QST

september, 1944
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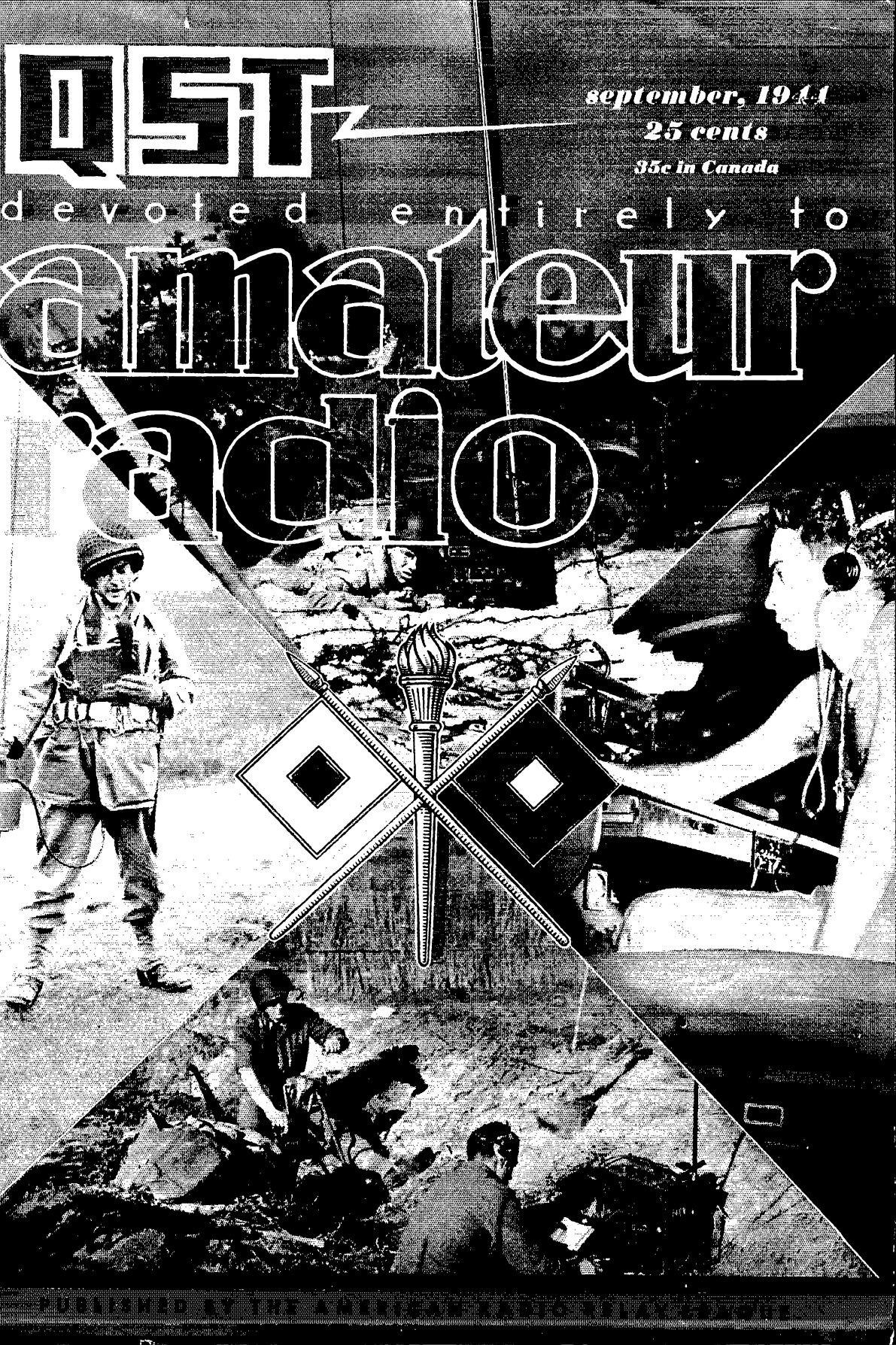

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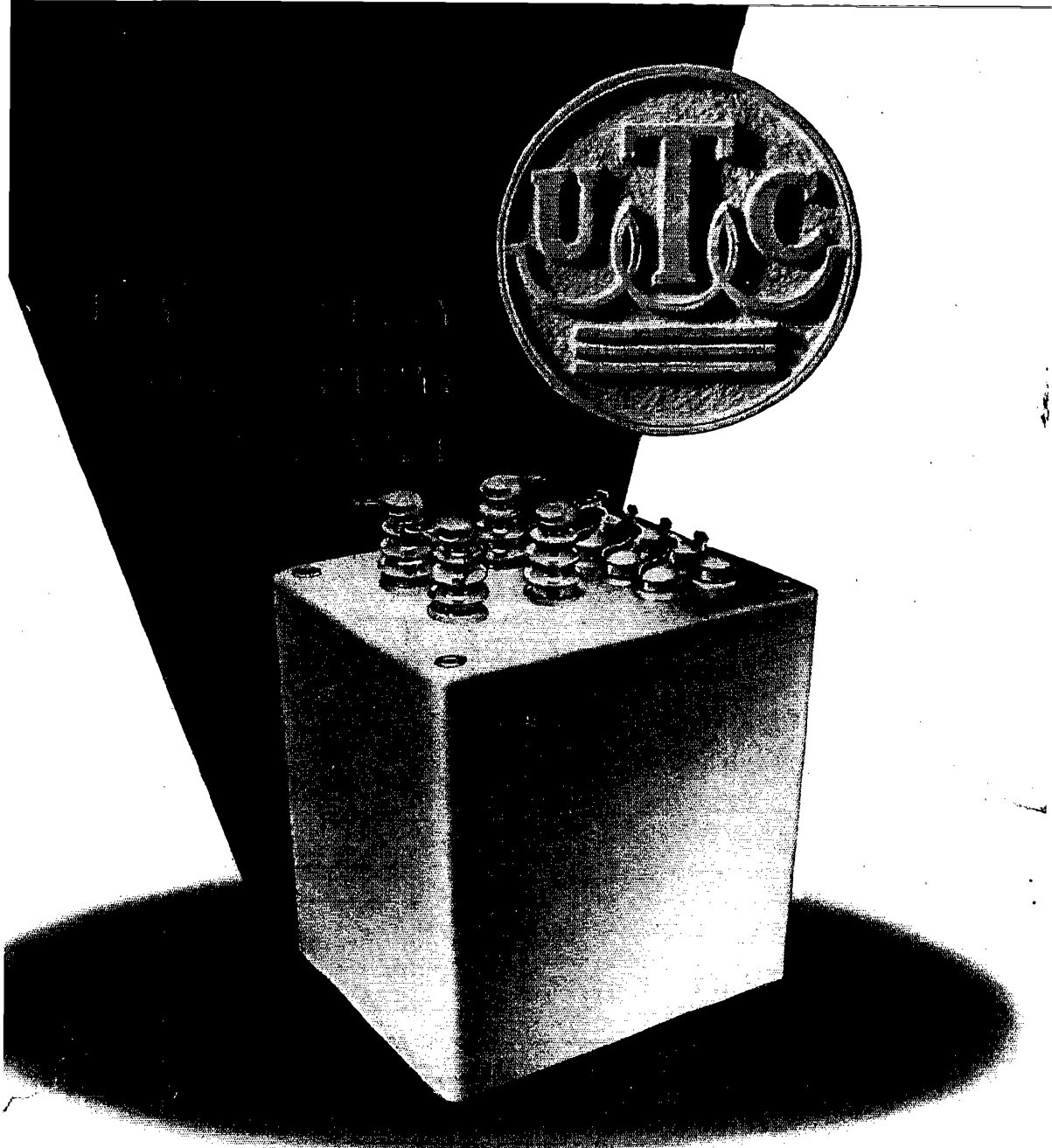

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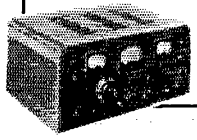

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SEPTEMBER 1944

VOLUME XXVIII

NUMBER 9

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QST *devoted entirely to*

AMATEUR RADIO

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CONTENTS

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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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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.

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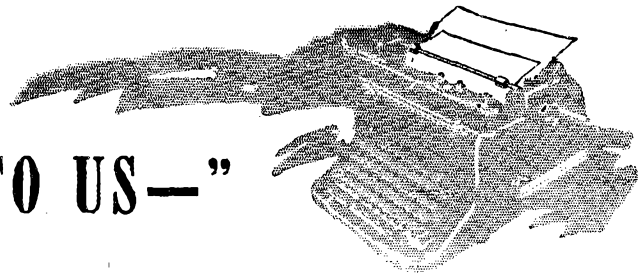


"IT SEEMS TO US—"

THE SIGNAL CORPS

WITH pride which we believe the reader will find warranted, we present in this issue of *QST* an experiment in a new kind of reporting of the military communications scene. It is an attempt to convey in one unified picture the structure, application and conduct of military radio communications as found in combined ground force operations.

This would ordinarily be a subject for treatment at textbook length. Rarely has the attempt been made to display so ramified a structure in a magazine article or even in a series. And then generally the result has been a patchwork that gives no balanced image of the whole. In this review the separate elements of the picture have been assembled and assimilated from a single viewpoint, so that they join and blend to give the reader the entire picture and in proper perspective. Moreover, the objective has been to make the treatment have meaning for all categories of readers, conveying something of use to anyone who reads it from those with no military background to experienced military commanders.

The story of ground military communications is told here as it relates to the Signal Corps — not because that corps is the sole constituent but because it is the vitalizing agency of Army communications as a whole. It is not the purpose to contend that the Signal Corps does the entire job; it doesn't, of course. The actual operation of equipment in the forword combat zones is handled chiefly by infantry, artillery and cavalry personnel — as several contributors to our correspondence columns have taken pains to point out in recent months. But it is no disparagement to these arms to view their radio activities from the vantage ground afforded by the Signal Corps' association with them all. For it is in touch with every aspect, participates in almost every phase, serves as a service of supply for all: the eyes of the Signal Corps alone encompass the entire spectacle of Army radio.

The Signal Corps is a peculiarly American institution. In priority of conception, delineation and initial reduction to actual authorization it is an original invention of the United States Army, perhaps this country's sole contribution to the classic philosophy of military organization. What it is doing in this war is therefore of unusual interest to Americans, and what it is doing with radio is of exceptional interest to us amateurs.

It will come as a shock to many radio men to learn that radio has not always enjoyed an unalloyed acceptance in military planning circles. There have been times when it was in considerable disrepute. The military traditionalist never quite accepted it, always kept in mind that he would probably junk it when it came to cases. Even most of those who embraced it did so gingerly and but sketchily, with a superficiality that promised small success when the problem deviated from the example in the textbooks. Those of us who were communications-conscious could perceive in the early German blitzkreig successes a communications machine of such beauty and perfection as had never been seen before, coördinating the diverse units of armored striking power and linking them into a single integrated machine instantly responsible to a central commanding intelligence. It was just as frightening to us as any other aspect of German might, for its counterpart no more existed in our forces. There were days, you will recall, when we were none too sure that we should be able to organize and to evolve countertechniques in time to save ourselves.

A mighty work has been done in the past thirty months. Not the least part of it is the complete revolution in military communications. That that job has been superbly handled is now attested by the daily success of American and Allied arms in the field. It is an altogether reassuring spectacle, giving us again a pride in the western way of doing things. It is, in short, a story well worth telling — the story of the modern Signal Corps. We hope you find it good reading!

AUTOMATIC RELAYING

AN INCONSPICUOUS little item in our August issue reported the granting of a construction permit to AT&T to erect a chain of automatic relay stations between Boston and New York operating on wavelengths between 2½ and 15 centimeters. It is of importance not only as indicating another step toward automatic relaying but especially because it discloses that the soundest and hardest-bitten group of engineers in the country have no doubt of their ability to generate continuous power economically at frequencies as high as 12,500 megacycles. It should give considerable impetus to relaying projects.

We ourselves have long been dreaming about the application of automatic relaying to ama-

teur communication on the very-high, ultra-high and superhigh frequencies where the range is inescapably short. We'd like to sketch a little picture to you. We visualize the v.h.f. ham station of the future as possessing not only transmitter and receiver but means for coupling the two together, so that received signals can be retransmitted, the local operator also patching himself into the circuit at will. Then we can have bucket-brigade relaying, automatically, of both m.c.w. and 'phone signals, and an infinitude of fascinating possibilities open up for us. This Relay League of ours was founded at a time when station ranges were so short that we could get our messages through only by agreeing to coöperative relaying for each other. Although a relay system is still a necessity for the expeditious movement and distribution of record traffic, the development of the technique has given us plenty of range on our lower frequencies and today we never think of relaying as positively essential to making ourselves heard at a distance: by the choice of the right frequency we can, if necessary, lay down our signals at any given spot. Not so the superhighs, though. We'll be back at spark-coil ranges, with the same dependency upon relaying and the same possibilities for marvelous accomplishment through organization, but with the new ability to do the job automatically and simultaneously throughout the length of the relay system.

Imagine that we begin to take up this idea. An occasional fellow crops up with the ability to offer to relay automatically. He reaches out for Joe and repeats his signal to Jim in the opposite direction, forming the simplest automatic-relay system, made up of just three stations. Jim and Joe can now talk, where they could never reach each other before, and our man in the middle can talk to both of them, making it three-way. He gets his reward from doing something unusual. The chances are that Joe and Jim will now build "linkers" for themselves, and will then reach out for Tom and Harry, respectively (or Jane and Jill), and like that there will be a five-station chain. In no time there will be wheels around cities, or stars radiating out from a few relayers in superb locations. Now let yourself go. Imagine a whole lot of us equipped for this work. Intercity chains spring up. All the stations along a lane are in constant and instantaneous touch with each other, taking turns talking. Incidentally, we perceive right now that we're going to need a new Q abbreviation that means "I have automatic relaying and have a gang lined up behind me from the so-and-so direction and seek any other automatic relayer who can extend us in the thus-and-so direction." Fantastic? We don't think so. Perhaps by slow stages, numerous of these intercity routes will surely grow up. Some fine night we can see a number of these short circuits succeeding in connecting themselves up end to end, and — presto! — we'll have automatic relaying from New York to Chicago or between San Francisco and Los Angeles. And some day (we gulp twice but we're going to say it) coast to coast!

Our dream has another facet, too — that of grid relaying for message traffic handling. Brace yourselves and get ready. Suppose there are an awful lot of us prepared for this kind of work, peppering the country. We're a sort of v.h.f. ORS, let's say, operating in a special section of the Communications Department. We work by the clock. On an appointed hour each evening we constitute of ourselves innumerable east-west traffic lanes. All of us on each lane are in constant touch with each other. Traffic pours into the lane from every station on it, in sequence. If its destination isn't a point on that particular lane, it is taken down by a station which lies north or south of the destination. Comes the end of the hour and the lanes dissolve, but instantly reforming new combinations of north-south lanes with the aid of new intermediate stations. The assembled traffic moves up or down these north-south routes to destination, while new traffic destined east or west of the lane is again collected at appropriate points, awaiting the time when the clock says to dissolve and reform east-west. Alternate hours through the evening, maybe — on a schedule that, like our dream itself, can go far into the night.

Do you agree with us that there is lots of fun in sight? Some pretty problems, too. Organizationwise it would be almost the ultimate in coöperative effort, requiring careful compliance with frequency specifications suggested by some such coördinating agency as our Communications Department, and the most rigid sort of net discipline. But the accomplishment would be well worth the effort and would teach us new extensions of coöperation, give new demonstrations to the world of our prowess, be of immense value to the national community. On the technical side there will be lots of problems to lick. Two antennas at every station, one for reception and one for transmission? Back to back on one mast, or separated on opposite sides of the yard? Simplex only? Can we do the job duplex on one bidirectional antenna by the help of a time-divider gimmick which switches between reception and transmission at a supersonic rate? How much separation in frequency must we have between local receiver and transmitter? How much geographical separation before the same frequencies reappear in the lane or net? Can a whole lane be made to work on the same frequency by the use of our supersonic switcher? These will be things to intrigue our experimenters no end, probably projects for a hq. lab program. They won't be easy to solve and the Utopia we sketch is certainly years in the future. But it seems to us that here are possibilities for us to dream on, while we're yet off the air, offering such interesting potentialities in the development both of our social fabric and our technique that the field may well become one of our major projects.

K. B. W.

THE U. S. ARMY SIGNAL CORPS

AN ARMY . . . larger than the entire standing Army of peacetime U. S. A. . . . a fighting army . . . radio men, wire men, repairmen, operators . . . radar men, power men, repeater men, intercept men . . . photographers, cinematographers, meteorologists, pigeoneers . . . engineers, aides, tacticians, instructors . . . cable splicers, dispatchers, technicians, cryptographers. . . .

Signal troops . . . slogging up a beachhead with a hundred pounds of radio on their backs . . . leg-ironed linemen . . . spurred high on thirty-foot poles etched against the sky, oblivious to waves of strafing Messerschmidts grassclipping the top of a near-by hill . . . invasion teams . . . unloading cargo in methodical spurts, metronomed by the obbligato of enemy guns and the shrieking crescendo of diving Stukas . . . amphibious signaleers . . . guiding waterproofed matériel ashore to a beachhead landing. . . .

Soldiers . . . infantrymen with grease-blackened faces, haversacked walkie-talkies on their backs, sloshing through the salt surf into Jap bullets whipping from pillboxes nestled under palm fronds . . . armored mobile command posts, frequency-modulating combat orders from inside tightly buttoned heavy tanks rolling blind on caterpillar treads . . . fighter pilots racing to intercept swooping interceptors, spurred on by the rallying radio cry of "Tally ho!" from a squadron commander . . . front-line infantry scouts on reconnaissance tightening fingers around the press-to-talk levers of handie-talkies . . . forward artillery observers squeezing T-1s, directing howitzer concentrations from shell-scarred hilltops . . . calling hits and misses until each barrage fills a valley in red-tipped mountain ranges of sulphurous flame. . . .

Officers and men . . . more men than those Grant had when he took Richmond . . . staff officers and service troops . . . and WACs, radioteletyping combat orders and reports from all the world's battlefronts . . . technical WACs, splicing wire and mixing developer solution . . . multilingual WACs, pushing switchboard plugs on foreign shores. . . .

A mighty army — mightier than ever served Napoleon. . . . And behind it a mightier army still . . . modelmakers, machinists, warehousemen, electricians . . . crystal grinders, punch-press operators, assemblers, testers . . . welders, tool makers, die makers, cabinet makers . . . the feather-light touch of a woman's fingers assembling the grid of a vacuum tube . . . a slim girl with a fork truck lifting a three-ton load in a storage depot . . . a tough inspector turning down a dubious soldered joint, foreseeing a day it might fail . . . psychologists pondering assimilative traits in the habit patterns of mass-trained GI ops . . . scientists in research laboratories . . . late-working designers painstakingly laboring at drafting boards. . . .

Secret meetings behind locked doors . . . algebraic symbols involving "Ds" and "Hs" that mean days and hours . . . names and places mentioned only in code . . . requisitions, requests, plans, procedures, directives, doctrines, ARs, MCs . . . stapled files, bound files, classified files . . . flowing from "IN" baskets to "OUT" baskets on Pentagon desks. . . .

Radio operators . . . T/3s and T/4s tensely pushing traffic over WAR, swinging bugs addressing 40-kw. signals to Iceland, Chungking, Recife, Cairo. . . . Sweating, stinking ops broiling in the radio shacks of invasion command ships . . . cramped-muscled, mind-weary ops, sending flawlessly still as the temperature soars under a blazing sun . . . khaki-clad seaborne soldier ops on a shining white hospital ship. . . .

A fluttering pigeon held tightly in a hand shadowed in blackout, an upward fling and a message winging on its way . . . trickling water in a battered sink, a photographic darkroom in a squalid basement lightproofed by tarpaper tacked over windows . . . a V-mail processing station of discarded packing cases in a North African wheatfield . . . steaming jungle . . . swirling blizzards . . . bitter sub-Arctic cold . . . white puffs from bursting shells . . . fighting mosquitoes and horseflies and keying a bug with the other hand . . . grinding desert sand . . . "A for Alehouse" . . . muskeg mud . . . dynamiting holes for antenna masts . . . digging mired vehicles from surface-frozen tundra . . . belching mortars . . . coughing machine guns . . . searching for enemy mines with borrowed mine detectors . . . QRM . . . "Over" . .

Getting the message through. . . .

Such is the prismatic panorama presented by the U. S. Army Signal Corps of today.

— C. B. D.

A Message to All Radio Amateurs

"ON BEHALF of the Signal Corps, I welcome this opportunity to say to all radio amateurs that your accomplishments in this war are fully recognized and genuinely appreciated. Speaking particularly to those of you within the Corps, I commend you for your loyalty and devotion."

