmission, Terrell demurred. While conceding that such a ban would ease the interference situation — and, incidentally, ease his own problems — he felt that it would work too great a hardship on the impecunious younger hams to force them hurriedly to convert to c.w. Considering that even a 5-watter cost $9 in those days, with other prices in proportion, the sympathetic justice of this attitude is evident.

Such support on the part of a non-member of the amateur fraternity is rare indeed. For Terrell doesn't consider himself an amateur, although he did operate a ham station for a brief period back in the Brooklyn days. Since his first introduction to radio was via the official rather than the amateur route, however, and because always since he has occupied an official capacity, he never felt that he could engage in it as a hobby.

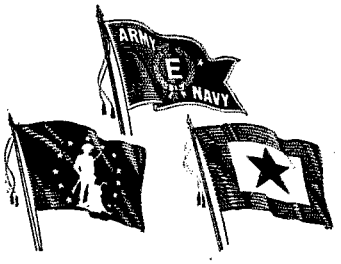
Yet the fact is that radio was and is his hobby as well as his life work. It has been both vocation and avocation. He is an inveterate listener. He watches over the radio spectrum like a mother hen. It is almost literally true that Bill Terrell has been listening on one radio channel or another every waking hour for the past thirty years. At his office or at home, there is always a receiver turned on. Even when he is conferring or working, the murmur of music or code or the punctuated orders on an airways or police channel modulate the background. From time to time he listens in on every radio service, just to see what's going on and how the boys are conducting themselves.

That was how he heard radiotelephone transmission of music for the first time. It was in the old New York office at the Customhouse, shortly after he joined the Bureau. He had a receiver going, as always. Then, instead of the code chirping in faintly in the cans, he heard a voice repeating the traditional formula: "One — two — three — four. Hello, test." Then followed a burst of music. Excitedly, the entire office crew gathered around to listen. It was an experimental radiotelephone station atop the Wanamaker building, making the first of what was to be a series of daily noon-hour tests. Thereafter the office force would gather in his office every noon hour to listen to the music, until finally the congestion got so bad he had to close off the office doors at noontime.

RADIONICS*

"AYE, AYE, SIR."

In old English "Aye" meant "Yes." But the Navy's "Aye, Aye, Sir" means far more. It really says . . ."Your order is understood and will be obeyed." The Navy has given Zenith many "orders" since the war began. Our prompt "Aye, Aye, Sir" has, we believe, been justified by the "intelligence and initiative" (as the Navy says) with which these orders have been executed.



"the impossible we do immediately . . . the miraculous takes a little longer"
—ARMY SERVICE FORCES

—in days of civilian radio, Zenith was proud of its long series of "firsts"—improvements which made radio history and established leadership in the industry.

—today our viewpoint has changed—materially.

—engaged exclusively in war production, the things we have been called upon to do—the tasks we have succeeded in accomplishing, make past improvements in civilian radio literally look like "child's play."

—the work of our engineers in radionics has made the "impossible" possible and accomplished the "miraculous."

*—mark that word "RADIONICS" (with its subdivisions of Electronics, Radio, etc.)—it has brought into reality and being, devices which only a year or so ago came in the "impossible" and "miraculous" categories.

—today Zenith works in the science of radionics for our armed forces alone.

—in that bright "tomorrow" when peace returns—

—we can only say—the post-war radios that Zenith will produce will contain many interesting new developments.

—that statement is based upon experience which we can not now reveal—but you may take our word that it is a fact.

ZENITH RADIO CORPORATION, CHICAGO

BETTER THAN CASH
U. S. War Savings Stamps and Bonds

ZENITH
LONG DISTANCE RADIO
RADIONIC PRODUCTS EXCLUSIVELY—
WORLD'S LEADING MANUFACTURER

(Continued from page 100)

Quite apart from informal comment, Mr. Terrell put himself on record many times with his high opinion of the amateur fraternity. Hardly an annual report of the old Department of Commerce Radio Division (or, before that, of the Bureau of Navigation, which contained his office), failed to have some laudatory word about amateurs. They were sprinkled with phrases such as: "Some of the most useful contributions to the radio art have been made by men who but recently were classed as amateurs, while during the recent war they were found much superior to the average commercial operator in resourcefulness and technical knowledge. . . . Reports indicate the amateurs are taking advantage of all improvements made in the art and are inclined to more readily adopt new ideas than is possible with larger stations. . . . Amateurs show increasing technical skill. . . . Amateurs of the United States have long been known for their excellent self-policing. . . . The pursuit of amateur radio continues to constitute a valuable training school for skilled radio personnel for industry and the art generally. . . . The amateurs' record of public service, their spirit of coöperation, and their demonstrated national value have continued to justify the policy of this Government toward them."