This is the message Major General Harry C. Ingles, Chief Signal Officer of the U. S. Army, has commissioned us to convey to all of amateur radio via this issue of *QST*. "The Signal Corps and amateur radio have long been good friends and close associates," he added, "and it is my hope that the ties which link us will be even stronger in the future than ever before."

Concerning the liaison which has existed between amateur radio and the Signal Corps since before World War I, General Ingles said: "It could even be said that the same blood flows in our veins — not only because of our mutual interest in radio communication, but also because many Signal Corps men are or were radio amateurs."

This close association was firmly sealed in the difficult days of 1917–18 when the Signal Corps faced the most demanding responsibility in its history. For the first time the new science of radio communication was enlisted to supplement visual signaling and the wire telegraph and telephone.

General Ingles' recollection of those trying days has not been effaced even by his present enormous responsibilities. His own association with the Signal Corps coincided with their beginnings. Commissioned from West Point in 1914, after serving three years in the 14th Infantry he was transferred to the Signal Corps the same month the United States entered the war — April, 1917.

To perform the varied wartime tasks assigned it during the nineteen months of combat, the Signal Corps achieved a degree of expansion exceeded only in the present struggle. From 55 officers and 1570 men in 1916, it grew to a total of 2712 officers and 53,277 men in 1918 — a 35-fold increase.

It was in the radio field that personnel problems proved most difficult. The long-established wire telephone and telegraph systems of the nation provided a substantial reservoir from which trained wire men could be drawn. The relatively new commercial radio field, however, afforded no comparable source of skilled personnel.

The Signal Corps initiated an extensive radio training program in the military camps, supplemented by special undergraduate training at forty-five colleges and technical institutes. Considerable time elapsed before this program could get under way, however. Indeed, the war was to end before it attained full fruition.

In the meantime, even while plans for the training program were under study, the radio amateurs of the United States volunteered their services. It is a matter of historical record that practically every amateur in the nation eligible for military service unhesitatingly answered his country's call. Of the 6089 amateur licensees of all age groups and walks of life, more than 4000 put on uniform. Not only did they fill the critical early void of trained radio men; they supplied the even more important need for qualified instructors.

General — then Lieutenant — Ingles, who was himself an instructor of Signal Corps officer candidates, believes that the skill and versatility displayed by amateurs in this early period was of material aid in establishing the superiority of Allied communications — an important deciding factor in the outcome of the struggle.

So emphatically was the public-service value of radio amateurs demonstrated by their performance that the War Department, soon after the Armistice, initiated consideration of plans for the organization of an Army amateur radio reserve. The Signal Corps, however, like many other government branches, was confronted with complex demobilization problems. Its personnel had been reduced; surplus material had to be sold; contracts had to be terminated and adjusted.

These problems so occupied the residual skeleton staff that little tangible progress was made until 1925. In that year the Signal Corps School at Fort Monmouth — of which General Ingles was then director, and where a number of the regular administrative and instruction personnel were practising amateurs — recommended to the Chief Signal Officer that active steps be taken toward the organization of an Army-amateur system.

As a result, a board of Signal Corps officers was ordered to Hartford, Connecticut, to confer with officials of the American Radio Relay League. After a series of conferences, a plan of affiliation was agreed upon. Under this plan the ARRL, representing the amateur body, undertook to assist in organizing and promoting the Army Amateur Radio System as a reservoir of trained radio operators for use in emergency, the Army in return pledging its encouragement and support of amateur frequencies and privileges.

The proposed plan was submitted to the Chief Signal Officer. After minor changes it was approved by the War Department, with the provision that no funds or personnel be authorized for its operation. The ARRL Board of Directors similarly approved the plan, and it was made effective on November 1, 1925.

The amateur body received the proposal with enthusiasm. Unfortunately, General Ingles acknowledged, lack of funds and personnel prevented the Signal Corps from giving it proper impetus. The individual amateurs selected in each corps area to serve as liaison representatives were obliged not only to initiate the plan but to organize nets, keep records, and perform a number of other administrative details. In time many of them lost interest in the AARS and resigned.

From the Chief Signal Officer—
Major General Harry C. Ingles

The need for providing interest-sustaining operating activities was recognized, and on January 1, 1929, a revised plan was put into effect which emphasized as its prime objective coöperation with the American Red Cross in supplying disaster relief radio communication. Thereafter the AARS increased in numbers and effectiveness, despite the continuing handicap of lack of funds.

General Ingles noted that various efforts were made to overcome this handicap. In 1934 a board of officers, convening in the Office of the Chief Signal Officer to study the AARS, recommended that the Signal Corps enlisted reserve be activated, with the AARS as an integral part, and that funds and personnel be authorized for its operation. Early in 1936 the Chief Signal Officer again pointed out to the War Department the desirability of activating the enlisted reserve, citing the need for more binding and official ties with the amateurs and other specialists whose ready-made skills would be required immediately upon mobilization. This proposal was approved both by the Chief of Staff and by the Secretary of War, but Congress did not appropriate the necessary funds.

Nevertheless, the amateur body loyally continued its support of the existing affiliation. Membership increased steadily; from 500 in 1933 it rose to 1100 in 1935, and to 1700 in 1939. On December 8, 1941, the AARS had an active membership of more than 2400 licensed amateurs.

"Many of those Army amateurs are now in uniform, wearing the crossed flags of the Signal Corps," the Chief Signal Officer asserted with satisfaction, "and thousands of other radio amateurs have joined up along with them."

General Ingles displayed interest in a recent ARRL check of licensed amateurs in the Signal Corps. According to this check, based on a substantial test sample, 40 per cent are commissioned officers, 35 per cent are noncoms, and only 25 per cent are privates or privates first class.

"History repeats itself," General Ingles observed reflectively. "You amateurs proved your worth in the last war, and now in this war you've demonstrated even greater value to the nation."

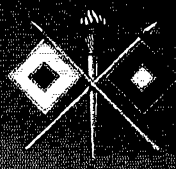
He went on to explain that, from the viewpoint of the Signal Corps, there are advantages to the existence of a strong amateur body that hadn't been fully appreciated before the start of this war. "The experience of the last war taught the Army that amateurs, because of their previous self-training and their intense preoccupation with radio, could be quickly converted into skilled military operators and maintenance men," he said. "We were already aware that amateurs could perform signal duties in the field with a minimum of training, and that many of them could qualify as competent instructors with little or no indoctrination. We knew, too, from our work with the AARS, of the amateur's usefulness in providing auxiliary communication during peacetime emergencies when normal facilities are disrupted.

"But through our experience in this war we have come to realize that there are still other military advantages in having you fellows around."

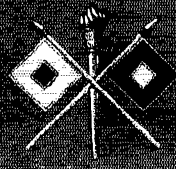
In explanation, General Ingles recalled the problem the Signal Corps confronted at the outset in finding manufacturers capable of immediate production of the intricate communications and other equipment needed for the new army which was being mobilized. It was then that the specialized radio manufacturing industry which supplied the exacting needs of amateur radio proved an invaluable military resource. The larger manufacturers in this group, the Signal Corps learned, were using precisely those processes which could most readily be adapted to meet exacting military standards. Moreover, the products of some of these manufacturers could be applied with only minor re-design. This greatly expedited the solution of initial procurement problems, particularly in the production of thoroughly engineered high-performance apparatus. General Ingles also emphasized the assistance rendered the Signal Corps by amateurs through the sale or loan of communications receivers, transmitters, meters and other apparatus to fill critical early needs.

Still another important asset, the significance of which bears a far-reaching relationship to future policy, was found in the frequency bands assigned to amateurs which became available to the military upon the suspension of amateur operation. These bands provided space in the spectrum for a number of indispensable wartime services, with the added advantage that this space came neatly packaged in bands of substantial width rather than as isolated, scattered channels. In this connection, General Ingles praised the action of the ARRL in acceding to the partial relinquishment of certain blocks of frequencies for essential training purposes in 1941, some months before actual U. S. entry into the war.

"In these as well as in many other ways," the Chief Signal Officer concluded, "amateur radio has confirmed the wisdom of the national policy which encouraged and supported it."



"OCSigO"



IN THE warfare of the past, the primary necessities of an army were munitions and food. Even in the first World War, these were still the prime essentials. In World War II, however, a third service has achieved the status of a major requirement — communications.

There are two factors responsible for the magnified importance of communications. First, this is a global war. Second, it is a mobile war.

Centralized control is imperative in the direction of a conflict which, in one way or another, extends over almost every square mile of the Earth's surface. Such control can be achieved only by a communications system so comprehensive that it merges the far-flung fronts of the United Nations into a solid anti-Axis bulwark.

Centralized coördinating control is required also for the separate elements in this war of motion — moving planes, moving tanks, moving armies. The speedy movement of troops and equipment over large areas of territory requires instant control — and that means communication.

To provide communication, two kinds of facilities are required — matériel and personnel. For the Army to be victorious, each must be the best of its kind.

To supply these facilities is the responsibility of the Chief Signal Officer, discharged through "OCSigO" — the Office of the Chief Signal Officer.

The Chief Signal Officer

Under Army Regulations, the Chief Signal Officer is responsible, under the direction of the Commanding General, Army Service Forces, for:

a) The development, coördination, standardization, procurement, storage, issue and repair of (1) signal communication, cryptographic and meteorological equipment and supplies (except repairs under the jurisdiction of commanding generals of service commands); (2) all electrical apparatus for radio direction finding and for range finding; (3) photographic supplies and equipment [except that required for aircraft and other special purposes]; (4) all sound recording equipment relating to communications. . . . [Office dictating equipment for stenographic work not associated with communications not included.]

b) Procurement and supply of photographic and motion pictures. . . . [including in general all photographic work of the Army not specifically assigned to other arms or services].

c) Establishment and operation of Signal Corps branch depots, signal sections of quartermaster depots and facilities for the repair of Signal Corps equipment, except the facilities within units of the field forces and the air service commands and those under the command of commanding generals of service commands.

d) General coördination and standardization of all radio operations and enforcement of regulations concerning same.

e) Assignment of call letters, radio frequencies, power and types of emissions for all Army radio stations.

f) Maintenance, for the Chief of Staff and the Commanding General, ASF, of digests of military and technical characteristics of signal equipment in the Navy and in foreign military forces.

g) Recommendations to the Commanding General, ASF, on the proper allowances of Signal Corps equipment in Tables of Basic Allowances and Tables of Allowances of the arms and services, except AAF and the Signal Corps aviation units.

h) Recommendations to the Commanding General, ASF, on the Tables of Organization of all Signal Corps units except Signal Corps units with the AAF.

i) Maintenance of liaison with the Navy and with friendly foreign powers on the necessary coördination of signal communications equipment and procedures.

j) Recommendations to the Commanding General, ASF, on uniform methods and procedures for the use of signal communication equipment.

k) Operation of the War Department Signal Center and the establishment of necessary channels of communication required for its efficient operation, and the operation of the War Department code room.

l) Supervision of the installation, maintenance, and operation of all military signal communication systems and equipment, including military cable, telephone and telegraph lines, radio apparatus and stations, except the routine maintenance and operation of fixed fire-control communication systems and fixed airways and airdrome control systems and radio aids to air navigation, and the supervision of the installation, maintenance and operation of temporary systems used by troops in field operations (over which he exercises general supervision only).

m) Installation, maintenance and operation of all military signal communication systems and equipment, including military cables, telephone and telegraph lines, radio apparatus and stations which are employed for the purpose of maintaining communications with overseas theaters, task forces and bases.

n) The organization and operation of the Alaska Communication System.

o) The supervision of the organization and operation of the Army Amateur Radio System.

p) Preparation, publication, revision, storage, accounting for and distribution of all codes and ciphers required by the Army, and in time of war the interception of enemy radio and wire traffic, the location of enemy radio stations, the solution of intercepted enemy code and cipher messages, and laboratory arrangements for the employment and detection of secret inks, except . . . as may be delegated to commanding generals of theaters of operations . . . and similar commands. Maintenance of liaison with other arms and services, with the Navy Department, and with the friendly foreign powers on all cryptographic matters.

q) Coördination of the training of personnel assigned to signal communication duties, under instructions prescribed in orders of the War Department.

r) Production, storage and issue of training films and film strips . . . except . . . as specifically assigned to other arms or services.

s) Training of civilian personnel required in the operation of agencies of the Signal Corps.

t) Training of specialists required by Signal Corps units except those trained in units or in schools not under the jurisdiction of the Commanding General, ASF.

u) Promulgation of training doctrine, scheduling programs, and conduct and supervision of training in Signal Corps schools, unit training centers and replacement training centers, and the selection, assignment and relief of training staff and faculty personnel assigned thereto; determination of major policies regarding the training of . . . officers and specialists in civilian institutions, and supervision as to the maintenance of standards in such institutions. . . .

v) Establishment and conduct of training activities for breeding and training centers for homing pigeons. . . .

w) Preparation and revision of all books, pamphlets, and instruction data required by the Army to make proper use of all equipment and apparatus developed, procured and issued by the Signal Corps.

x) Administration of apportioned funds.

Before summarizing the duties and functions performed by the separate compartments of the OCSigO organization, the division within it of the duties assigned the CSO under the basic regulations should be known.

These are the definitions:

The **Signal Corps** consists of the Chief Signal Officer and such Signal Corps commissioned officers, warrant officers, and enlisted personnel as are authorized by the Secretary of War for the Army.

The **Office of the Chief Signal Officer** consists of a staff and operating services:

a) The staff consists of the Assistant Chief Signal Officer as Chief of Staff, the Executive, the Control Division, and Plans & Operations, Fiscal, and Legal Divisions.

b) The operating services consist of the Engineering & Technical, Procurement & Distribution, Personnel & Training, Army Communications, and Army Pictorial Services, including their respective field activities; and the Office Service Division.

Staff

The Staff functions are summarized as follows:

The **Assistant Chief Signal Officer** acts as the principal assistant to the Chief Signal Officer and represents him during his absence, and acts for the CSO as his principal coördinating agency in a capacity comparable to that of a Chief of Staff. He directs and coördinates the activities of the staff; informs the CSO as to the general effectiveness of the organization and the results being obtained; directs the continuous study of anticipated future developments and contingencies and preparation of over-all operating plans.

The **Executive** insures that all instructions published are in accord with the policies and plans of the CSO and directives from higher authority, and edits and authenticates all orders, instructions, regulations and memoranda, required for issuance by higher authority or recommended for issuance by the CSO, by staff divisions or services. The Executive also assigns and reassigns officers to duty in services, divisions and branches in OCSigO, and to committees, boards, and other duty as directed by the CSO; supervises administrative arrangements and prescribes office methods . . . ; handles requests for information; directs appropriate action on correspondence received by the CSO . . . ; receives official visitors for the CSO; supervises office security; and prepares agenda for the CSO's staff conferences.

The **Control Division** studies and evaluates the functions, organization, administration, methods, procedures and operations of all activities under control of the CSO, both departmental and field; investigates sources of difficulties and recommends corrective action; recommends methods and procedures to be prescribed for the compilation of statistical reports, and reviews all such reports as are required by the CSO or higher authority; maintains statistical information as to the progress and status of operations, and prepares summaries thereof; evaluates the effectiveness with which plans and directives of the CSO are being executed, and makes appropriate recommendations for corrective action. . . .

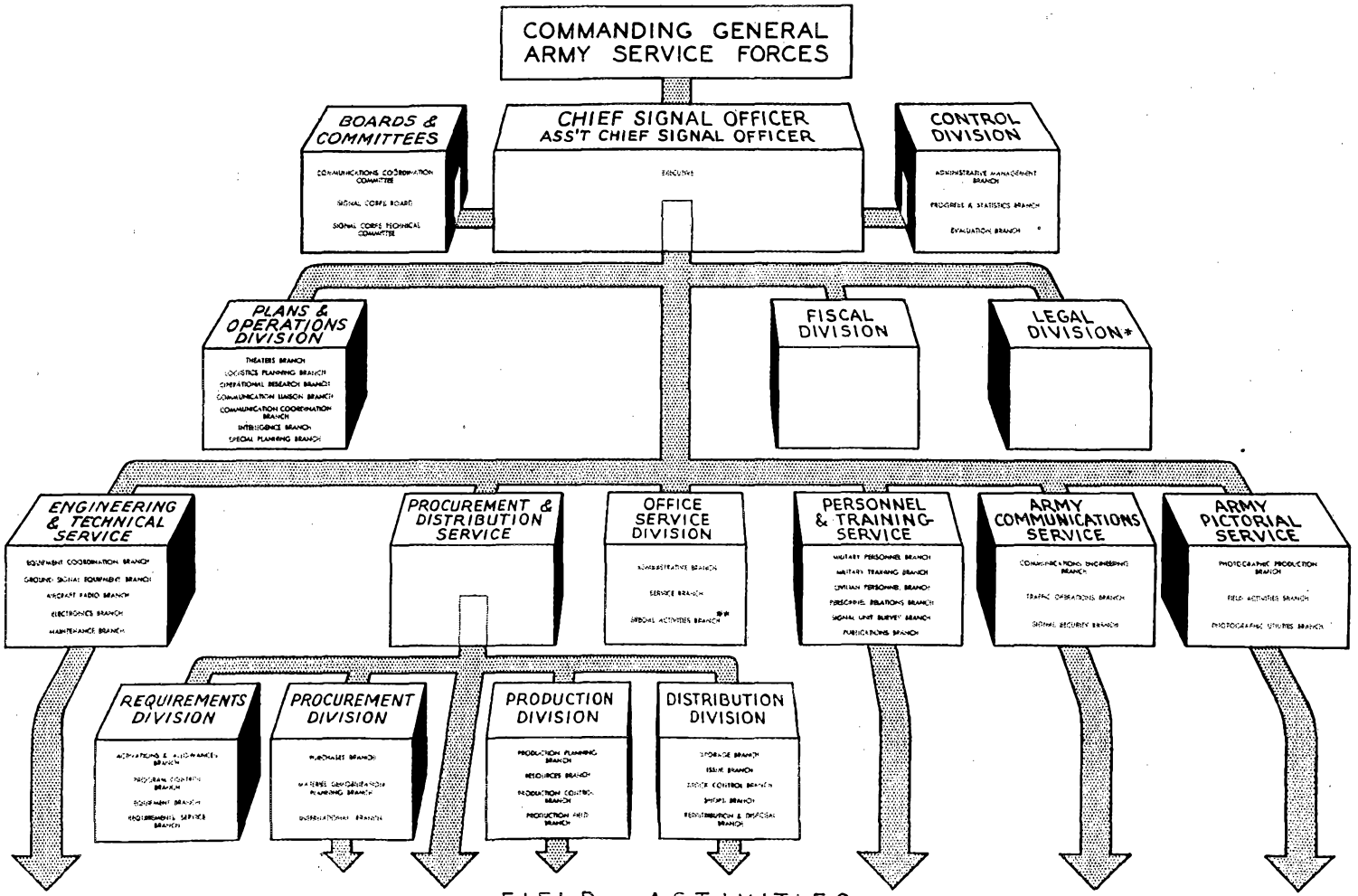
The **Plans and Operations Division** plans and supervises programs and projects pertaining to strategic and tactical requirements for Signal Corps personnel and matériel; performs staff functions relating to communications procedures, tactical doctrines, and techniques; reviews, coördinates and expedites Signal Corps matters pertaining to theaters, task forces, base commands and defense commands; determines whether operational and training requirements will be met; acts as consultant to the CSO and operating services and division, OCSigO, on scientific aspects of equipment, operation and training. The Division also assigns radio frequencies for all War Department installations and activities; maintains liaison for the War Department with other agencies regarding frequency allocations, radio interferences and related matters; analyzes reports from maneuvers and theaters involving Signal Corps activities and initiates corrective action where required; collects, compiles, evaluates and disseminates, for military purposes, information on military communications of U. S., Allied, Axis and neutral nations; makes special studies to serve as a basis for the formulation of joint and combined communication policies of the CSO and the War Department; exercises staff supervision over demobilization planning . . . ; makes recommendations for the CSO on availability of equipment for international aid and Navy assignments.

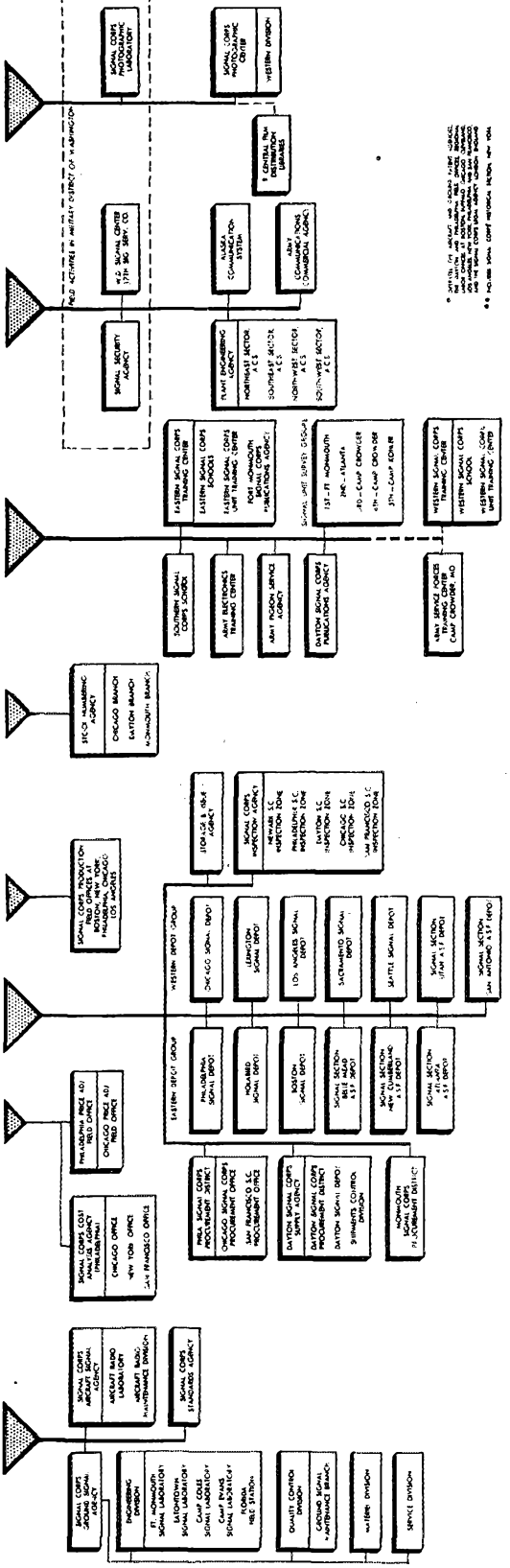
Major General James A. Code, jr., has been the Assistant Chief Signal Officer since January, 1942. For a year prior to that time he was the Chief of the Control Division in OCSigO. Graduating from the United States Military Academy in 1917, after serving in the Coast Artillery he was transferred to the Signal Corps in 1923. His assignments have included duty at Army posts and universities throughout this country, the Philippine Islands and the Panama Canal Zone.

The **Fiscal Division** exercises staff supervision over all fiscal matters. It investigates fiscal methods, procedures, records and accounts of activities under control of the CSO, recommending corrective action when necessary; supervises the preparation of estimates of appropriations and justifications therefor; allots funds upon recommendation of the operating services; directs action on matters relating to status and change in status of funds and related fiscal activities in the operating services; maintains records of all funds allotted or suballotted by the CSO; prepares all fiscal reports . . . ; and performs various functions relating to Signal Corps contract renegotiation, insurance, etc.

The **Legal Division** acts as general counsel to the Chief Signal Officer and acts as the CSO's representative on all legal matters. It directs action on specifically designated legal matters; acts as the legal advisor on the application and interpretation of common law, statutes, regulations, and directives; reviews pending legislation affecting activities of the CSO; . . . advises military personnel on income tax and other personal matters, and drafts wills and powers of attorney for military personnel anticipating foreign service; . . . advises, assists and takes necessary action in connection with patents, copyrights, inventions and licenses; administers interchange of technical information between contractors and between the United Nations involving rights to patents and inventions; drafts contracts upon request and reviews all formal contracts and all informal contracts in excess of $50,000 . . . ; advises and assists in connection with the financing of contractors; . . . maintains liaison with the Office of the Under Secretary of War in connection with congressional inquiries and investigations; represents the CSO in matters related to labor relations, labor morale and supply of labor as they affect Signal Corps contractors; gives legal advice to the CSO on labor matters affecting civilian personnel of Signal Corps.

The **Engineering and Technical Service** directs research and development of Signal Corps equipment, except fixed communications, photographic, and such cryptographic equipment as may be specified by the CSO; controls initiation of such research and development and all requests submitted to NDRC; evaluates military characteristics of equipment and makes recommendations to Signal Corps Technical Committee; arranges engineering and service tests


COMMANDING GENERAL
ARMY SERVICE FORCES
BOARDS & COMMITTEES
COMMUNICATIONS COORDINATION COMMITTEE
SIGNAL CORPS BOARD
SIGNAL CORPS TECHNICAL COMMITTEE
CHIEF SIGNAL OFFICER
ASS'T CHIEF SIGNAL OFFICER
EXECUTIVE
CONTROL DIVISION
ADMINISTRATIVE MANAGEMENT BRANCH
PROGRESS & STATISTICS BRANCH
EVALUATION BRANCH
PLANS & OPERATIONS DIVISION
THEATERS BRANCH
LOGISTICS PLANNING BRANCH
OPERATIONAL RESEARCH BRANCH
COMMUNICATION LIAISON BRANCH
COMMUNICATION COORDINATION BRANCH
INTELLIGENCE BRANCH
SPECIAL PLANNING BRANCH
FISCAL DIVISION
LEGAL DIVISION*
ENGINEERING & TECHNICAL SERVICE
EQUIPMENT COORDINATION BRANCH
GROUND SIGNAL EQUIPMENT BRANCH
AIRCRAFT RADIO BRANCH
ELECTRONICS BRANCH
MAINTENANCE BRANCH
PROCUREMENT & DISTRIBUTION SERVICE
OFFICE SERVICE DIVISION
ADMINISTRATIVE BRANCH
SERVICE BRANCH
SPECIAL ACTIVITIES BRANCH**
PERSONNEL & TRAINING SERVICE
MILITARY PERSONNEL BRANCH
MILITARY TRAINING BRANCH
CIVILIAN PERSONNEL BRANCH
PERSONNEL RELATIONS BRANCH
SIGNAL UNIT SURVEY BRANCH
PUBLICATIONS BRANCH
ARMY COMMUNICATIONS SERVICE
COMMUNICATIONS ENGINEERING BRANCH
TRAFFIC OPERATIONS BRANCH
SIGNAL SECURITY BRANCH
ARMY PICTORIAL SERVICE
PHOTOGRAPHIC PRODUCTION BRANCH
FIELD ACTIVITIES BRANCH
PHOTOGRAPHIC UTILITIES BRANCH
REQUIREMENTS DIVISION
ALLOWANCES & AUTHORIZATIONS BRANCH
PROGRAM CONTROL BRANCH
EQUIPMENT BRANCH
REQUIREMENTS SERVICE BRANCH
PROCUREMENT DIVISION
PURCHASE BRANCH
MATERIEL COORDINATION PLANNING BRANCH
INTERNATIONAL BRANCH
PRODUCTION DIVISION
PRODUCTION PLANNING BRANCH
RESOURCES BRANCH
PRODUCTION CONTROL BRANCH
PRODUCTION AID BRANCH
DISTRIBUTION DIVISION
STORAGE BRANCH
ISSUE BRANCH
STOCK CONTROL BRANCH
SHIPS BRANCH
REDISTRIBUTION & DISPOSAL BRANCH
FIELD ACTIVITIES



for necessary modifications in equipment and specifications; develops over-all policies relating to maintenance, replacement, and repair parts and recommends procurement thereof; recommends initial replacement factors for new equipment developed by Engineering and Technical Service; exercises staff supervision for the CSO over all operations relating to *maintenance; prepares technical maintenance* lists, develops maintenance repair kits and test equipment, concerning equipment for which the Service is responsible; advises, upon request, with respect to T/Os and T/Es for maintenance units other than for AAF; operates, through the Signal Corps Technical Committee, to classify Signal Corps equipment as to type, except fixed plant and fixed airways equipment; maintains file of cases acted upon by technical committees of other arms and services on which Signal Corps is represented; plans reduction of the number of types of signal equipment and designates the security classification; coordinates characteristics of equipment with all interested arms and services within the War Department, also Navy Department for items of joint interest; maintains contact with the Navy and representatives of foreign forces regarding military and technical characteristics of signal equipment employed by their services; assigns nomenclature of Signal Corps equipment and furnishes representation on Joint Army-Navy Nomenclature Committee; prepares and coördinates with others concerned the official parts lists for assemblies; assists in the preparation of technical manuals on major items of equipment for which the Service is responsible; standardizes component parts of signal equipment to insure interchangeability; recommends source of procurement and distribution of radio quartz crystals; recommends training programs for specialized personnel required to operate and maintain new equipment; represents the Signal Corps on research and development policy-making committees and military-industry standardization committees; provides expert consultant service, and loans technical personnel to other operating services as required; prepares and makes distribution of a list of adopted types of standard Signal Corps items of equipment shown in tables of allowance, tables of equipment and tables of organization and equipment; exercises staff supervision over specification responsibilities applicable to the Signal Corps; represents the Signal Corps in specification activities; standardizes materials and component parts in signal equipment and approves such standards for use by the Signal Corps.

The **Procurement and Distribution Service** assembles and compiles requirements for all Signal Corps equipment and supplies; procures, takes appropriate action to achieve production and delivery of, and inspects and accepts such equipment and supplies, except as any such functions are specifically assigned to other operating services; stores, issues, repairs and salvages all equipment and supplies under the jurisdiction of the CSO, except cryptographic; obtains cost data from Signal Corps contractors and conducts overall price adjustment and contract termination; exercises staff supervision for the CSO over operations directly relating to the foregoing; reviews and recommends training programs for supply personnel.

The **Personnel and Training Service** recommends policies and procedures relating to, and exercises staff supervision over, the administration of military and civilian personnel activities under control of the CSO; . . . recommends allotments of officers, enlisted and civilian personnel to all activities under control of the CSO . . . ; recommends methods for reporting military and civilian personnel strengths and related data; prepares plans for procurement and assignment of Signal Corps personnel and for activation and inactivation of Signal Corps affiliated units; recommends and promulgates training doctrine, policies and quotas; reviews training programs of Signal Corps training installations to which the preparation has been delegated and for specialized training specifically assigned to other services, and prepares training programs for which responsible, for the training of Signal Corps military and Women's Army Corps personnel; inspects Signal Corps tactical units in the continental United States as directed; plans and coördinates all pigeon activities pertaining to ASF and coördinates signal supply for pigeon activities for the Army; establishes and interprets general publication policies concerning, and reviews Signal Corps publications, training films, and film strips . . . ; plans and schedules future procurement and production of training and technical literature; prepares technical literature and specifications for equipment procured by the Signal Corps.

Major General Roger B. Colton has been Chief of the Engineering and Technical Service, OCSigO, since August, 1943. He also has served as Chief of the Plant and Traffic Division and of the Research and Development Division of OCSigO. At Fort Monmouth he was executive officer and in 1938 became director of the Signal Corps Laboratories. Commissioned a second lieutenant in the Coast Artillery in 1910, he served in various capacities in that branch of the service until 1930, when he transferred to the Signal Corps.

The Army Communications Service controls and directs the development, engineering, installation, operation and maintenance of fixed radio and wire communication and signal security facilities for the Army, except those specifically assigned to other elements of the Army; provides and exercises operational control over the War Department Communications System; exercises operational control over subordinate networks, over radio intelligence agencies in theaters and defense commands designated to perform War Department missions, and over administrative communications channels primarily serving installations of the Army, airways in accordance with policies arrived at jointly with the Commanding General, AAF; operates and maintains the War Department Signal Center and associated facilities, commands the 17th Signal Service Company, and administers the Signal Property Office; provides specialized instruction to officers and enlisted personnel preparatory to assignment to overseas bases in procedure and operating technique for fixed communications; prepares plans for military fixed communications requirements throughout the world; inspects fixed communication installations for the Army as required and authorized; contracts for commercial communications services for the War Department in Washington . . . ; initiates the procurement of fixed communication equipment; assists in the preparation and coördinates with others concerned, technical manuals for equipment for which the service is responsible; reviews and coördinates theater requirements for fixed wire communication requirements; formulates tactical doctrines and techniques for the protection of Army communications; initiates action and performs duties relating to signal security, goniometric and intercept activities for which the CSO is responsible; furnishes all codes, and cryptographic material for the Army.

The Army Pictorial Service performs all photographic work for the AGF and ASF, . . . except basic photographic work required for direct, internal use of the respective elements thereof or specifically excepted by Army Regulations, . . . conducts the research, development, design and coördinates standardization of photographic equipment and supplies; assists in the preparation of and coördinates with others concerning technical publications for Signal Corps photograph equipment; . . . supervises the operation of V-Mail and official Photo-Mail facilities and the supply of personnel and equipment therefor, and procures privately owned V-Mail facilities as required; supervises the operation of the United Nations Film Library; produces, procures, stores, releases and distributes still and motion pictures; directs the operation of photographic personnel for ASF and AGF; formulates tactical doctrine and techniques for the employment of Signal Corps photographic units and equipment; exercises technical supervision over . . . film libraries . . . and photographic laboratories. . . .

Brig. General Jerry V. Matejka (above) is Chief of the Personnel and Training Service. He received that assignment in 1943, following a one-year tour of duty overseas. Upon graduation from the University of Texas he was commissioned in the Engineer Reserve in 1917, transferring to the Coast Artillery later that year and to the Signal Corps in 1923. General Matejka is a graduate of the Army Industrial College, the Signal School at Fort Monmouth, the Command and General Staff School and the Army War College.

Brig. General Frank C. Meade (left) has been Director of the Plans and Operations Division, since August, 1943. Graduating from the United States Military Academy in 1917, he was commissioned in the Coast Artillery. He attended the Signal School at Fort Monmouth and in 1928 transferred to the Signal Corps. Graduating from the Command and General Staff School in 1938 he was assigned to the War Plans and Training Division, OCSigO. Prior to his present appointment he was Officer in Charge, Air Communications Division.

Major General William H. Harrison (right) is Chief of the Procurement and Distribution Service, OCSigO. He was commissioned a colonel in the Army of the United States in 1942. Before he was called to active duty he was director of the Production Division of the War Production Board. He held positions with the New York Telephone Co., Western Electric Co., Bell Telephone Co. of Pennsylvania, Diamond State Telephone Co., and A T & T, of which he was vice president and engineer from 1938 until he entered the Army in 1942.

Brig. General Frank E. Stoner (below) is Chief of the Army Communications Service. General Stoner began his military career in 1914 as a private in the infantry, later attending the United States Military Academy. His first commissioned service was in the Philippine Scouts. He was transferred to the Signal Corps in 1926. A graduate of the Command and General Staff School and the Army Industrial College, he has served at Army posts throughout this country and in the Philippines.

The **Office Service Division** performs administrative and service functions for OCSigO. It receives and distributes mail received by the CSO; prepares and distributes Office Orders and Memoranda; furnishes military and civilian personnel to assist the Executive in the performance of his duties; performs office service and Provost Marshal functions for OCSigO; distributes literature and mail; operates messenger service; . . . arranges for supply and repair of office supplies; furniture and equipment; maintains basic record files of OCSigO and exercises staff supervision over the maintenance and disposal of records in Signal Corps Field Activities; operates central machine tabulating service for OCSigO; gathers Signal Corps information and distributes, through War Department Bureau of Public Relations, to newspapers, magazines, radio, picture services and other media; disseminates classified information to personnel concerned with Signal Corps equipment; operates Office of Technical Information; arranges and supervises ceremonies for Army-Navy "E" Awards to plants manufacturing Signal Corps equipment; prepares the annual report of the Chief Signal Officer; records the history of the Signal Corps in World War II; handles all miscellaneous public relations activities; plans and executes promotional projects for the benefit of the Signal Corps, and reviews advertising copy and layouts, feature articles, news stories, speeches, exhibits, etc., having to do with Signal Corps activities.

Colonel David E. Washburn is the Executive Officer, OCSigO, and head of the Office Service Division. His first military service was in 1917 as a private in the infantry. Commissioned in the Signal Reserve in 1918, he served at Headquarters AEF in France. In 1920 he was commissioned a captain in the Signal Corps. Colonel Washburn has served at posts in this country and from November, 1941, to April, 1942, he was Signal Officer of the U. S. Military North African Mission.

Boards and Committees

The following Boards and Committees are organized in the Office of the Chief Signal Officer:

The **Communications Coördination Committee** consists of a representative of each of the following: Operations Division, War Department General Staff; AAF; AGF, and ASF. The Committee receives from the CSO matters involving the coördination of operational methods and equipment for communications and electronics within the Army and makes recommendations to the CSO on such matters.

The **Signal Corps Board** consists of a president, a secretary and not less than three or more than eight other officers detailed as members thereof and such other personnel as may be assigned by the CSO. The Board originates and submits to the CSO recommendations for the improvement of Signal Corps operations and equipment; and considers and makes recommendations on the following subjects: (1) Test of development articles to determine if military characteristics are met, or if improvements are required. (2) Test of production articles . . . (3) Test of commercial articles . . . (4) Determination of operating technique, to include the equipment employed and the composition of teams. (5) Liaison with appropriate field organizations and activities of the armed forces to facilitate proper functioning. (6) Other subjects as determined by the CSO.

The **Signal Corps Technical Committee** is organized to effect coördination between interested arms and services during development and standardization of types of equipment and the preparation and coördination of specifications. It acts in an advisory capacity to the CSO.

THE CYCLE

From the viewpoint of OCSigO, invasion planning — after being initiated by the Chief Signal Officer himself — began in the Plans and Operations Division, which handles all matters pertaining to planning and coördination necessary for strategical and tactical matters. It performed the staff functions relating to communication policies, procedures, tactical doctrines and techniques concerned with the complex arrangements required for the landings on the North African Coast.

The photographs on these two pages constitute a pictorial story of the progress of a universally known item of Signal Corps procurement — the SCR-299 — from the manufacturer's production line to Signal Corps operators in foreign theaters.

At the left above, individual components of the 450-watt c.w./300-watt 'phone transmitter are mounted on chassis and wired into individual subassemblies. These, in turn, are combined in rugged steel cabinets to make complete BC-610 transmitters alike as peas to their amateur-designed HT-4 prototype. Girls and men work side-by-side on the mass-production assembly line.

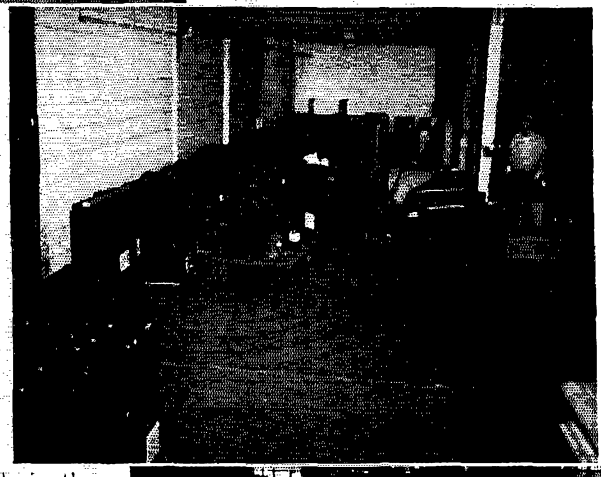
Below, completed and thoroughly tested transmitter units are shown being taken off the line by a warehouse "mule" (resembling an over-grown kiddie-kar or a toy tractor, as you choose). At the bottom, antenna insulator bases are seen being attached to the truck bodies before transmitters are lifted into place.

OCSigO at War

The manifold labors of the Signal Corps in developing and procuring the matériel of military communications have only one main purpose — to make possible swift and accurate communications for the armies in the field.

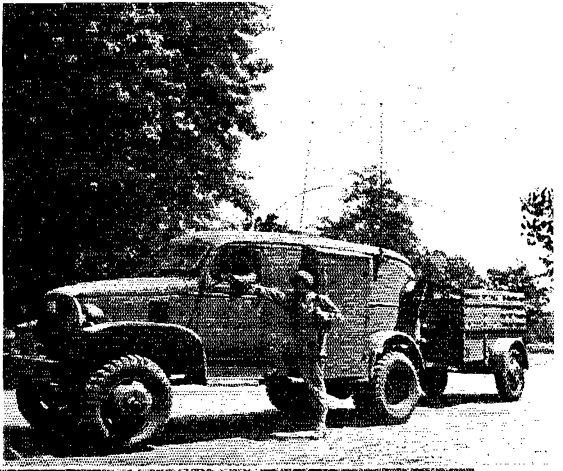
The undertaking of equipping any major military operation obviously has many phases. When the Signal Corps goes to work on such a job, the various components of OCSigO function as a team to deliver the goods on time.