Especially in the '20s, Terrell was a frequent guest at ham conventions. In fact, he was the official representative of the U. S. government at the first national ARRL convention in Chicago in 1921, where he brought Secretary of Commerce Herbert Hoover's message describing the Commerce Department as "the legal patron saint of amateur radio."

That was the government's policy, and it was also Mr. Terrell's policy. He fought for it with the vigor of a gladiator time and time again. In the toughest fight of all — the Washington international conference of 1927, when all the other nations of the world ganged up on amateur radio and Uncle Sam alone upheld us — Bill Terrell was out in the front line trenches fighting the fight of his life for our preservation. Even when other government representatives became disheartened at the overwhelming odds and would have capitulated, he refused to concede defeat. It is only fair to say that, during that hectic autumn of 1927 as well as at other times, amateur radio as we have known

(*Continued from page 102*)

it might not have existed had it not been for the efforts of W. D. Terrell.

It was in recognition of that fact, as well as of his own personal qualities and the value placed on his friendship, that ARRL President Bailey and Secretary Warner presented Mr. Terrell with a scroll at a farewell dinner given by FCC employees in Washington on his last day on the job he had held so many years. This scroll read:

Dear Bill: Because you were the first U. S. radio official, because for thirty-two years you have administered the radio laws of the United States faithfully and with fairness to all, because you are now retiring from the governmental scene after forty years of conspicuous public service, because you are loved by all who know you, and most of all because, throughout your career, you have been our good friend and wise counsellor, the monitor and defender of amateur radio, now, therefore, on behalf of the radio amateurs of America, we bring you this expression of their affection, gratitude and good wishes, and the hope that your well-earned rest will bring you none but sunny days.

In reply, Mr. Terrell reiterated his high regard for amateur radio, and asked that we convey to every amateur his pleasure at this tribute.

The deep sincerity of his regard for amateur radio was impressed on us as we were leaving his office that morning of our interview. At the door he spoke of the role amateurs are playing in this war, and then his thoughts drifted back to World War I. He recalled having heard Marconi say that we were the most fortunate country in the world, in that we had amateurs to man our military radio service who had trained themselves in the use of exactly the kind of apparatus and the wavelengths used in the war. By working on their own sets they had equipped themselves to operate and repair military equipment — and, moreover, such was their skill and ingenuity that they could improvise repairs right on the battle scene.

"Of course, you fellows are doing the same thing in this war, too," Terrell added.

Then he went on to emphasize that, in his mind, amateur radio was and would continue to be an indispensable national asset. "There's no doubt in my mind that amateur radio will be back on the air when this war is over. No, sir — not a doubt in the world. It would be the biggest mistake any country ever made if your bands weren't restored," he declared. "There'll be more amateurs than ever after the war, and I believe in giving them every opportunity. So many new men are being trained as technicians and operators. They'll get the bug — yes, I know how it is," he smiled.

Terrell should know that virus. It first bit him over thirty years ago — half a century ago, in fact, if you count the landline "ham" as an ancestor of the radio ham — and it's as strong now as ever.

Nor will stepping out of harness mean losing touch with the world of radio that Bill Terrell has monitored these many years. This winter in Florida, and later in his Arlington home, he'll still have his ears glued to a receiver, twisting knobs from band to band to see what the boys are doing. And you may be sure that he as well as we will be hoping for the day when those bands marked "Amateur" again are filled with the bustle of traffic and ragchews and DX — with the stuff of peacetime amateur radio.

The Radio Amateur's Handbook

"THE ALL-PURPOSE VOLUME ON RADIO"

Text, data book, operating manual — it is all these and more. As a text it is probably more used in radio schools and colleges than any other single volume. As a practical constructional handbook, it stands in a class alone. As an operating manual, it provides information available from no comparable source.

Standard Edition

The latest Edition of THE RADIO AMATEUR'S HANDBOOK is the largest ever published. It includes a comprehensive chapter dealing with War Emergency Radio Service plus other new material — all added without sacrificing the essential information in previous editions which made the HANDBOOK the world's most valuable and widely-used radio book. The theory and design sections cover every subject encountered in practical radio communication, sectionalized by topics with abundant cross-referencing and fully indexed.