The North African invasion, which represented its first major trial in combat, affords an excellent example of American radio equipment serving simultaneously on land, at sea and in the air — linking the American vessels in the 850-ship armada, maintaining a communications network between the task forces and General Eisenhower's headquarters, using portable transmitters to tell the native populations why our forces were there. No guess-work was involved. The equipment had been tested for months to make sure of its performance under the very conditions, including climate, that would be met when the time came.



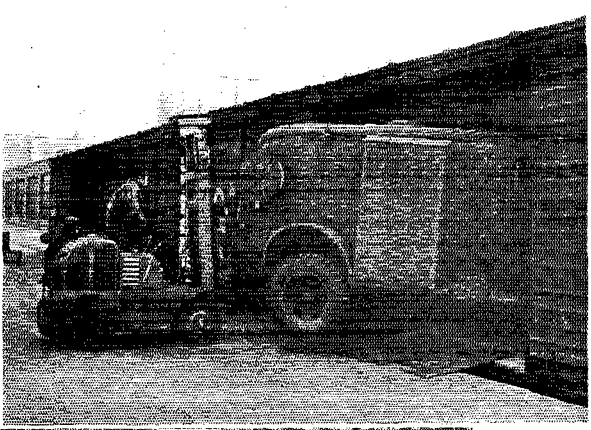
OF SUPPLY

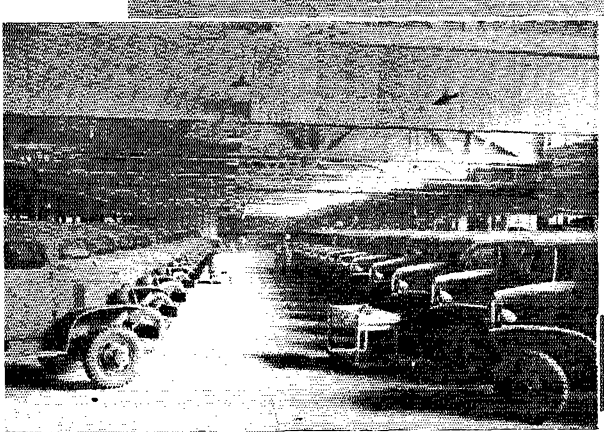
When the signal officer of the North African Western Task Force arrived in Washington in 1942, he had to work out the final details of the complex communications requirements for the simultaneous landings at Casablanca, Oran, and Algiers, and to determine the number of Signal Corps troops and the thousands of tons of communication equipment to be shipped on the assault and supporting convoys. In this difficult task he was aided by officers in the Theaters Branch and logistics Planning Branch. The



The cycle now enters the distribution phase, with waiting rows of the 1½-ton radio trucks in a Chicago Signal Corps depot. From the depot completed 299s are loaded into box cars — two to a car — by the powerful lifting hoist of the warehouse tractor.

By rail and sea (and even by air) these mobile radio stations travel to all parts of the world. At right a Signal Corps private first class (home town: Chicago) drives a newly delivered 299 down a wooded trail in Australia, while above a signal team on maneuvers receives its orders. Operating as a mobile unit traveling at full speed, on either c.w. or voice, the 299 has a "guaranteed" range of 100 miles under any conditions, day or night, using the 15-foot transmitting whip antenna. Fixed operation with a longer horizontal antenna provides reliable ranges of several hundred to several thousand miles. The SCR-399 is similar except that it is mounted in a shelter for transportation on a 2½-ton truck or for fixed use on the ground.





Theaters Branch is fundamentally a liaison office between the tactical signal officers of theaters of operation and the Chief Signal Officer. It is composed of officers who represent the various fighting zones, their knowledge of high strategy derived through representation on the Joint Communications Board and the Combined Communications Board. Under the absolute secrecy which enveloped this operation, these officers provided for the activation of special troops, arranged for specialized training of personnel, expedited procurement, modification, assembly and shipping of vital equipment, and generally coördinated the activities of all divisions of OCSigO to enable it to meet the deadline. Detailed estimates of Signal Corps units and equipment, which the broad strategic plans indicated would be required for operations in the principal combat areas, were prepared. Each estimate was broken down by successive zones through which the capture or recapture of enemy-occupied territory was expected to proceed, and covered not only the specific types of personnel and equipment needed but also estimated approximate dates.

The Signal Corps in the Field

TODAY'S army is an aggregation of units of men and matériel. Each of these units has its separate mission — an individual task that somewhere fits into a gigantic master plan. To make that plan successful, every unit must perform its particular task in concert with every other.

When Wellington counterattacked at Waterloo, Adam's brigade of infantry and Vivian's cavalry advanced in close formation, shoulder to shoulder, as though they were "single things commanded by a single voice."

In a certain sense the same is true today, but the practical effect is incomparably different. Now the commands of the "single voice" are delivered through the medium of the latest and best signal communications equipment as well as through the visual signals which were the only means of communication open to commanders of the past. It does not, however, voice a single command. No longer does one man irrevocably decide while whole divisions only obey, marching as automatons, in rank and in step from flank to flank, until enemy gunfire mows them down like wheat before the sickle.

The tactical unit of the modern army is the battalion. Sometimes, of course, a still smaller unit such as the company or platoon may have a separate tactical mission. But all units must be motivated by a single plan and must collaborate with each other in close liaison and perfect teamwork — linked together by the sometimes invisible strands of communication.

Wars are *not* won by signal communications alone, however. Not even radar is a competitor of ordnance. Superior matériel and tactics and techniques are among the ingredients of victory, but in the final analysis it is teamwork that counts most in winning a war.

And, while skillful, efficient engineering and procurement and distribution are prerequisite to successful signal communication, in themselves they cannot perform the ultimate task. There, too, it becomes a matter of teamwork. It is the operators, the technicians and the maintenance and installation men in the field who achieve the final victory.

These men are of two kinds in terms of their branch of service. Some wear the flaming torch and crossed flags of the Signal Corps; the others may appear with the insignia of any arm of the service. The former are signal troops, while the latter are members of the communication detachments of the various combat arms. Use of the term "signal" and "communication" to differentiate between those communication specialists who are in the Signal Corps and those who are not is an inexact and unsatisfactory procedure. However, this distinction is about the only one that can be applied when speaking in collective terms. The point is that communication men in the infantry or artillery or cavalry actually are infantrymen or artillerymen or cavalrymen.

Signal troops are assigned to any one of the dozens of different specialties within the Signal Corps, but theirs will generally be a communications job. An infantryman, however, even though a radio operator today, might be assigned any other duty at any time — company clerk, automatic rifleman, bazookaman, or any of the other combat jobs in the infantry.

Not that Signal Corps men do not encounter their share of combat duty. Although Army Regulations clearly state that Signal Corps personnel are charged primarily with the combat mission of communication for such large units as divisions, corps and field armies, in this war both the Germans and the Japs have displayed their scorn for regulations and make a special effort to seek out signal centers for attack. Even though they may be located some distance behind the lines, that fact is no protection against dive bombers and strafing planes. And in combat often it is vitally necessary that signal units go well forward of battalion and infantry company installations in the performance of their duty.

Much stress therefore has been placed on training in methods of self protection, including foxholes, concealment, active and passive defense against air and mechanized attack; and defending lines of communication. In the last war the Signal Corps man was armed only with a revolver. In this war he carries a carbine.

Every Signal Corps soldier must be qualified in weapons training. In the replacement training center he has spent hours of patient rifle sighting and trigger squeezing. He has had target practice on the rifle range and instruction in directing fire against enemy aircraft. He is drilled in the use of the Army gas masks and in defense against chemical warfare, against air attack, and against mechanized attack. In other words, signal troops are fighting soldiers. Their basic training is the same in general as that given every soldier in the Army. They are built up physically by daily exercise. They are given daily close-order drill, with and without arms. They learn to march in formation in squad, platoon, company, and finally in a complete battalion.

Combat Mission

But with all this drill the combat mission of Signal Corps troops in the field remains that of providing signal communication for the units to which they are assigned.

Through them the entire Army is linked by radio and wire networks. They man the "local stations" of the greatest communications system the world has ever seen.

With WAR, the War Department's Signal Center in Washington as a focal point, each field sig-

Radio servicing in the field — deluxe! This Signal Corps sergeant, working in the mobile repair truck of a signal repair company stationed somewhere in New Guinea, has every necessary facility at hand for rapid and accurate troubleshooting, circuit analysis and repair of every type of equipment from the simplest to the most complicated. (The FC-1 being operated on at the moment is not necessarily included in the latter classification!)

nal center at a theater headquarters is the center of a communication net comprising the area of that command. Smaller signal centers with their radio and teletype station and messengers are located within the theaters, each in turn the key point in a still smaller system. Finally, at the outer fringes of the net, the chain of communication reaches individual soldiers carrying handie-talkies and walkie-talkies. The chain is continuous from the high command in Washington to the most remote combat unit, aircraft or tank crew in the field.

The Signal Corps employs every serviceable means to keep that chain complete. If wires are cut, it uses radio. If radio silence is imposed, messengers get through by motor vehicle, bicycle or on foot. When human messengers are not available, carrier pigeons are used, but only from front to rear. Every signaling device, from the most ancient visual signals to the latest developments in radar, finds employment in the Signal Corps of today.

The Signal Corps is larger now than was the entire U. S. Army before the outbreak of World War II. Yet it numbers within its ranks only a portion of the Army's total communication personnel. In addition, large numbers of communication personnel have been trained by the other branches of the Army — as airplane, tank and scout-car radio operators, manning nets and doing the simpler repair jobs.

The coördination of all these communication activities, whether or not they are carried on by Signal Corps troops, remains a responsibility of the Signal Corps, however. The Signal Corps provides the special organization of technically trained men needed to design and develop, to procure and distribute the hand portables and the vehicular sets and the countless other communication components, to install them properly, and to repair them when they break down. And, of course, it also supplies the organization needed to install, operate and maintain the elaborate radio and wire networks which serve the headquarters of divisions, corps, and armies of the Ground Forces and the corresponding units of the Air Forces.)

Organization

The organization under which Signal Corps troops in the field operate is dictated by the fact that — although they are well-armed fighting soldiers — normally no signal unit by itself is committed as a striking force against the enemy. Their job is primarily to provide signal communication for the units to which they are assigned.

The most explicit description of Signal Corps organization in the field is that it corresponds with the military chain of command. The assignments and duties of Signal Corps personnel can be considered only with reference to the organization of the Army as a whole.

The U. S. Army is constructed in a series of echelons, or levels of organization. In the infantry individual soldiers are grouped into squads, squads into sections, sections into platoons, platoons into companies, companies into battalions and battalions into regiments. Infantry regiments plus supporting and service units are grouped into infantry divisions. Infantry and/or armored divisions, with occasionally a cavalry or airborne division thrown in, constitute corps, and corps and independent divisions are grouped into armies.

The company commander may be compared to the foreman of a factory department. The foreman is, with the aid of the employees under him, entirely capable of doing any particular manufacturing operation assigned to him. But it is the manager who decides what part of work on hand is to be done by this foreman's department.

So it is in the Army. The top command — headed at the apex by the President and the Chief

of Staff — decides over-all policies and assigns major tasks to theater or task force commanders. These commanders in turn allocate portions of the responsibility to the next subordinate commanders and so on down the line. Each commander becomes the executive in charge of a given department or subdepartment or subsubdepartment, throughout the chain. Within the limits of his particular field of responsibility, each of these major executives has the authority to establish policies, to plan specific operations (in conformance with the broad policies of higher commands), and to assign personnel to perform these operations.

It is at the division level where the operational line between "signal" and "communication" troops is drawn.

Tactical Signal Troops

In the field, the Signal Corps is responsible for both the installation and operation of communications equipment in units down to and including the divisional echelon, but not within units of the next lower echelons. Units from the regiment down use equipment operated by their own personnel but procured by the Signal Corps.

A Signal Corps officer is detailed to serve as the signal officer for every expeditionary force, theater of operations, overseas department, defense command, task force and base command, as well as every tactical unit of the Army Ground Forces larger than a brigade, and every Army Air Forces command larger than a group. In instances where no signal officer has been so detailed in orders, the senior Signal Corps officer present for duty with the staff of the organization commander, or with the Signal Corps troops immediately subordinate to that commander, serves as the staff signal officer.

The Signal Corps officer is a member of the staff of his commanding officer and is charged, under the direction of his commanding officer, with the command, so far as relates to training and operation, of the signal troops of that command not assigned or attached to subordinate units.

The Signal Corps troops attached to a unit serve as a direct agency of the commander of that unit, operating terminal facilities of his channels of communication to his superior officers in the next-higher echelon in the one direction and to his subordinate officers in the other direction. Over these channels are transmitted and received orders, reports and other messages — the term "message" including "all oral, written or pictorially presented official communications, orders, reports and instructions in plain language or encripted, except those transmitted by mail."

The execution of that duty involves the installation, maintenance and operation of all equipment necessary to its performance. This includes the setting up of message centers at all command posts and advanced command posts, the establishing and maintaining of the various channels — wire, radio, messenger — to the next lower units and furnishing local telephone service for agencies of the headquarters, provision for repair and maintenance facilities, and units to perform other specialized functions of the Signal Corps such as photographic and pigeon services.

The performance of these functions necessitates the assignment in the higher echelons of a number of specialized Signal Corps units. Within these units are some 150 categories of enlisted specialists and nearly sixty kinds of commissioned officer specialties.

Division Signal Company

As the division is the basic large unit of the combined arms, organized as a self-contained force capable of limited independent action, so the division signal company is a versatile, self-sufficient organization capable of supplying any radio, wire or visual communication need arising within the headquarters of the division to which it is assigned. The infantry division signal company is considered the basic field unit of the Signal Corps. One such company is an integral part of every infantry division.

A division signal company is administered by a Signal Corps captain. It operates under the direct supervision of the division signal officer however, who is a lieutenant colonel and who acts, among other things as the staff adviser to the major general commanding the division on all matters pertaining to communication.

A division signal company has three platoons. It also includes a division signal officer's section which operates the signal office and signal supply office of the division. Each platoon or principal section is commanded by a first or second lieutenant. In addition, each has a number of noncommissioned officers of various grades with specialist ratings such as chief radio operator, radio operator (high speed), and other categories.

The headquarters platoon consists of an administrative and mess section, which handles correspondence and records and provides mess facilities for the company, a repair and maintenance section, and a supply and transportation section which takes care of supply and operates the motor pool for the company.

The operations platoon is divided into three sections. Two of these sections specialize in radio and wire communication respectively. The third section operates the division message center.

The message center, located at the division headquarters command post, is the control point in the network which keeps the commander in touch both with the higher command of the Army and with the forward units under his control. It may be set up either at division headquarters or at an advanced CP at any point convenient to the headquarters and concealed from the enemy. All arriving messages, regardless of their origin or mode of transmission are filtered through the message center and sent by messenger to the appropriate officer of the division staff. At the message center the routing of all traffic is decided — whether an outgoing message shall be transmitted by radio, wire, messenger, or other means.

There is also a construction platoon, with a

platoon headquarters and two construction teams to lay necessary field wire lines to serve the various echelons of the headquarters.

The equipment of a division signal company includes peeps, jeeps, trucks and other transportation, assorted radio sets, telephone and telegraph equipment, and reels with many miles of wire. It also includes 158 carbines (.30 cal.); 55 Garand (M-1) rifles (.30 cal.); thirty-five M1928A1 submachine guns (.45 cal.); six Browning machine guns (.50 cal.); fifty-five M-7 grenade launchers; and six antitank rocket launchers (bazookas).

That's enough fire power to throw approximately 10,000 slugs per minute, sustained fire, apart from the rifle grenades, deadly at 150–200 yards, and the bazooka rockets with the devastating wallop of 105-mm. projectiles at short ranges.

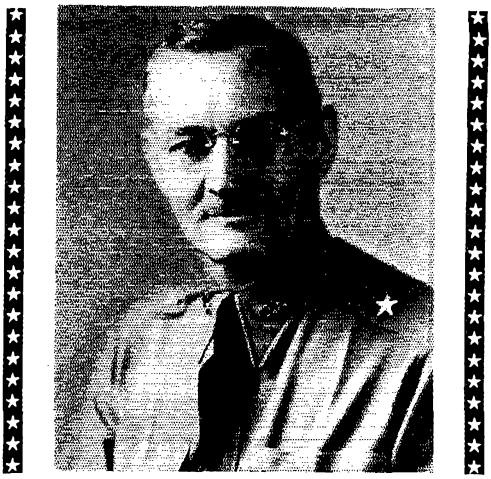
Higher Echelons

For communication between division headquarters and the corps, the next step in the chain of command, the responsibility rests with the commanding general of the corps. This is a basic principle; in general, installation, operation and maintenance of communication between two echelons is a function of the higher echelon. Communication between the corps and the army of which it is a part becomes the responsibility of the army commander. For communications between the field army headquarters and the theater headquarters or the General Staff in Washington, the responsibility rests in turn with GHQ or the War Department, acting through the Army Communications Service in OCSigO.

The Signal Corps troops attached to a corps are organized as a signal battalion. This is an integrated unit having approximately the same basic composition as the signal company, although on a larger scale. Where the signal company has a platoon, the signal battalion has a full company. Instead of sections of 20 or 30 men, the battalion has a full platoon. One reason for the greater strength of the corps signal battalion is that sections may be assigned from it to work with lower-echelon units.

At the army headquarters, in contrast to the comprehensive unified division signal companies and corps signal battalions, a number of separate units perform similar essential functions on a broader scale. A signal operations battalion is equivalent to the signal operations company of a corps signal battalion, proportionately enlarged, and so on. A separate signal service company at army headquarters supplies the needs of the greater number of Signal Corps personnel in that command.

In addition to these basic signal units found also at the level of the division and the corps, still other signal battalions and companies are attached to the higher echelons. They may be introduced at the level of the army or under the direct control of the commanding general in a major theater of operations, or they may be assigned to the commander of a special task force. Each commander of a unit above the corps has a



Major General William S. Rumbough is Chief Signal Officer, European Theater of Operations, serving on General Eisenhower's staff at SHAEFF. He joined the National Guard in 1916, transferring to the Army in 1917. He is a graduate of the Signal School, Command and General Staff School and Army War College.

number of special signal battalions and separate signal companies at his disposal for various specialized functions involved in coördinating the striking power of the army as a whole. The signal organization at a theater headquarters is too complicated and specialized for discussion here.

The higher the level of army organization, the more specialized become the Signal Corps units. The signal repair company, equipped with extensive testing equipment for determining obscure sources of trouble inside the circuits of a complex transmitter or receiver and materials and tools for repairs short of rebuilding may be found at this echelon. A signal depot company, prepared to replace or rebuild any type of equipment which may be seriously damaged for the signal repair companies to take care of, likewise is attached to an army as a whole. This depot is likewise prepared to keep the large volumes of wire, dry batteries, tape fuses, radio tubes, etc., used by the combat troops, as well as complete units of equipment to replace battle losses, moving to the divisions up front. Both of these latter units may be called on to furnish sections to operate at lower echelons.

The tactical signal officer of a corps will be a full colonel, with a lieutenant colonel commanding the signal battalion; in the field army the staff signal officer usually is a brigadier general, to whom commanders of the individual units report directly — which, in military language, means through a deputy or an executive officer.

Lower Echelons

Reversing direction to go back down the chain now, the division signal company, as the lowest echelon Signal Corps unit, has the duty of providing communication from division headquarters down to the command posts of the three regiments composing the division together with the auxiliary forces from other arms. Communications within

and below the regiment are, as previously explained, handled by special communication personnel within the regiment itself. Lower-echelon maintenance and repair may also be performed by regimental personnel, although recourse can be made to the Signal Corps when a radio set used within a forward echelon gets seriously out of order. Too, the equipment used by the lower echelons is supplied by Signal Corps units from supply dumps accessible within the combat zone.

Among his other duties, the division signal officer has the responsibility for supervising required in-service communication training of all communication personnel within smaller units.

The brigade, once the largest tactical unit containing only a single combat arm, no longer exists as a unit in the modern triangular (three regiment) infantry division, but it remains the largest basic unit of non-divisional artillery and cavalry.

From the communications standpoint the brigade may be considered as an enlarged regiment, in the same way as the corps signal battalion is essentially an expanded division signal company.

In the infantry division — on which this treatment is based — a regiment is usually a group of three infantry battalions — representing, at normal strength, about 860 men per battalion — to which are added (1) an antitank company for supplementary defense, (2) a service company to supply the innumerable needs of the combat troops in the regiment, (3) a medical detachment, and (4) a regimental headquarters company to handle administrative details — records, payroll, etc., (5) a cannon company to provide supporting fire with 105-mm. howitzers. The regimental headquarters is the centralizing and coördinating link between the battalion, which is the basic tactical and administrative unit of a single arm in the field, and the division — the basic command tactical unit of the combined arms.

Regimental communication functions are, therefore, principally those of relaying between higher and lower echelons in the command chain.

The regimental communication officer customarily has the rank of captain. His communication unit is a platoon having, in addition to a warrant officer, a master sergeant (the platoon communication chief), a technical sergeant (radio), two staff sergeants (message center and wire) and 43 technicians, privates first class and privates, or a T/O total of 49. Within the communication platoon are both c.w. operators and radio repairmen.

The infantry battalion, comprising three rifle companies, a heavy weapons company and a battalion headquarters detachment, is the basic tactical unit of the army. The smallest unit to have a separate headquarters organization distinct from the combat troops, the battalion is also a key communications center. A battalion commander therefore has a communication officer with the rank of first lieutenant on his administrative staff. The battalion headquarters detachment also includes a communication chief (technical sergeant), chief radio operator (technical sergeant), two staff sergeants (message center and wire) and 18 technicians, privates first class and privates.

Obviously, the communications requirements of a battalion command post are considerable. Both moderately long-range equipment to provide channels to higher echelons and short-range sets for intrabattalion work are required.

Communication at the company level, while of vital importance, is comparatively much simpler. The captain commanding the rifle company needs communications primarily in three directions: first, to battalion headquarters, to enable him to receive orders and transmit reports; second, to his individual platoon leaders; and third, to front-line scouts and reconnaissance details.

With all of these points direct voice conversations are employed. The company officer and enlisted men are their own operators; radio is used like the home telephone. Thus no specialist radio operators are required at the company level and, since it isn't very practicable to repair a set in a foxhole under fire, no maintenance work is performed. A single communication sergeant comprises the entire company; therefore, his job is to keep on hand enough equipment in operating condition for required needs — returning units that have become unserviceable, picking up replacements from battalion headquarters, and so on. Sound-powered telephones, assault wire and three messengers are found in the company.

Other Arms

The details of army organization as described in the foregoing are in terms of infantry. Similar organizations exist in the artillery and cavalry, although equipment and techniques often vary considerably. The terminology also is different.

Specifically, among purely combat units it is only in the infantry and armored command that the term "company" is used. The equivalent unit in the artillery is a battery; in the cavalry, a troop; and in the Air Forces, a flight.

Both infantry and artillery have battalions, but in the cavalry and in the Air Forces that echelon is occupied by a squadron.

The term regiment is common to all units except the Air Forces, where the comparable unit is called a "group," and the armored command, where no comparable unit exists.

Summary

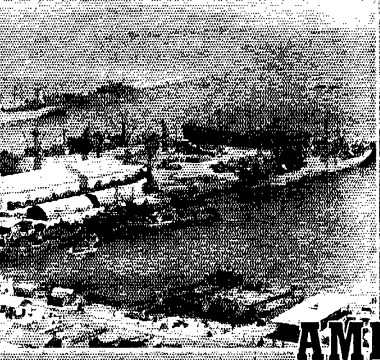
Summing up, the field army, corps and division are the "large" command or administrative units.

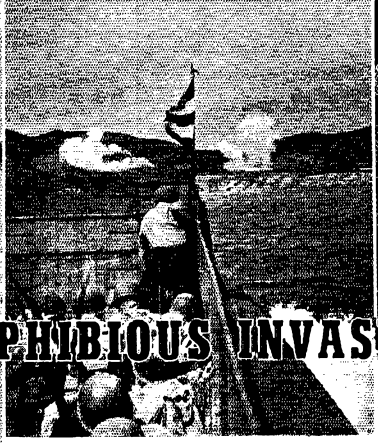
The corps and division are also tactical units, in that they combine within them components of the several different arms and services essential to meet all the requirements of combat, and include command, combat and service elements.

The regiment (group) is the largest tactical and administrative unit (except for an occasional brigade) made up exclusively of units of one service element.

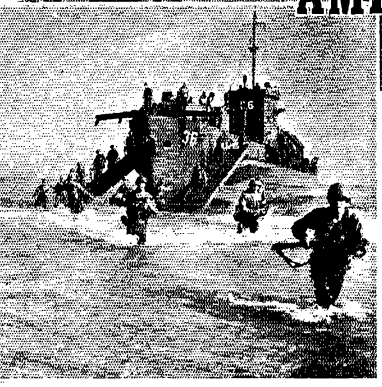
The battalion (squadron) is the basic tactical unit.

The company (battery, troop, flight) is capable of independent action, and is the smallest administrative unit.





AMPHIBIOUS INVASION



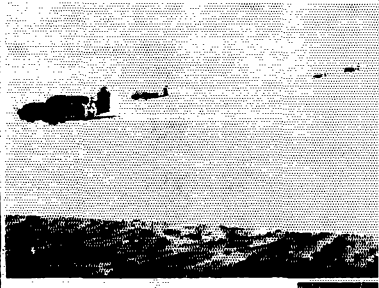
Successive stages of seaborne invasion, beginning (upper left) with a part of the invasion fleet assembled at its base — including a transport, freighter, gunboats and landing barge. Troops lounging on the steel deck at the upper right are aboard a Naval vessel racing toward a Jap-held island in the Admiralty Group.

Grounding on the enemy beach, LCIs and other craft disgorge loads of infantrymen and weapons. Center views show American assault troops with full equipment moving onto a beachhead on the Normandy coast of France on D-day. Half-tracs and a beached DUKW near shore indicate successful landings by the initial waves. As first troops wade ashore, numerous other craft awaiting landing orders jam the harbor in the background.

Tanks and other armored vehicles are landed along with the assault troops. At right a smoke screen partially conceals a long file of infantrymen moving into the interior, soon to be followed by the armor assembled on the beach. Communications equipment accompanies the assault waves. Further down on the right a photograph made in the Southwest Pacific theater shows an SCR-299 going ashore during the landing at Arawe in the New Britain campaign.

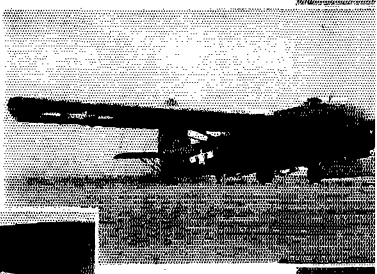
Once the beach commander reaches shore, radio nets are activated. At the bottom left a signalman uses a handie-talkie encased in a waterproof bag which does not interfere with talking or listening. The SCR-284 main beach regimental station shown in the center is operated from a semi-concealed position back from the beach. At bottom right an SCR-300 walkie-talkie, its gooseneck antenna curved upward, is being operated in a camouflaged beach position by a shore party commander.

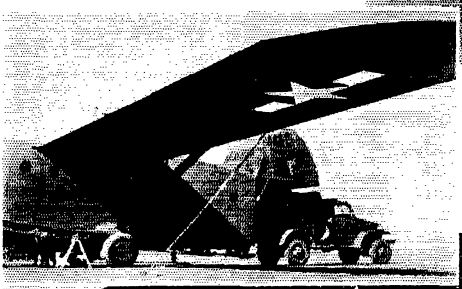
AIRBORNE INVASION



Above — Gliders towed by C-47s arrive over France. *Below* — The YCG-13, newest and largest Army glider.

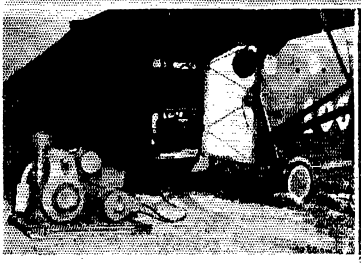
Airborne divisions — each with one regiment of paratroop infantry and two of glider troops, together with signal and other units — also play a major invasion role. Paratroop operations are shown along the left on this page; those of glider units at right. *U. S. AAF Photos* →

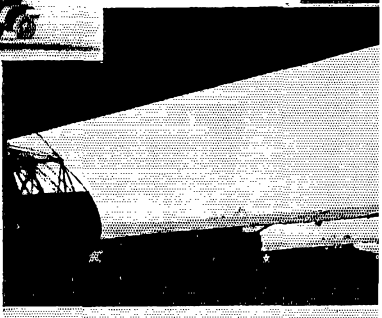




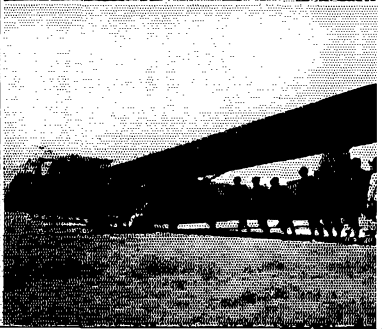
The four-ton YCG-13 can carry a medium truck (as pictured) or two jeeps with crews.

Above — As the fleets of C-47 troop carrier planes reach destinations in France, the jump master and crew chief push supplies in parapacks to the paratroopers landing below. *Bottom* — U. S. paratroopers advancing in Sicily after landing at Gela. *Bottom center* — A signal paratrooper with complete equipment — helmet, jump suit, boots, parachute, .45-cal. pistol, trench knife, machete, M-1 rifle, 200 rounds of ammunition, bayonet, six air-ground liaison panels, and SCR-511.





Above — An SCR-499 in operation in a CG-4A with PE-75 power unit on ground. *Right above* — CG-4A gliders correctly lined up for rapid unloading. *Right* — Unloading cases of .50-cal. ammunition from a glider which has just landed. *Bottom right* — Troops of an air-borne field artillery battalion boarding a glider for invasion maneuvers.



INVASION!

So much for the factual background. Now for a narrative picture of signal communication in action. From the General Staff to the army commander, and thence down the chain of command echelon by echelon, come orders — orders for the army to take the offensive against the enemy. That means, as the first operation, invasion.

In this war, in contrast to World War I when the closest approach to a "beachhead" experienced by American troops was most of France and American troops marched far inland through friendly territory before they met the enemy, the preliminary to every major U. S. offensive has been invasion operations. So far had the Germans and Japs progressed by the time our forces could achieve decisive strength that on each side of the world they have dominated the strategic land areas which Allied grand strategy required U. S. forces to attack and occupy.

The campaign begins with combined amphibious and airborne assaults upon the enemy-held shores selected as a landing objective.

Amphibious Invasion

Amphibious warfare imposes unprecedented demands on radio by its need for infallible communications in directing the invading forces and maintaining the chain of command.

The undertaking of landing thousands of men on a hostile shore and providing them with the necessary supplies and support calls for absolute coördination of all movement. It is imperative that the commanders be equipped with the communication channels necessary to obtain all information required to make prompt and firm decisions in those crucial moments which spell success or rout for the invading force.

Amphibious invasion is a complex enterprise and every detail must be exactly planned. The army signal officer has realized that successful performance on the part of the signal troops assigned to such a mission required long hours of study and many more hours of painstaking and tedious rehearsals. Recognizing the necessity for schooling both officers and enlisted men in the specialized techniques employed, he established amphibious communication schools teaching not only radio procedure and tactics but also the art of loading communication equipment and personnel on transports and cargo vessels. The moving of troops and supplies ashore and the establishment of successful beachheads are also subjects of intensive study.

Finally D-day approaches. The invasion troops are assigned to vessels at several ports. On D minus 1 the troops embark for the designated landing point. In spite of all efforts to maintain secrecy, the huge armada may be under intermittent enemy aerial and naval attack throughout the journey. When the heavily laden transports near the enemy shore, dive bombers, medium bombers and torpedo boats may appear to dare the protective fire of escorting naval warships and friendly fighter cover.

Their effect is felt long before the slow-moving transports reach the shore. When the pre-dawn H-hour approaches and the amphibious task force nears its objective, the enemy's coastal guns may serve notice that the attack is not unexpected.

Our own supporting forces have not been idle, however, nor are they silent now. As the invasion armada approaches its objective, ready to disgorge its cargoes of men and munitions into landing craft, the terrific fleet bombardment of the enemy shoreline strengthens. Low-flying Allied bombers and strafing fighters sweep defensive works in the landing zone. Other planes fringe the beach with a protective smoke screen.

Concealed by this screen, leading invasion craft jam onto the beach — for according to American tactics the last thousand yards are navigated at full throttle after mine-free lanes have been opened. Allied troops spring into the sea from craft that ground offshore for the beach assault. As they plunge doggedly through the boiling surf the chattering fire of covering machine guns blends with mortar and shell fire and the sharp reports of enemy rifles.

The first wave of assault troops hits the beach and fans out seeking cover. A second wave quickly follows up their thrust, striking hard at enemy positions as they are disclosed. Every step holds the imminence of sudden death.

Close on the heels of the initial assault waves follow the first Signal Corps units. Each carrying a full hundred pounds of equipment on his back they splash their way to shore. Pausing on the sand, they lay down their waterproofed radio and other equipment to begin setting up communication channels over which the shore-party commander directs the later waves of support troops and the landing of tons of supplies.

Hastily the battle-helmeted signal troops seek out strategically located positions. Radio silence is lifted, and thereafter the network embracing all land, sea and air groups supplied by the Signal Corps soldiers and their Navy counterparts who landed under fire and fought their way up the enemy's beaches to the heart of the action, becomes a decisive factor in the successful accomplishment of the operation.

The task-force commander from his station on the command vessel, still offshore, gets his first reports of the action ashore over his command net, which may use the SCR-177, 193, 299, 399, or one of the larger v.h.f. sets.

During the first phase of the landing operation communication is needed only over a limited area. Comprehensive reports and observations from all elements pour steadily into the commanders' pool of information, so that all trends can be quickly discerned and prompt advantage taken of any signs of enemy weakness.

This portion of the amphibious communications job is handled primarily by the low-powered short-range miniatures — the guidon set and the handie-talkie — and the smaller f.m. portable units, such as the SCR-300.

Accompanying each infantry assault battalion is a fire-control shore party containing one naval

gunnery officer, an army artillery officer and five enlisted army technicians landing in LCVs. These parties go ashore carrying portable a.m. SCR-694s and 536s which are set up on the beach. The crews direct and observe the fire of the big naval guns pouring in supporting barrages. Other fire-control parties from the division, with SCR-193 and SCR-284 or 694 mobile units in jeeps, accompany the invasion troops inland to be at hand to direct the artillery's fire when it lands.

Other short-range mobile units are used to maintain communication with the tactical air support. These units are in constant contact with Air Force headquarters, enabling the ground forces to call for tactical air support by bombers and strafing planes wherever it is needed.

Airborne Landings

While all this is going on the simultaneous airborne phase of the invasion is actively in progress. Shortly before midnight, at a distant Allied air base tense paratroopers file into a long row of C-47 troop-carrier transports.

Each paratrooper's equipment is carefully checked by the jumpmaster before he steps aboard the plane — parachute, carbine, maps, emergency rations, and other smaller equipment bulging the reinforced pockets of his jump suit.

At the same time other files of airborne troops march at double time through the broad entranceways of the CG-4A gliders silently poised along the airstrip in staggered rows. Simultaneously, freight-carrying gliders are loaded with the final articles of cargo by ground crews. Fully loaded, every glider holds fifteen men, a jeep, or a 75-mm. gun — and one contains an SCR-499.

One by one the C-47s take off and the glider crews are airborne. Soon they are over enemy territory. Less than an hour later hordes of paratroops drop from the sky at strategic points behind the invasion beachhead. Dropping with them are the varicolored parachutes carrying their weapons, radio equipment, rations and other gear.

Assembling in units according to carefully worked out plans, the paratroopers set out upon their assignments. In each unit are airborne communication specialists carrying guidon radios and handie-talkies. One unit has the task of capturing a heavy artillery gun emplacement. Another will blow up a strategically located bridge, while still others will have descended on or near enemy air fields which had previously been subjected to intensive preliminary bombing and strafing by American aircraft.

Meanwhile the glider trains are loosed. Streaming through the inky sky the powerless aircraft find safe landing spots almost anywhere — on fields, roads, even on small bodies of water.

Accompanying the airborne units are communication and signal troops with short- and medium-range radio equipment. They proceed to establish communication nets much the same as those of their earth-bound comrades — first, short range radio nets; next, a command-post message center; and, finally, a long-range radio station for direct contact with the task-force commander. The heavy SCR-499 a.m. equipment for this station, almost identical with the mobile radio unit controlling the troops on the beach, is also landed by a large freight-carrying glider.

Consolidation

At dawn the regimental commanders come ashore to consolidate the beach into regimental units, the beach commander having by then established local security for the shore party and started in motion the vital flow of stores and supplies needed to keep the assault troops moving. Reinforcement troops are landed and the drive pushes vigorously forward.

The beach is a scene of wild confusion. Jeeps dash one way; heavy trucks haul supplies another; reinforcements move up; bulldozers grade down layers of sand; heavy guns, tanks, columns of armored cars, half-tracs, jeeps, trucks and other vehicles, as well as tons of ammunition and food, pour from landing craft of every description. . . . It seems incredible that every activity is under coördinated command. Yet it is — and mostly through radio. This alone makes possible the unified control indispensable in the successful landing of an amphibious force.

The most critical time in the entire operation is the first 12-hour period after the landing. Throughout that day the invading force battles fiercely to extend the narrow strip of sand and rock it has won. Signal troops and the lower-echelon communication men sweat it out at their posts until it becomes their turn to move warily ahead with the advance. Despite continuous dive-bombing, strafing, and mines and artillery fire they keep the radio nets in operation — uniting advance elements, command posts, shore depots, offshore convoys — every part of the action.

As depth is gained by the invading forces and the invasion battle enters its second phase, more powerful high-frequency a.m. radio transmitters are brought into use, replacing the shorter-range

Examples of ground radio station units supplied by the Signal Corps and currently employed in the field.

portable or mobile f.m. units which served as a channel of command during the first landing phase. Division and corps headquarters are transferred to shore as soon as possible. The signal communication system begins to develop into a complete land-based command system. Light rubber-covered assault wire, useful over distances up to five miles, has been laid for telephone lines running inland to the command posts of the various assault battalions from the higher-echelon headquarters, or from terminal points on the beach, linked to the higher headquarters by radio. These lines unburden the radio circuits, but radio is still employed wherever wire has not yet gone into service.

Hour by hour the enemy is pushed still farther back, and soon the second invasion phase is ended. Sufficient penetration is attained to require the installation of regular operational communication channels. Divisional and corps headquarters are moved forward. Assault wire used by battalions and regiments is replaced with regular field wire on poles and by Spiral-4. The army headquarters is brought ashore and an army message center is established, completing the comprehensive communication network linking all elements of the command.

Land Battle

Now once more in its accustomed rôle of a wholly land-based force, the bloodied beach over which it came ashore now the terminus for relays of supply-laden transports, the invasion army presses its advance into the interior.

As it advances, it encounters opposition. Resistance is light, at first — chiefly minor clashes between reconnaissance patrols. The enemy's shallow coastal defenses having been pierced, he is gathering his strength inland.

The army commander knows that soon enemy troop concentrations will be encountered, either as mobile counterattacking forces or entrenched in defense works at a strategic point. That is the situation depicted on pages 30–31. Around and in a city lying athwart the advance, a strong enemy force has established itself.

Why they are there we do not know — nor do we need to know. The tactics of the situation aren't important. Our purpose is not to depict any particular battle, or the reasons for it, or its outcome; it is simply to illustrate in generalized form the organization and functioning of military radio by suggesting a purely imaginary and somewhat idealized problem.

To make the arrangement of the signal communication network intelligible, it is necessary first to analyze the situation as a whole. Diagrammatically, from the chain of command viewpoint, the chart is shaped like a funnel, with the larger end at the left. That is where the field army headquarters is located — just off the page. Within the left-hand margin, snugly bivouacked under the outflung limb of the spreading chestnut tree, is II Corps headquarters. The Second Corps is one of the three corps which constitute the army, each of which in our assumed situation is responsible for about a ten-mile front.

By order of the lieutenant general who is the corps commander, the *n*th division crossed the river two nights before over a pontoon bridge provided by the combat engineers to replace the bombed-out road bridge up the stream. There a bivouac area was established, outposts detailed, and the troops dug in for the night. The 105-mm. and 75-mm. howitzer batteries of the division artillery selected positions and began building up ammunition dumps.

The next day staff officers pondered data accumulated from preliminary reconnaissance. Especially selected patrols were briefed concerning the detailed reconnaissance they were to perform early that evening. The platoon and section leaders assigned special missions ran off rehearsals with the communication men who were to coördinate their activities.

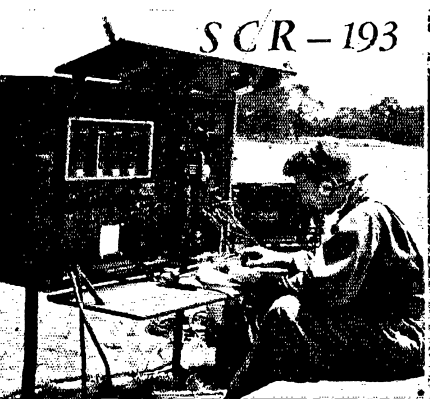
By dusk all battalion and company commanders were acquainted with the general tactical plan. At 2100, with the night pitch dark and moonrise two hours away, vehicles were taken from cover and the troops entrucked. Following a carefully worked out schedule, each regiment moved to the assembly area.