$1.00 *In Continental U. S. A.*

$1.50 *Elsewhere* **$2.00** *Buckram Edition*

Special Defense Edition

This edition of the HANDBOOK is designed especially for use in radio training courses. It eliminates those portions of the regular edition which are not useful for instruction purposes and has added chapters on mathematics, measuring equipment and code instruction. The first chapter covers the elementary mathematics necessary for the solution of all formulas and interpretation of graphs appearing throughout the text. A four-place log table is included in the Appendix.

$1.00 *Postpaid Anywhere*

A Course in Radio Fundamentals

By GEORGE GRAMMER

The objective in preparing this course was to accent those principles most frequently applied in actual radio communication. "A Course In Radio Fundamentals" is a study guide, examination book and laboratory manual. Its text is based on the "Radio Amateur's Handbook." Either the special edition for war training purposes or the Standard Edition may be used. References contained in the "Course" are identical in both editions. As a text, this book greatly smooths the way for the student of the technicalities of radio. It contains interesting study assignments, experiments and examination questions for either class or individual instruction. It describes in detail 40 experiments with simple apparatus giving a complete practical knowledge of radio theory and design. *Price* **50c**

Learning the Radiotelegraph Code

By JOHN HUNTOON

This booklet is designed to train students to handle code skillfully and with precision. Employing a novel system of code-learning based on the accepted method of *sound* conception, it is particularly excellent for the student who does not have the continuous help of an experienced operator or access to a code machine. It is similarly helpful home-study material for members of code classes. Adequate practice material is included for classwork as well as for home-study. There are also helpful data on high-speed operation, typewriter copy, general operating information — and an entire chapter on tone sources for code practice, including the description of a complete code instruction table with practice oscillator. *Price* **25c**

The A.R.R.L. Antenna Book

By GEORGE GRAMMER *and* BYRON GOODMAN

A comprehensive manual of antenna design and construction. Sixteen chapters, profusely illustrated. Both the theory and the practice of all types of antennas used by the amateur, from simple doublets to multi-element rotaries, including long wires, rhomboids, vees, phased systems, u.h.f. systems, etc. Feed systems and their adjustment. Construction of masts, lines and rotating mechanisms. The most comprehensive and reliable information ever published on the subject. Over 100 pages. *Price* **50c**

AMERICAN RADIO RELAY LEAGUE, INC., West Hartford, Conn., U.S.A.

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 arrangements, 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.

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

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QUARTZ — direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond Drill Carbon Co., 719 World Bldg., New York City.

COMMERCIAL radio operators examination questions and answers. One dollar per element. G. C. Waller, W5ATV, 6540 Washington Blvd., Tulsa, Okla.

USED TELEPLEXES, Instructographs bought, sold. Ryan's, Hannibal, Mo.

WANTED: *QST*s, 1916 issues. Wayland Groves, Hawkins, Texas.

WHY NOT turn your unused equipment into ready cash which may be applied towards new and better equipment after the war? Leo, W9GFQ, offers you the best cash prices for communications receivers and test equipment. Write today for large illustrated catalog. Wholesale Radio Laboratories, 744 W. Broadway, Council Bluffs, Iowa.

CRYSTALS available all types, including 100 KC, 465 KC and 100 KC. Broadcast and Aircraft given prompt attention. Scientific Radio Products, Council Bluffs, Iowa.

FOR SALE — RME-69 latest model with noise silencer, speaker — $135. DB-20, $25. D-104 extal mike with stand — $15. 12-watt speech amp. 2A3's perfect. 500 ohm output — $40. 9 series 221 meters medium ranges — $3 each. 2500 V. DC voltmeter 3" with resistor — $15. E. G. Bentley, 28 Club Lane, Louisville, Kentucky.

813 TUBES wanted. New or used. Must be in good condition. WPFR. Police Radio, Birmingham, Ala.

CRYSTALS — Immediate delivery on time-proved Eidson commercial crystal units in the 1600-10,000 kilocycle range. Dependable crystals with temperature coefficients to meet all requirements. Order from us, especially if it's rush. "Eidson's", Temple, Texas.