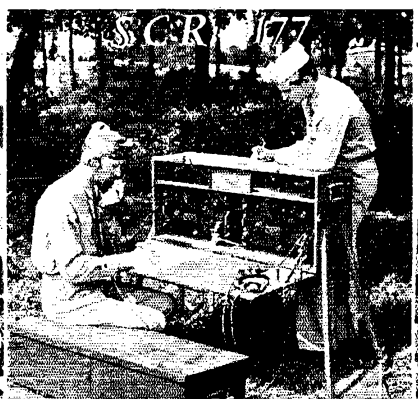
The central regiment, the 73rd Infantry, moved up to a point just over the brow of the ridge bordering the river valley. There its headquarters company halted and the regimental command post was established. The three infantry battalions and the regimental AT (antitank) company continued across rolling fields. Moonglow was filling the sky when the 3rd battalion pulled up at the selected point for battalion CP.

Meanwhile, things had been happening over in the enemy's country. At irregular intervals waves of medium bombers from the bomber group bases of the tactical air force which is assigned to the theater continued the air "preparation" which had been going on all that day and for

(Continued on page 98)

Generalized technical data and tactical employment of each type of equipment are discussed in the text.

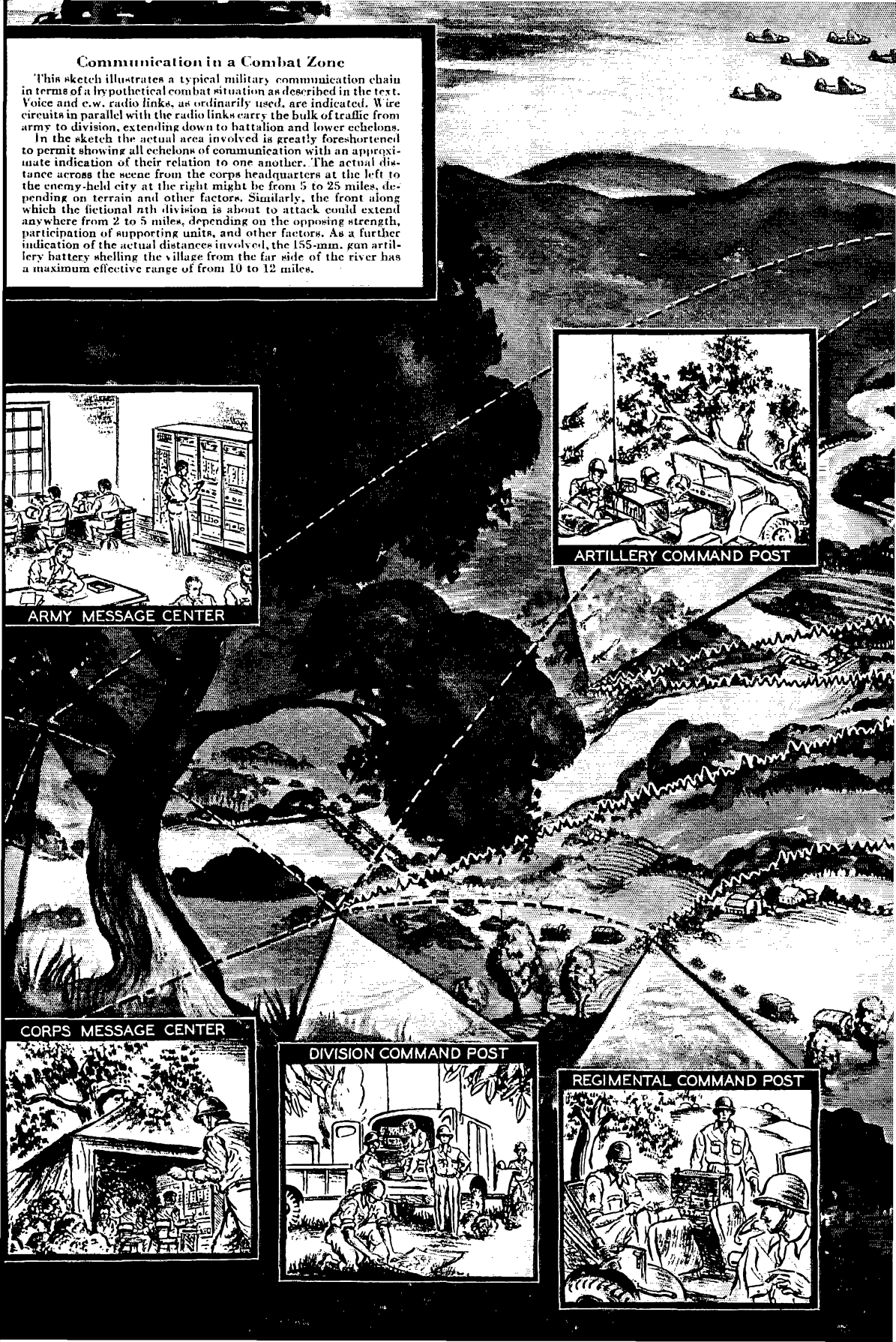


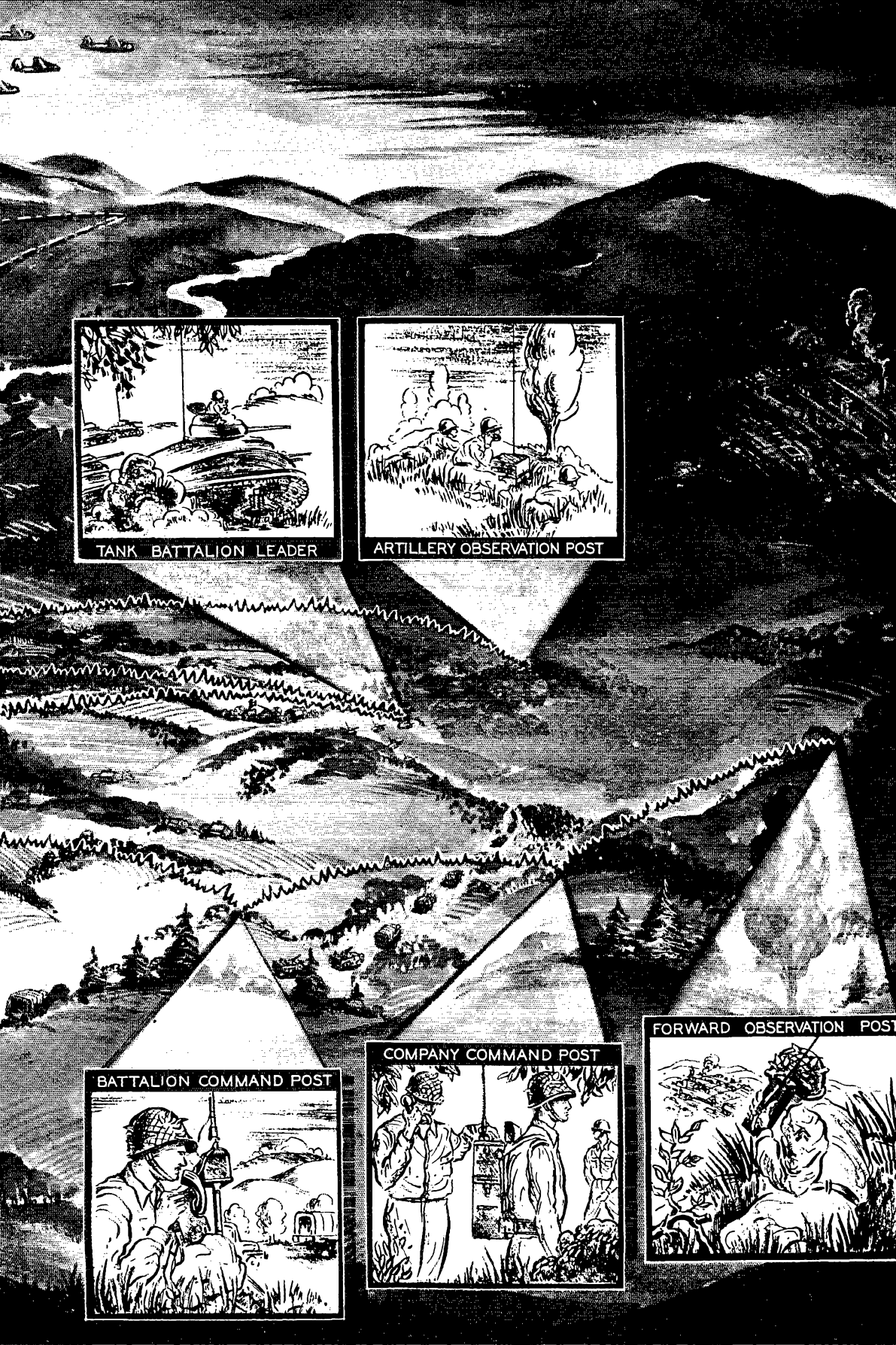


Communication in a Combat Zone

This sketch illustrates a typical military communication chain in terms of a hypothetical combat situation as described in the text. Voice and c.w. radio links, as ordinarily used, are indicated. Wire circuits in parallel with the radio links carry the bulk of traffic from army to division, extending down to battalion and lower echelons.

In the sketch the actual area involved is greatly foreshortened to permit showing all echelons of communication with an approximate indication of their relation to one another. The actual distance across the scene from the corps headquarters at the left to the enemy-held city at the right might be from 5 to 25 miles, depending on terrain and other factors. Similarly, the front along which the fictional nth division is about to attack could extend anywhere from 2 to 5 miles, depending on the opposing strength, participation of supporting units, and other factors. As a further indication of the actual distances involved, the 155-mm. gun artillery battery shelling the village from the far side of the river has a maximum effective range of from 10 to 12 miles.




TANK BATTALION LEADER
ARTILLERY OBSERVATION POST
BATTALION COMMAND POST
COMPANY COMMAND POST
FORWARD OBSERVATION POST

Signal Corps Engineering Benefits the Amateur

MANY an epigram has been devised on warfare. To suit a purpose of the moment, the elementals of war have been at various times reduced to terms. It has been said, for instance, that "War is logistics." The best such reduction may be that given by the Assistant Chief Signal Officer of the Army — Major General James A. Code. He said: "The essentials of war are firepower, transportation and communications; hence, warfare is engineering."

Engineering was first conceived as "the art of making and using military engines or military works." Today it is "the art and science by which the properties of nature are made useful to man in structures, machines and manufactured products." Still, the General emphasized, warfare is engineering.

The engineering work of the Signal Corps includes not only the application of old and accepted principles of engineering but also the elucidation of new scientific principles evolved from original, creative, pioneering research.

The engineering of the Signal Corps is pioneering. It is determining new trails, avoiding the assumptions and limitations placed on ancient principles — mechanics, wave theory, and ballistics. Progress has changed from a slow evolutionary past to a revolutionary dynamic present.

"The Signal Corps works with methods and techniques which have been discovered within the memory of this generation," General Code asserted. "Some, in fact, were discovered or applied by men working within or for the Signal Corps itself. Even now we are continually expanding neglected variations of old principles as well as finding new applications for them."

The dynamic Assistant Chief Signal Officer, who himself has fostered the foraging spirit of experimentation which characterizes the Signal Corps, supported these assertions by pointing to the Signal Corps' modern worldwide radio and wire telephone, telegraph, teletypewriter and telephoto networks, in comparison to the state of the art less than 100 years ago, when signaling comprised flags and torches.

An Interview with Major General James A. Code, Assistant Chief Signal Officer

The Battle of the Laboratories

"Even in time of war, the Signal Corps builds; it doesn't destroy. It fights on the frontiers of science. I don't mean that our men are not out there in foxholes and mud, or threading through barbwire, or matching wits with snipers in front lines, or that they are away from devastating shell fire. The Signal Corps does help win beachheads and takes its part in engagements and battles on all fronts.

"But our greatest battles are fought and won in quiet here at home in laboratories. It is here that powerful new weapons of communication are developed, counter weapons devised, which give our troops their advantage over the enemy. When I say *new* weapons, I mean just that — for they are *new*.

"Do you realize that about the only actually *new* weapons so far employed in this war are those involving electronics? Why, even the rocket bombs are ten times older in their origin than the telephone, and are one of the oldest military weapons; they were used by the Chinese more than 700 years ago.

"The development of these new weapons I speak of is a potent blow for victory. These new electronic instruments represent further exploration of engineering principles — original concepts which outstrip the enemy far more decisively than any advantage to be gained by improvement of old equipment in size or strength alone. When we uncover a wholly new scientific technique and put that to work against the enemy, he must either discover our secret or work out some alternative method of his own. In either case, we have gained a significant advantage — if only in time, a great ally."

The Signal Corps and Science

When asked whether he had any specific equipments in mind, General Code replied: "You would not be permitted to write about them now, anyway — not the most vital and important ones, at least."

He knew there was no need to mention actual examples to prove his point. The record of the war shows that there is no field of military endeavor in which American inventive genius has made more significant contributions than in radio communication. New ideas and devices have multipled until today, as General Code intimated, our forces are benefiting from the availability of an increasing number of amazing electronic devices. These

(Continued on page 120)

TECHNOLOGICAL research and development in this war have provided the U. S. armed forces with the world's finest military communications and electronic equipment. For its part in that achievement, the engineering establishment of the Signal Corps rates a high order of credit.

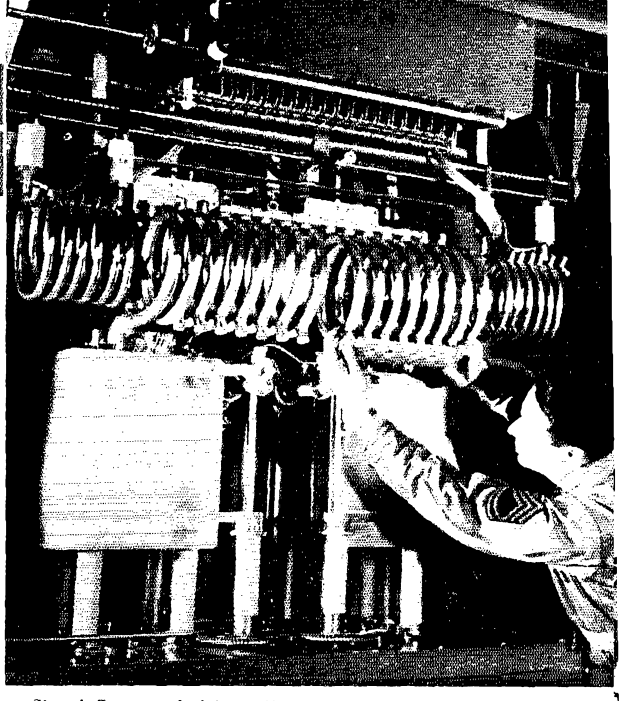
That establishment is a complex one, since most of the component offices in the Office of the Chief Signal Officer have relationship in one way or another with engineering matters. The Engineering and Technical Service, under Major General Roger B. Colton directs research and development in connection with all U. S. Army communications equipment employed in the field. The Communications Engineering Branch of the Army Communications Service, under Lt. Col. Vernon B. Bagnall, is charged with the advance planning and general engineering of all fixed radio and wire networks of the Army. The Operational Research Branch of the Plans and Operations Division, under Dr. W. L. Everitt, serves as a glorified firm of consulting engineers and analysts to the Chief Signal Officer and the operating services and divisions. These agencies will be considered in turn.

In addition, two special advisory groups appointed by the Chief Signal Officer perform engineering functions. The Signal Corps Board initiates and submits recommendations for the improvement of Signal Corps operations and equipment. The Board, located at Fort Monmouth, conducts tests of existing commercial equipment and during development or production of new equipment. The Signal Corps Technical Committee is organized to effect coördination between the interested arms and services during the development and standardization of types of equipment and the preparation and coördination of specifications.

Engineering & Technical Service

The Engineering and Technical Service is responsible for the research, development and standardization of communication and other electronic equipment employed by combat elements of the AAF, AGF and ASF. It evaluates military characteristics, arranges engineering and service tests, provides expert consultant service and loans technical personnel to other operating services. It is also responsible for the essential elements of specification preparation and revision, improvement and refinement of equipment, establishment of quality control standards, standardization of component parts, and establishment of maintenance policies.

That's rather formidable language. The easiest way to translate it into an understandable picture will be to follow a typical item of equipment through all the various stages of development, testing, standardization and procurement.



Signal Corps technician adjusting the final-amplifier tank assembly of a 15-kw. transmitter operated by the 822nd Fixed Signal Radio Station Company, near Fort Monmouth, N. J. The worm-gear assembly at the bottom varies the coupling between the tank inductance and the antenna tuning unit (not shown in the photograph).

To start with, it must be understood that the Signal Corps does not attempt to perform all of its own development work. While the Signal Corps laboratories maintain a development and design staff which supervises development work done by industrial concerns, the policy is to utilize to the utmost the research facilities of private industry.

Another point to be borne in mind is that the Army is only one of the armed services, and its needs must be tied in and coördinated with the requirements of the Navy, the merchant marine, and with the requirements of Lend-Lease. The Navy, of course, also does extensive development work, and the Signal Corps maintains close liaison so that advances made by either development group become available to the other.

Still a third point is that the Signal Corps labs don't merely decide on their own that they'd like to build something and then go ahead and build it. Whenever the AAF, AGF or ASF find need for a particular type of electronic equipment for which no suitable design exists, the service concerned decides on the general nature of its need and makes application for development by the Signal Corps of equipment to meet it.

The first step in the development of a new item of equipment begins with a set of "military characteristics." These are a statement of the military purpose for which the new set is required and the conditions under which it is expected to operate. MCs usually start by giving a general description of the item desired, with particular emphasis on the proposed use. Severe restrictions are usually imposed — maximum allowable weight,

size and shape, antenna length, necessary range, power source (or minimum acceptable battery life), and means of transportation. Often seemingly impossible or contradictory requirements are established. Finally, the accessories and other special features are described. No technical specifications are given and the designer is given no hint as to how to accomplish the required result. Many an engineer face to face for the first time with a set of military characteristics has wished he had chosen another profession!

While military characteristics usually are formulated by the service test board of the combat arm seeking the unit, according to Army regulations anyone may initiate military characteristics. It may happen, therefore, that the basic idea, if not the formal MCs, will be presented originally by a staff consultant in OCSigO, possibly at the suggestion of an engineer with a commercial manufacturer, or by a Signal Corps laboratory worker — or even by an operator in the field or a communication sergeant.

A Walkie-Talkie Story

Well, something like that happened in the example about to be described. Did you ever hear it? The story of how the original walkie-talkie came to be developed? It's quite a yarn.

The hero, as might be expected, was a ham — a sergeant in the field artillery. Veterans of World War I may remember that in those days communication from the front lines to the rear was over telephone lines — and whenever the going got rough these lines invariably were knocked out by enemy fire. Thereafter "communication" was by runner. The endurance of artillery runners became legendary; but endurance was not enough. Instant communication between the infantry's front line trenches and the supporting artillery batteries was needed to put a barrage on exactly the right spot at the right time.

Not for more than twelve years was the solution to this problem found. It happened then only because this unsung artillery sergeant was a reader of *QST*.

Along about 1932 he came upon a description of one of Ross Hull's midget 5-meter transceivers. Perhaps it was after a particularly hot spell of running; anyway, this sergeant-ham had an inspiration. If only he had a pair of these little 5-meter jobs, they would be just the answer!

With the aid of the few tools he had available, using parts bought with money out of his own pocket, the sergeant contrived a pair of rather haywire duplicates of Hull's transceiver. The sets were demonstrated — and worked. From the results of these early experiments, his superior officers had the foresight to realize that in this new development lay the solution of the artillery's traditional problem.

A set of military characteristics was prepared and a development project established at the Fort Monmouth Laboratories. The sergeant's models were carefully examined by Signal Corps engineers who set about eliminating inherent faults and redesigning the set for mass production. Two groups of models were constructed and given rigorous service tests. Finally a satisfactory design was achieved, manufacturing drawings and specifications were prepared, contracts were let, the designation SCR-194 was assigned, production began — and soon the arduous days of the old-time artillery runners were over.

So far as the artillery was concerned, the 194 was simply a small portable transmitter over which an artillery observer could report fire corrections to his battery from an advanced observation post. It was a substitute for the observer's telephone — minus the hazard of having the wire cut by shell-fire. It never occurred to them that it could be used as a human mobile unit.