WE HAVE a large stock of new communications equipment available immediately without priority including Thordarson, Stancor, UTC, Bud, Johnson, B&W, National, Aerovox, Mallory, etc. New copper-oxide multi-meter rectifiers, $1.95 each. New communications receivers available immediately on AA-1. Write us your needs. Henry Radio Shop, Butler, Mo.

HIGHEST cash prices paid for used receivers, meters, testers, parts, etc. I promise you the best deal. What have you? Bob Henry, W9ARA, Butler, Mo.

WANTED — Hallicrafters SX16–SX17 with crystal and speaker. State price and condition. R. D. Corson, 75 Maynard Road, Framingham, Mass.

WANTED — EC1, Skybuddy, or similar. Donald McClellan, Box 1751, Las Vagas, Nevada.

WANTED — Ten Volt Three Amp. Transformer, small. W. K. Gardner, 1821 Chouteau, St. Louis, Mo.

WANTED — Sky Buddy or EC-1. Jack Moore, Lake Crystal, Minnesota.

WANTED — Sky Champion, RME 69, NC100A, Howard 435A, 436A, 437A. State price and condition. W4ELO, J. W. Fowler, 584 Holderness St., SW, Atlanta, Ga.

SWL'S — Fritz, 1213 Briargate, Joliet, Illinois.

FOR SALE — High fidelity Thordarson amplifier and power supply. Low gain input to push-pull 2A3 variable output transformer. 300 mil. 1250 volt UTC power supply. Miscellaneous transmitter parts, tubes, power supplies. What do you need? D. B. Whittemore, 36 Masterton Rd., Bronxville, N. Y.

WANTED immediately, Hallicrafters S20R or equivalent. Paul Heim, USPO, Gettysburg, Pa.

WANTED — EC-1 or any inexpensive receiver. Lawrence Brey, 1952 N. 34th St., Milwaukee, Wis.

SELL *QST*'s January 1925 to December 1937 inclusive, also transmitting tubes and parts of 700 watt rig. Send for list. Anthony Martinka, 1253 Grace St., Chicago, Ill.

WILL buy used RCA broadcast receiver Model 9K2, Hammarlund Super-Pro, or other communications receiver. W4EYK, 720 Broadway, Columbus, Georgia.

WANTED: First 5 lessons corr. course Institute of Associated Radiomen, also meters and test equipment. J. W. Harlan, 1679 Alta Mura Rd., Pacific Palisades, California.

PARTS for sale: Am dismantling 500 watt semi-commercial rack and panel phone transmitter so parts may go to war effort, or where needed. All high quality parts used only about 15 hours, also some new unused parts. Send stamp for mimeographed list or state needs. Will buy Hallicrafter SX16. W5HDG, Box 652, Abilene, Texas.

CASH for good modern tube tester, Hickok 510X, Precision 920, Triplett 1183, Radio City, Supreme, etc. Tomkins, W7SD 1801 N.E. 62nd Portland 13, Oregon.

FOR SALE — 2½ meter transceivers, transmitters, receivers. Also surplus transmitting tubes, amplifiers, modulators, power supplies, etc. from W9UFD. John F. Leeder, 3176 So. 13th, Omaha, Nebr.

Echophone Model EC-1

(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on three bands. Electrical bandspread on all bands. Beat frequency oscillator. Six tubes. Self-contained speaker. Operates on 115-125 volts AC or DC.

ECHOPHONE RADIO CO., 201 EAST 26th ST., CHICAGO, ILLINOIS

Index to Advertisers

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.

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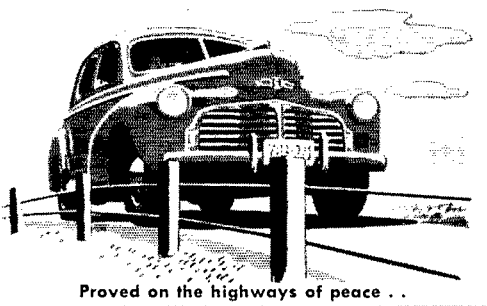
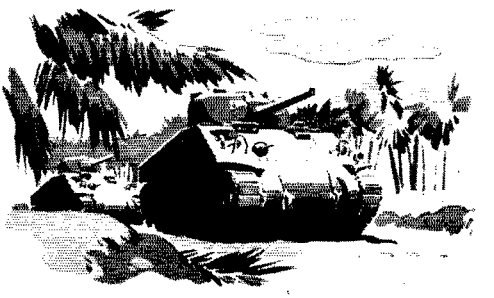
CONCORD, N. H.

DELCO RADIOS

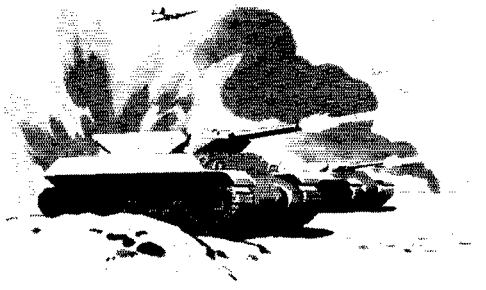
"BATTLE-PROVEN" EVEN *BEFORE* WAR STARTED!

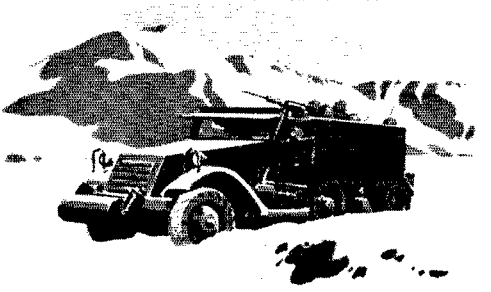


Proved on the highways of peace . .



to serve on the battlefields of war





Vibration—shock—intense heat and cold . . . Delco radios have been meeting these "war conditions" for years

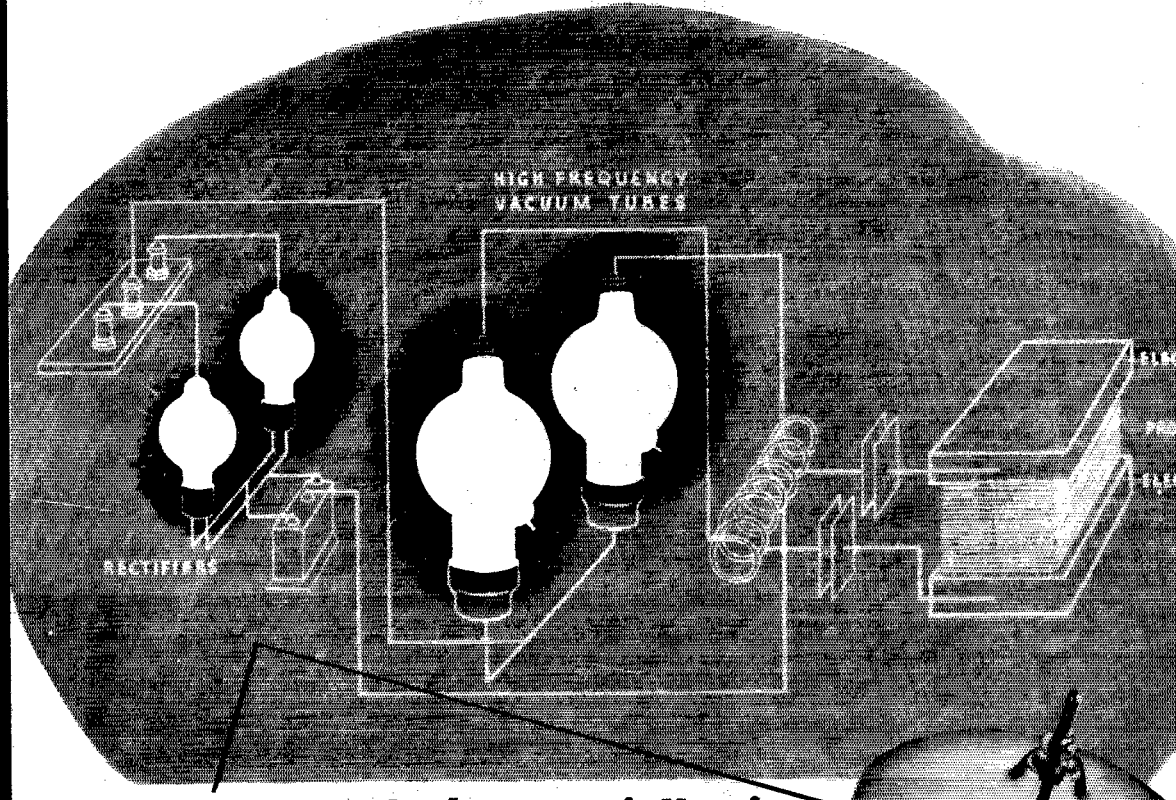
The physical beating dealt out to radio sets used in tanks, tank destroyers and other *mobile* units is old stuff to Delco Radio engineers. For years, Delco Radio has been a leading manufacturer of automotive radios . . . having solved such problems as shock—vibration—heat and humidity—extreme cold—electrical interference. True, such punishment is more intense on vehicles of war . . . but actually they're the same old problems that Delco researchers had to lick to make automotive radio practical.