Then one day a soldier hurrying back to camp didn't bother to put the set down before turning on the switch. It was then he discovered the set would operate just as well while he was carrying it on his back as when it was on the ground. Somehow a report of this simple but portentous event filtered up to the Chief Signal Officer. Laboratory tests of the new procedure were conducted, and as a result the infantry asked for — and got — the SCR-195. The 195 was the SCR-194 modified for a different frequency band and arranged for operation while in motion.

Thus was born the walkie-talkie. There followed intensive efforts to lighten the 40-pound burden on the operator's back. In time a lighter and more compact transceiver weighing 28 pounds emerged, a rugged, versatile set carried by a soldier in a canvas bag on his back, the collapsible antenna projecting over his head, while he walked along with a breast mike and headphones.

It was still a transceiver, however — and a 1932 model, at that. Its defects were many. The long antenna was unwieldy when extended and inefficient retracted; the oscillator was unstable, and the superregenerative detector re-radiated so badly as to make netting impossible. Still, the Army had the sets; it was peacetime, and for maneuvers they served well enough.

Then suddenly it was war. The artillery, which never did have much use for the talking-while-walking idea, got itself a vastly improved crystal-controlled f.m. job in a square metal box to replace the now distinctly obsolete SCR-194.

As for the infantry — well, that's where the second chapter of the story begins.

The Infantry's MCs

The infantry wanted a new set, too — but a walkie-talkie, not just another portable. The old 195 no longer would get by; they wanted something better — if they could get it.

Within the infantry there is a board of officers whose job it is to translate any such desire for modified or new equipment, expressed from the field, into a statement of required military characteristics. As stated before, MCs merely describe the performance of an "ideal" set. It's up to the engineers to interpret these general terms to the nearest technical approximation.

The infantry board's MCs in the matter of a new walkie-talkie came through as a single-page

document asking — roughly — for a small backpack unit weighing not over 25 pounds warranted to give strong, readable signals up to, say, three miles. There may have been some mention about the number of channels required, but as to whether a.m. or f.m., how many tubes, superhet or superregen, crystal or no — such details were left to the Signal Corps.

The document drawn, it was given a hopeful pat and sent on its long road — "through channels." Up from the infantry board to Hq. AGF. From Hq. AGF to Hq. ASF. From Hq. ASF to OCSigO. From OCSigO via Engineering & Technical Service, through Ground Signal Equipment Branch to the lab destined to inherit the job — in this case, the Camp Coles Signal Laboratory.

The lab's job in such a case is to figure out, first, what should be done, and second, what can be done. Engineers analyze the MCs, decide which specifications are feasible and which, being mutually incompatible, must be compromised. A study is made to determine the nature of the research or development work involved, and the coördination, if any, which can be effected with similar equipment currently under development for or in use in other services. The lab estimates the time required to work out a design, what the expense is likely to be, how much completed units will cost. In some cases a completely new development may not be required, relatively minor alteration of existing equipment being sufficient. If such changes seem desirable from a technical standpoint, the laboratory next considers the effect on production. It may be possible to incorporate the improvement with relatively little difficulty. If not, the change is either postponed for application to future models or filed for reference when a complete redesign becomes desirable.

Getting back to the infantry's walkie-talkie, the engineers took the original MCs and worked up the necessary technical data, translating the broadly phrased service specifications into more or less exact engineering requirements. To this they added a statement of engineering tests that would be applied to the test model to establish conformity with the specifications.

These estimates and accompanying comments then travel, channel by channel, up to the Signal Corps Technical Committee. If this committee decides that the lab engineers know what they're talking about (and they usually do), the report is passed along to Hq. ASF.

If the equipment required is found sufficiently essential to warrant development and the work can be completed within a reasonable period, the Commanding General, ASF, then sends a directive to the Chief Signal Officer who in turn instructs Ground Signal to proceed. Funds are allotted, and the laboratory is instructed to go ahead with the experimental work.

Then comes the question of who is to do the work. The laboratory may conduct the research itself. In wartime, however, with so many projects requiring development, as much of the work as possible is farmed out. For projects requiring considerable original research, the most suitable facilities are selected. As soon as possible, development by NDRC or a commercial laboratory or manufacturer is started.

The course chosen depends upon which offers the greatest advantages as to speed of development and delivery of production quantities to the ultimate user. As a general rule, the development is done by an industrial organization under contract to the Signal Corps, following a policy of utilizing to the greatest extent the research and inventive facilities of American industry. Usually the project will be assigned to a reliable commercial organization which may be expected to have adequate manufacturing capabilities and thus be a potential source of supply once the development has been completed.

Several manufacturers may have been informed of the project, each of whom may have different proposals for a plan of attack. Selecting those most interested and/or qualified, the lab farms out the research work on the basis of what is called a development contract.

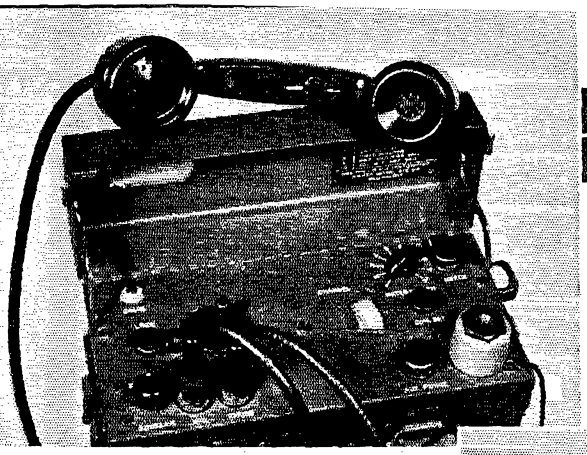
Development Contract

Development contracts are so drawn that the manufacturer will be compensated for his expenditure whether or not he is ever awarded a contract for actual production of the equipment. This form of contract is used because in many cases it is difficult if not impossible for bids to be either prepared or accepted on a basis that will provide an accurate estimate of the manufacturing costs. For this reason, in common with all contracts issued by the War Department, those entered into by the Signal Corps are subject to price renegotiation to forestall excessive profits. More than one development contract may be issued on the same project, the best of the several competing designs then being chosen by coördinating officers of the branches concerned.

On or before a designated date each development contractor will (or should have) completed his research. Experimental model in hand, all show up at the lab to submit their models for test. Each model is carefully tested following a prescribed routine. If any one test model delivers outstandingly superior performance, the remaining manufacturers are politely handed their hats with the suggestion that their visit is over — for this time.

As for the complacent winner, his joy may be short-lived. He may be told that his set, although better than the others, still is one-third lemon and needs a lot more work on it to make it acceptable. Renouncing futile argument (the government is paying the bill anyway, isn't it?) he returns home, model under his arm. His engineers listen patiently to the good news, sigh — and then start work on the alterations and refinements.

The next stage is what is called a service test order — a contract calling for the construction of several additional models incorporating the improvements recommended as a result of the first test. After a "pre-service" test of these models at



MIGHTY

Mighty proud is the Signal Corps of the robust babies of its stalwart radio family pictured on these pages.

Left — Panel view of the SCR-300, the fabulous 18-tube f.m. walkie-talkie which almost daily takes on new assignments and always seems to deliver. Delivering 1 watt to the antenna, its normal range is 3 to 5 miles. Crystal-stabilized tunable oscillators in both transmitter and receiver sections combine flexibility with a high order of frequency stability. *Below* — Rear view showing the special carrying harness designed to distribute its 35 lbs. of weight more evenly on the operator's shoulders.

the laboratory they are turned over to the using arm and given a thorough field test to determine how well they satisfy the original requirement.

As a result of these tests, the models may be either approved, disapproved, or approved with exceptions. The latter result is probably the most frequent. Assuming, however, that the service test samples live up to the claims made for them, a nice report is prepared ending up with the significant words "recommended for adoption."

In the case of the new walkie-talkie, some four or five manufacturers received development contracts. Each worked out a design and completed a preliminary model. (All but one, incidentally, chose a.m. against f.m. On that point the lab had passed the buck to the manufacturers; it made no stipulation, either.) The one f.m. entry — submitted by Galvin — became the SCR-300 (we might as well call it that now; the official name and number were assigned at an earlier stage in the process called "nomenclature"). The first test model delivered came closer to meeting the actual MCs than even Signal Corps engineers had thought possible.

The Signal Corps Technical Committee officially uttered the final words confirming adoption of the SCR-300, doing so when it had received official affirmatives from both AGF and ASF.

For the laboratory, the concluding part of the development phase was the preparation of exact production specifications, parts lists, maintenance lists and the like.

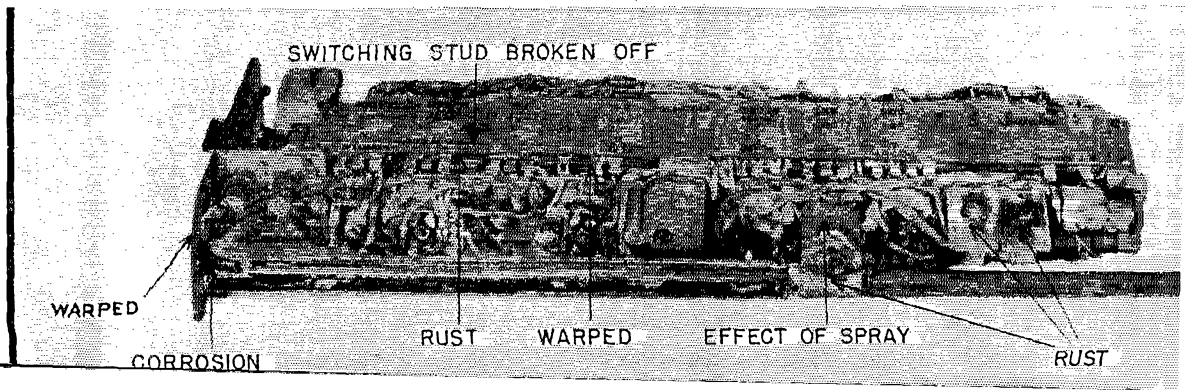
Once a design receives final approval from the engineering standpoint, the procurement cycle begins. In the course of several additional tours up, down and around the "channels," somewhere along the line ASF and AGF get together and decide what the set is good for, who actually will use it and where, how many of each unit will be required, when delivery is to begin.

Matters remain in the hands of Engineering & Technical Service until final approval of development and experimental models; they are under Procurement & Distribution thereafter. Even when manufacture gets under way and sets are delivered to the troops in the field, they still remain the Signal Corps' to supply, issue, maintain — and improve.

Production and Evolution

In the case of the SCR-300, the normal prewar development period was shortened by mutual efforts to cut red tape. Hq. AGF was becoming increasingly impatient in its need for the set, and in consequence helped speed each stage along. For example, forewarned AGF officers were on hand at the labs when the first test model was received. They witnessed the tests, satisfied themselves that the set was what they wanted, and then and there gave an informal "go ahead."

The Signal Corps Laboratory engineering-record photograph below illustrates the thorough-going ability to take abuse any radio equipment bearing the SCR designation must possess. This handie-talkie chassis was subjected to three weeks' simulated tropical exposure, without cover, and sprayed with antimold fungicide. Labels show effects.



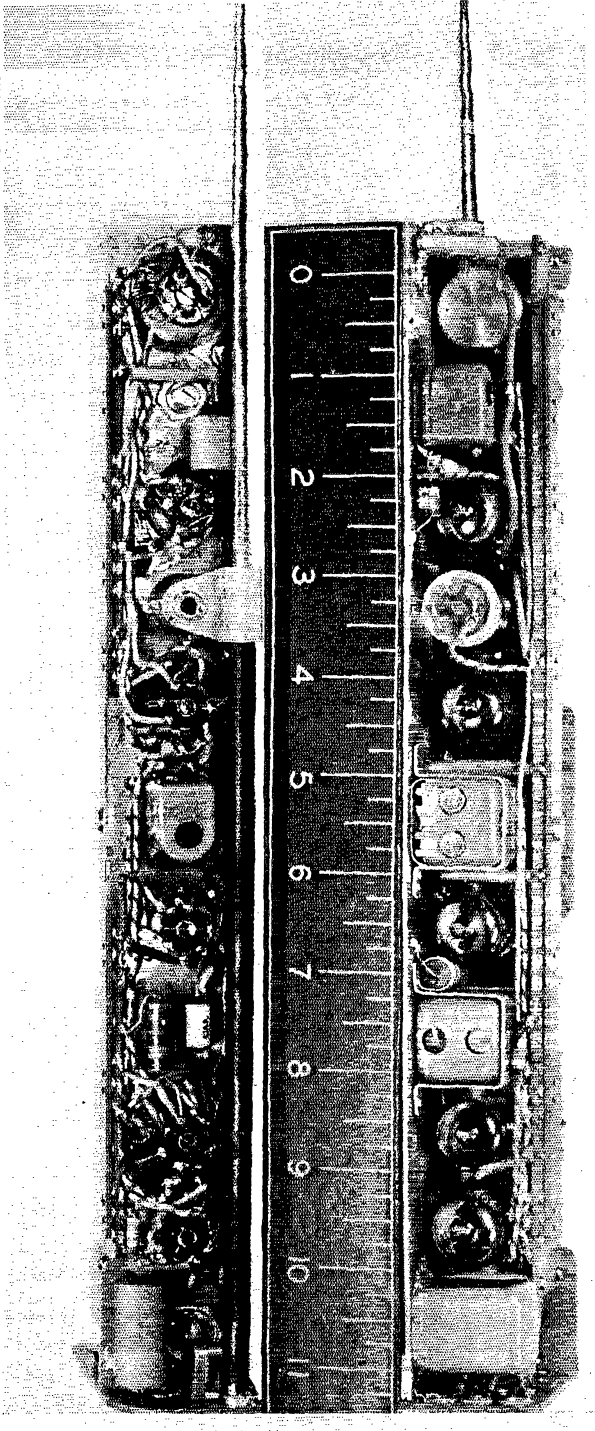
MIDGETS

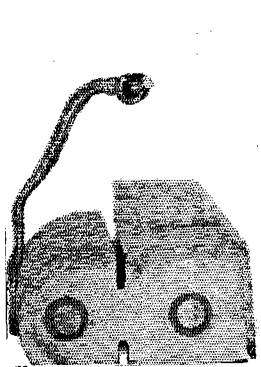
The total elapsed time required to make the minimum number of trips through channels and to obtain deliveries was almost exactly one year and a half. It was in mid-autumn of 1941 when the infantry board started the wheels in motion. In early 1942 the preliminary model was completed. Upon approval of the test report, the War Department established the basis upon which the equipment was to be distributed. The Laboratory was directed to furnish complete procurement information incorporating modifications which had been agreed upon. After the required tooling-up period had elapsed, deliveries to the military arm began. Large-scale production actually got going in the spring of 1943.

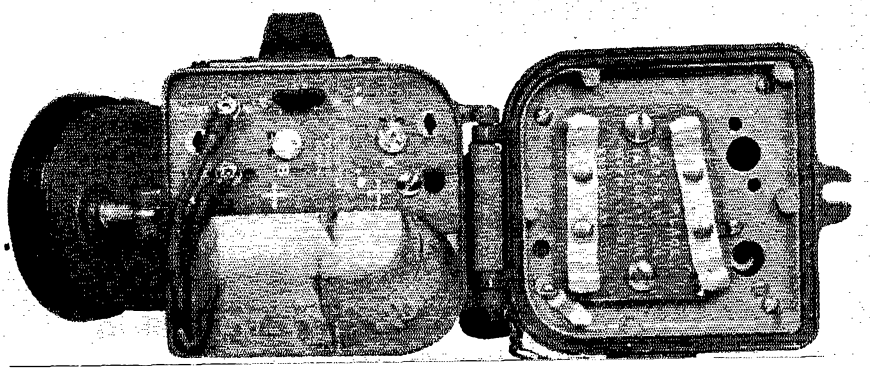
Many another project does not move so smoothly. At any point in the race it may be penalized or called back for a new start. But the SCR-300 project was born under a lucky star; it leaped every hurdle without faulting or knocking a single one down.

Military radio development today is infinitely speedier than was the tedious process of peacetime. Then, when orders were small and manufacturers disliked military contracts with their meticulous specifications, a new radio set might require years to design, perfect, produce and distribute. Today, with the entire radio industry at the disposal of the Signal Corps and other procurement agencies, the most far-reaching experimental development programs are brought to a conclusion, with equipment in production and in the hands of troops, in less than a year's time.

The explanation is that the engineering problems posed by complex military equipment, while not entirely foreign to the procedures used in industry, nevertheless required differing techniques. One of the problems was the peculiar forms for specifications. It became necessary for engineers to clarify specifications, to decide upon a uniform policy, and to get all government agen-







Interior views of the mightiest mite of all — the SCR-536 handie-talkie. *Right* — On the left is the "right" side of the BC-611 chassis (from the operator's viewpoint), with the "top-of-chassis" view at the right of the scale. The short loaded antenna retracts almost entirely inside the case when not in operation. *Below* — Bottom view with the cover open, showing the battery compartment and, at the left, the miniature vibrator which supplies plate power. Changing batteries is as simple as in a flashlight; connections are made by spring connectors.

cies to adopt a common course of action in engineering matters. The Signal Corps did much to bring about straightline engineering thinking, both in specification and performance.

Returning to the SCR-300, certain modifications — primarily of a structural nature — were made in the period between the original experimental set and the final production model. A squelch circuit was added; the present short antenna with the flexible gooseneck was evolved, in addition to a new lightweight rod antenna; the harness was provided with an extra strap going around the abdomen, distributing the weight more evenly; a special battery pack was designed to give optimum life and power output with minimum weight; waterproofing was devised to make the unit moisture and immersion proof. All of this development was done under the Signal Corps lab by engineers assigned to the project.

Meanwhile, other Signal Corps engineers — field engineers, both Civil Service and in uniform — coördinated with the manufacturer every step of the way, collaborating with Galvin engineers in working out the final circuit design and mechanical arrangement.

Speaking of circuits, that used in the SCR-300 takes one back to the days when "new circuits" were, conversationally at least, the sum and substance of radio. It is highly specialized in character, and Signal Corps engineers describe it as hardly adaptable to any other kind of communications equipment. We're told that the transmitter employs a crystal-stabilized f.m. oscillator (not a crystal-controlled oscillator with a following modulated stage) and that the receiver, too, uses a crystal-stabilized h.f. oscillator which is tunable over a wide frequency range.

An amazing little set — and no less so when you take a look at the size of the chassis compartment and realize that it contains 18 tubes!

After any new set gets into the field, Signal Corps engineers still keep a watchful eye on its performance, looking for possible deficiencies of the kind that can be uncovered only in actual use, or for similar possibilities for improvement.

As an example, consider that small gooseneck antenna. Consider also that radio performance often proved disappointing in the South Pacific because of screening by dense foliage. The original micro-output SCR-195 performed especially poorly under these conditions.

Even the SCR-300, despite its greater normal range and the f.m. limiter which stifled crashing jungle atmospherics, also experienced difficulty in locations where its antenna was enclosed by jungle growth. The signal simply couldn't get out.

It was an enterprising ham down in New Guinea who first showed the way to a solution. Required to operate a walkie-talkie at a command post buried (literally) in the interior, he rigged a half-wave doublet with a crude open-wire transmission line, climbed a tree, and strung the antenna more or less in the clear. It was like stepping out of the fog into a brightly lighted room. Thereafter his contacts were perfect.

In time reports of this ham/GI dodge filtered back to Camp Coles and to the Pentagon. The result, only recently achieved, is the new RC-291 antenna equipment — a modified vertical doublet antenna consisting of a quarter wave vertical whip and four quarter-wave horizontal radials, which are electrically equivalent to the lower half of a vertical dipole antenna. The whole assembly can be fastened to trees or poles and connected to the radio set, which remains on the ground, by means of coaxial cable. This arrangement enables transmission *over* the jungle growth instead of *through* it. Even under normal conditions this "elevatable" antenna is useful to extend the operating range where required.

On the relatively confined Anzio-Nettuna beachhead SCR-300s were used for command nets up to divisions — even being operated mobile with the long antenna on occasion. In the jungle, where movement is more restricted, in semi-fixed operation the walkie-talkies serve adequately for regimental and even higher-echelon nets under all ordinary conditions; normal mobile performance with the gooseneck is adequate for company-battalion net requirements.

Aircraft Radio

The Signal Corps has always had a sort of proprietary interest in the air force of the U. S. Army — a feeling which, to be sure, is not always reciprocal. The Signal Corps was the first agency of the Army to test the airplane. In World War I the precursor of the present AAF was the Aviation Section of the Signal Corps. Today the Signal Corps continues its association with aviation by supplying equipment for the radio eyes and ears of air communication and navigation.