The important point today is not that Delco Radio pioneered and developed automotive radios to equip America's leading cars. What is significant is that this experience in vehicular radio problems has enabled Delco Radio, in cooperation with military technicians, to provide efficient inter-vehicle radio communication quickly.

The experience Delco Radio has gained down through the years thus helps speed the day of Victory . . . after which it will help enrich the days of Peace. Delco Radio Division, General Motors Corporation, Kokomo, Indiana.

Delco Radio
DIVISION OF
GENERAL MOTORS

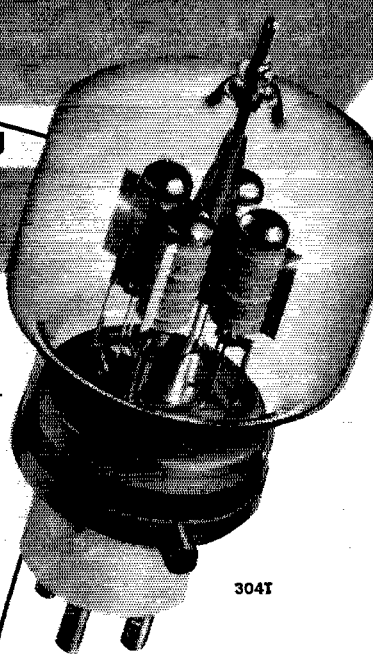
★ ★ ★ BACK THE ATTACK—WITH WAR BONDS ★ ★ ★



ELECTRONIC BRIEFS: Electrostatic Heating

High frequency electrostatic heating is simply the use of electricity to create friction between the molecules of a substance. The generation of heat in non-metallic substances by molecular friction is accomplished by the application of high frequency current, which is converted from a standard power supply. The equipment used employs the basic electronic circuit used in radio transmitters. The output of the power amplifier is connected direct to the material to be heated exactly as the output of a transmitter is connected to antenna and ground. The energy is sufficient to cause the molecules within the material to distort and rub against one another very rapidly. The friction thus caused creates heat within the material.

As with all things in the field of electronics, Electrostatic heating is wholly dependent upon the vacuum tubes employed. Eimac tubes are first choice of the world's leading engineers, first in the key sockets of the important new developments in electronics. You'll get long life, dependability and superior performance with Eimac tubes in the key sockets. Today Eimac tubes are proving their superiority in the most gruelling test — WAR.



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AND RCA ENGINEERS ARE DOING IT

RCA

872-A/872

Half-Wave Mercury-Vapor Rectifier

$7.50

Replacing the 872 and 872-A, this new tube gives you better results for less money. A special alloy for the cathode base yields increased emission with lower tube drop, enables the tube to withstand larger surge currents without injury to cathode coating. Net result: better performance, longer life. (Note: RCA 866B is a companion tube, with a heavy-duty base.)

RCA

828

Beam Power Amplifier

$17.50

High output with extremely low driving power is the big feature of RCA 828. And in addition, this tube needs no neutralizing in well-shielded circuits. In ICAS class C telegraph service, the 828 will develop 200 watts with only 2.2 watts driving power. Conservatively operated at CCS ratings, the RCA 828 provides high safety factor and long life.

RCA

831-A

Transmitting Triode

$75.00

An outstanding feature of this high-power air-cooled triode is its famous RCA zirconium-coated anode, permitting 44% more input and 33% more plate dissipation under CCS conditions than were possible with its predecessor, the 831. Designed for use as an r-f amplifier, class B modulator, and oscillator.

RCA

849

R-F and A-F Power Amplifier, Oscillator, Modulator

$120

The real value that tube users get from many tube engineering improvements largely depends upon the manner in which the improvements are utilized in the overall design. For example, the famous RCA zirconium-coated anode, used in the RCA-849, could have been applied primarily to the purpose of giving this tube a greatly increased rating. Or it could be utilized as RCA has done—to produce a tube which, operated at a conservative rating, would yield a very considerable increase in the operating life of the tube.

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RCA ELECTRON TUBES