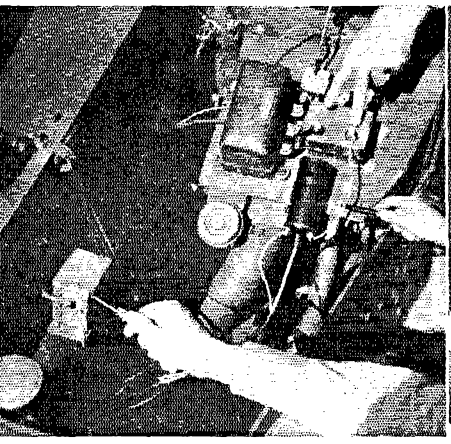
The Signal Corps Aircraft Signal Agency at Dayton and the Dayton Signal Corps Supply Agency, consisting, respectively, of the Aircraft Radio Laboratory and Aircraft Radio Maintenance Division, and the Dayton Signal Corps Procurement District and Depot, are charged with all research and development, procurement, storage and issue of aircraft radio, and of such radio as is used for navigational purposes. Headquarters and one zone office of the Signal Corps Inspection Agency also are located in Dayton.

To perform these functions close coöperation is necessary with the Matériel Command at Wright Field, the Air Service Command at Patterson Field, and the various research and manufacturing organizations in the radio field. By having these aircraft radio development activities under one directing head, red tape is slashed and close coördination is maintained with the AAF.

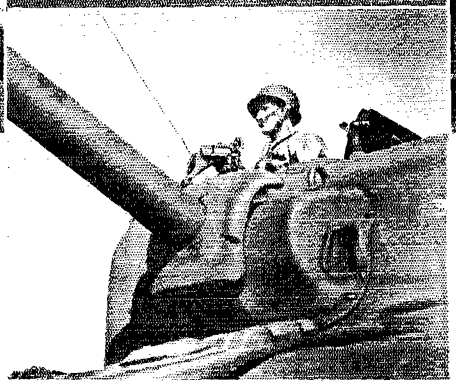
The Aircraft Radio Laboratory is charged with all research, development, engineering and inspection incident to the design, procurement, and installation of radio equipment in aircraft and of ground equipment for radio navigation.

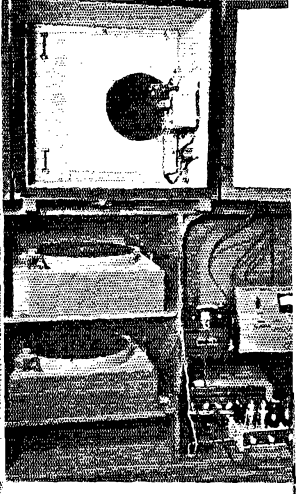
While it is true that radio devices now are used for many purposes other than communication and navigation, the most important use of airborne radio still is the transmission of messages between airplanes and between airplanes and ground stations. For this purpose the modern long-range

SIGNALS AND SCIENCE



Above — Signal Corps tactics in combatting electrical noise are based on (1) isolation and (2) envelopment. Engine compartments are completely shielded and wiring is so arranged that each noise source is decentralized. In the photograph above, technicians are shown pointing fingers, screwdrivers and pencils at the six major points requiring proper suppression to kill ignition noise at the source.





Above — In the lip-microphone testing chamber at Fort Monmouth the roar of an armored vehicle in motion from one record strives to overcome the normal speaking voice from the other, but the 2-oz. lip microphone brings the voice in a handy winner.

Battles must be won in Signal Corps laboratories before tanks can win battles in the field. In these photographs the battle against noise in armored force communications is shown being fought on two fronts.

bombers and transports carry what is known as the command set, which is operated by the pilot and used for command and navigation purposes; a liaison set, used by the radio operator, which is higher powered and employs both fixed and trailing antennas; the modern automatic radio compass, which is used by the pilot for homing or for taking bearings on radio stations on the ground; and equipment used for identification and instrument landing. In addition, all aircraft now are equipped with a crystal-controlled v.h.f. command set, which is push-button operated.

The trend is increasingly toward greater simplification of airborne equipment. More emphasis is placed upon ease of operation in the air even though this means more highly skilled maintenance on the ground. Since, in some aircraft, the radio operator is also a gunner, actual operation under the stress of combat must be kept as simple as possible. The pilot's command set, used for navigational purposes and for sending and receiving messages relating to tactical control of the flight, is voice-operated and must have simple controls because the pilot cannot fly an airplane and operate a complicated radio set at the same time. Radio operators are not able to carry out complicated tuning procedures under combat conditions, making it highly desirable that all sets either be crystal-controlled or be pretuned on the ground with frequency selection in the air accomplished by push-button or similar easy-to-operate systems.

Another important device on aircraft is the interphone system which connects up the various positions so that pilot, co-pilot, bombardier, navigator, radio operators and gunners can talk to each other during the flight. Present-day interphone systems employ modernized oxygen-mask microphones and new flat-response receivers.

Special Projects

Much research has been done on the reduction of electrical noise in aircraft radio installations. This work is carried on in coöperation with the Equipment Laboratory of the Matériel Center.

At frequencies above about 100 Mc. "man-made" electrical interference can be corrected only by proper shielding and bonding of certain critical circuits, such as the high-tension ignition circuits of the engine, the electric-propeller wiring, and the generator-circuit wiring. Much of the shielded conduit used in wiring the balance of the airplane can be eliminated if the over-all shielding and bonding is maintained in a satisfactory condition. Elimination of this conduit at such points results in greater ease of maintenance of the electrical and radio circuits, a saving of aluminum, and a considerable saving in the man-hours necessary for fabrication and installation of the conduit. Filters are employed to reduce electrical and radio interference at the source. Some shielding is still found necessary on the high-tension and generator circuits.

With modern high-speed aircraft, antenna design has become increasingly important. To reduce drag, the antenna must be as small as possible and have a streamlined cross-section. Usually its size and location is a compromise based upon the drag which can be tolerated and the locations available on the airplane structure. Considerable flight testing often is necessary to determine actual antenna patterns.

Other activities of the Aircraft Radio Laboratory include development work on u.h.f. radio navigational aids. Operating in the ultrahigh-frequency spectrum, to a considerable extent does away with thunderstorm static and rain, snow and dust static. Army aircraft are now equipped to operate in the u.h.f. band, which offers not only the advantage of reduction of atmospheric noise but also, since transmission is line of sight, a certain amount of secrecy.

The Aircraft Radio Laboratory also pioneered in the development of the automatic radio compass which is now standard equipment on all bombardment and transport aircraft. A smaller version is also installed on light bombers and fighters. This device simplifies navigation on routes where ground direction-finder stations are available. Either the pilot or the navigator can operate it.

Undoubtedly the most amazing project with which the Aircraft Radio Laboratory has been associated is the equipment of the celebrated 20th Air Force, which depends more heavily on radio communication and navigational aids than any other American strategical air command.

A veritable flying radio laboratory, the B-29 is equipped with the most modern communication apparatus, radio navigational aids, and numerous other electronic devices of the latest varieties. The electronic devices on the B-29 are of utmost importance, inasmuch as atmospheric and weather conditions cannot always be predicted accurately on very long flights. The radio devices for navigation, linked with the worldwide radioteletype system of the AACS, are of paramount importance in ensuring the bombers' safe return.

Each Superfortress carries several radio operator-gunners and specialists, as well as a lieutenant serving as communications officer — the largest communications section on any American military aircraft.

Army Communications Service

The Army Communications Service is the Signal Corps component responsible for engineering the Army's "fixed" communications, as distinguished from the "tactical" or mobile communications employed in the battle areas.

It engineers, installs, maintains and operates the vast War Department Command and Administrative Network which crisscrosses the nation and spreads overseas to principal headquarters in every theater of operations. In addition, it engineers, procures, installs and performs major maintenance on communication and meteorological equipment for the extensive AACS network.

Upwards of 50 million words a day — dealing with every phase of the war effort, from supply and transportation to training and combat orders — are handled by Army Communications stations.

The organization is composed of six large units which work together as a team to keep the messages of war humming. The Communications Engineering Branch performs the over-all engineering and acts as a staff section for the Chief. The Traffic Operations Branch operates the huge War Department Signal Center and the very elaborate remote-controlled transmitting and receiving stations of WAR. The Plant Engineering Agency, with headquarters in Philadelphia, performs detailed engineering and procures and installs equipment. The Alaska Communication System operates the network which stretches through Canada and Alaska into the Aleutian Islands. The Signal Security Branch is concerned with the safety of the communications. The Army Communications Commercial Agency, a field activity located in New York, handles business relations with private communications companies.

In the nerve center of Army Communications — the War Department Signal Center, the world's most modern and efficient communication headquarters — the newest types of radio and wire equipment speed vital information to its destination without a second's unnecessary delay. The Signal Center itself contains a vast array of operating positions, with a huge switchboard, banks of semi-automatic transmitters and receivers, teleprinters, and recording and numbering devices. Each remote-control position bears its corresponding station call sign.

The use of u.h.f. radio links between the Signal Center and the transmitting and receiving points eliminates dependence on wire lines for remote-control operation. Six signals are carried on each of the several radio channels.

WAR

The hub of the Army's radio net is WAR, which actually consists of a number of stations near Washington with transmitters ranging in power from 1 to 40 kilowatts.

Virtually every method of radio transmission is used at WAR — a.m. voice, ordinary hand-keyed c.w.; radioteletypewriter, operating at 60 words per minute; some f.m. voice; and the Boehme high-speed siphon recorder system, in which a stylus converts dots and dashes into a staggered line on tape.

Radioteletypewriter has become the dominant means, operating on a round-the-world multichannel "belt" into which are tapped scores of radiating circuits. It was through this "belt" that a message was sent around the world last May 24th in the unprecedented time of 3½ minutes, through five relay points.

WAR makes use of single-sideband facilities, including transmitters and receivers, to provide radio teletypewriter service to all parts of the world. In effect the multichannel principle involves a voice-frequency telegraph carrier system superimposed on a radio circuit, with a maximum of six channels available on one sideband.

For use on circuits where the volume of traffic fails to justify multichannel operation, the two-two, single-channel principle is utilized.

The single-channel system employs a special form of frequency modulation. At the transmitting station, teletypewriter signals received over a control line from the Signal Center operate a reactance tube which controls the frequency of an oscillator used as an exciter for the radio transmitter. The carrier is transmitted continuously at

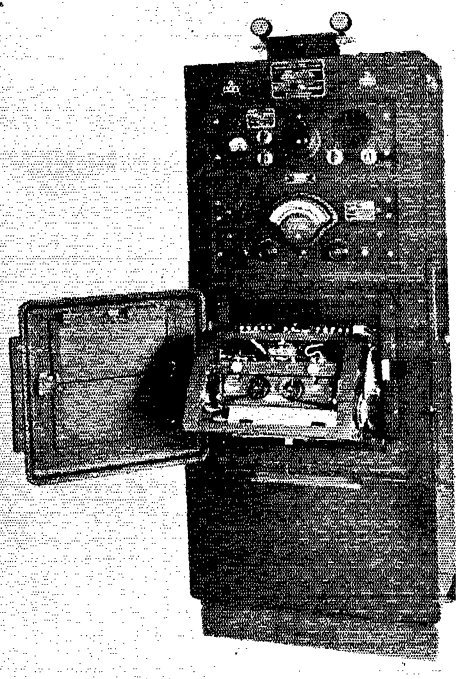
constant amplitude but is shifted between two values differing by about 850 cycles, the higher frequency representing marking signals and the lower frequency the spacing signals.

At the receiving station a special crystal-controlled superheterodyne receiver is used, producing a.f. output at 2125 cycles for marking and 2975 cycles for spacing signals. These two frequencies are passed first through a band-pass filter and a current limiter, then on through marking and spacing-channel filters which separate the marking and spacing frequencies. The outputs of these channel filters are separately amplified and detected and then are connected to oppositely wound coils in a polar telegraph relay. Reception of a signal of marking frequency pulls the armature of the polar relay in one direction, while a spacing signal pulls it in the opposite direction. The armature and contacts of the polar relay are connected via a wire control line to the receiving teletypewriter at the Signal Center.

In actual practice, two complete receiving equipments are employed, each with its own antenna, to provide space-diversity reception. The two outputs are connected in parallel to the two windings of the relay. Receiving antennas are located approximately 700 to 1000 feet apart.

This system has been found greatly superior to ordinary c.w. transmission and permits reliable teletypewriter operation over circuits which would be unsatisfactory with c.w. operation.

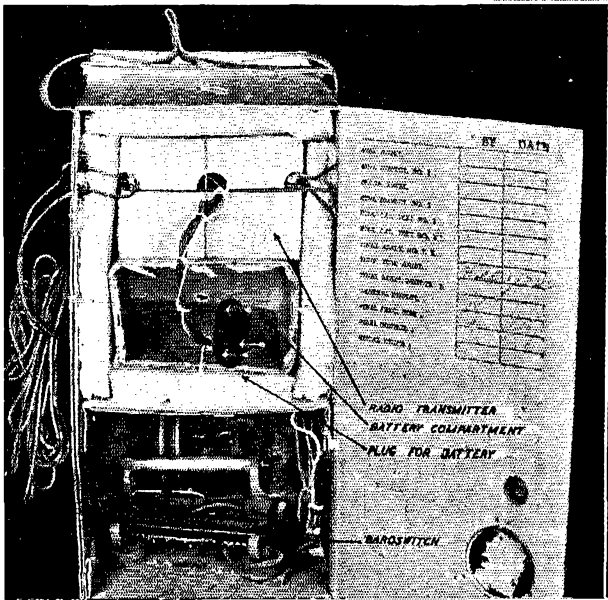
(Continued on page 108)

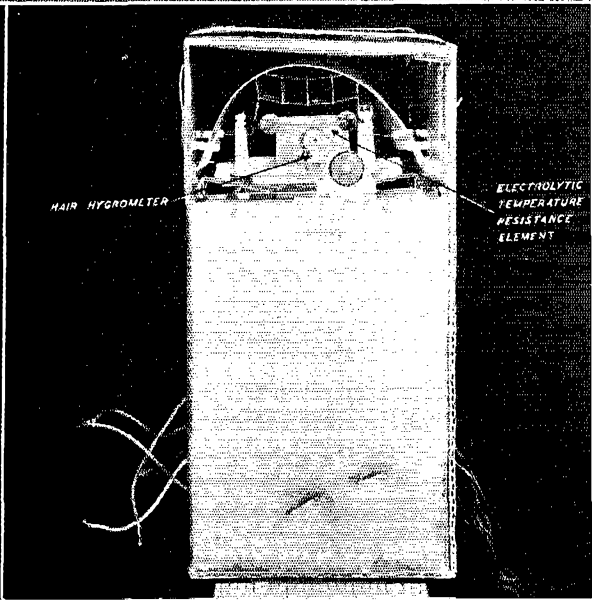


Right — A standard radiosonde receiver and recorder in a single unit. The superregenerative receiver and audio limiter deliver constant-amplitude output to the vacuum-tube audio-frequency meter (center) and continuous-roll graphic recorder.

Below — Complete mobile weather station developed by the Signal Corps, successfully used by the Army in all parts of the world.

Bottom — Cardboard-cased Diamond-Hinman radiosonde currently employed for most all scheduled U. S. radiometeorographic observations.





The Signal Corps in Combat

The Signal Corps man is just about the fightin'est soldier there is. Right in the thick of the battle is where you'll find him . . . more often in hand-to-hand combat with the enemy than not. . . . "The Signal Corps is its own infantry," the saying goes. . . . Often the Signal Corps is first to contact the enemy — and that's where the shooting starts. . . .[1]

THE above was written in the summer of 1942, when the "new" Signal Corps — the freshly inducted radio operators and repairmen then in training — had yet to prove itself in combat. It was by way of prophecy then — a prediction of what the Signal Corps of World War II would do when the time came.

In the nearly two years that have elapsed this prophecy has been more than fulfilled. Signal Corps troops have proved their fighting mettle in every theater and under all conditions. Practically all of them now are or shortly will be overseas (by recent announcement 75 per cent of all physically qualified men at fixed signal installations within the U. S. have been released for overseas assignments). Working right up to the front lines in every combat sector, they have proved that the bazookas and grenade launchers and the assorted carbines, rifles and machine guns allotted a division signal company aren't issued solely for decorative purposes.

Normandy Beachhead

It will be some time before detailed personal-experience accounts of actual operations begin to filter back from the major front of the moment — the Allied-occupied regions in France. The signal men and hams in that hyperactive theater are still too close to the nerve-blasting collection of noises which is modern war — the rattle and roar of artillery, the crack-thump bursts of automatic fire, the whistle of mortar projectiles and their delayed-action detonation, the screaming of shell fragments, the background rumble of armor and the noises of the men around them. . . .

But now and then one does manage to get off a few lines — as did Cpl. Edward Talley, W4IDI, in a letter postmarked June 14th and datelined simply "France." His letter was forwarded by his father, Robert Talley of the Memphis *Commercial Appeal*, who added:

"A Memphis ham, W4IDI, was right there with General Bradley, aboard the flagship, when he led the big parade across the English Channel on D-day. . . .

"Sure, I'm his Dad and I'm proud of him — and why in the hell shouldn't I be?"

And why shouldn't *we* be, too?

"About a week before the invasion the detachment I was in left our camp in England and went to [censored] where we boarded the flagship of the fleet. I was to be radio operator, using Navy equipment for the Army," the 19-year-old Army Signal Corpsman wrote.

"The day before the invasion was to start we moved into the outer harbor. We were to sail that night. Just before dark our sailing orders were canceled. The invasion was to be put off until the next night because of the bad weather.

"The next night we set sail. I never saw so many ships in all my life — LSTs, LCTs, cargo craft, tankers, troop carriers and many others, as far as the eye could see. They were going very slow, about three to five knots.

"Our ship passed them all. We were on listening watch up in the radio room. General Bradley and Admiral Kirk and many other officers were on board.

"I am not quite sure of the time, but I think it was about 4 A.M. when we reached the French coast. We were about four miles from the coast when the bombardment started. It did not seem to last more than about 30 minutes. Then our troops started to go ashore. By that time we were plenty busy at the radio sets.

"All that day ships pounded the coast and more LSTs and LCTs were constantly coming from England. We stayed on board ship, operating the radio sets, until we finally got off on D plus 4. . . .

"At first we were bothered with snipers, but now they have all been wiped out. We still sleep in our foxholes. The air raids are not as bad as they used to be. At first we had only K and C rations, but now the food is getting better. . . ."

Such is the invasion chronology of one man — one among hundreds of thousands. Multiply it — with every detail changed — by those hundreds of thousands, and you have the story of the greatest military operation in history.

Invasion Networks

It was a military operation directed and controlled over a communications network unrivalled in the annals of warfare.

D-day found the U. S. Army Signal Corps ready with a system expanded, perfected and foolproofed through literally years of preparation.

Army commanders in the front lines, at ETO GHQ in England and at the War Department in Washington, all were in instantaneous contact through ultrahigh-speed radio channels. As the operation developed, information on the progress of troops at scores of points was flashed within seconds to General Eisenhower's headquarters in England and on to the Pentagon in Washington.

Radio and landline telephone and telegraph stations were installed at strategic points. Alternate fallbacks were provided so that, if one channel failed, another would always be ready

[1] "QST Visits Fort Monmouth," *QST*, October 1942, p. 28.

A Signal Corps sergeant, receiving amphibious training as signal man with a shore party, hits the beach with his SCR-536 handie-talkie during early dawn invasion maneuvers. In an actual landing operation, Signal Corps troops go ashore with the first assault waves, fight their way up the beaches along with the infantrymen.

to fill the gap. Advance plans were worked out with the Navy covering detailed communications procedure for the combined forces, including complete unification of call letters and allocations preventing overlapping of frequencies.

Every part of the plan, we are told, went according to schedule. From the instant the first landing ship crossed the English channel, communications control of the giant armada was flawless. As pieces of the jig-saw puzzle that was the master tactical plan were fitted together, reinforcements in men and matériel were funneled to vital points. The intricate communications network provided by the U. S. Signal Corps and the British Royal Signals in concert enabled all branches of the invasion army — air, ground, and service forces — to fight as a well-coached team. So well did the invasion signal system function that communication with advancing Allied troops was maintained without a lapse.

The first D-day message from the Normandy beachhead was received by the Signal Corps at 6:35 A.M. It requested that the laying of smoke screens by American aircraft be discontinued. Wireless silence was not broken on the British circuits until 7:32 A.M., when a message from an airborne division relieved anxiety concerning the fate of glider troop units.

These messages were received at the joint British-American-Canadian communications center, described elsewhere in this issue, where Signal Corps men were busily at work 100 feet under the quiet English countryside.

Newly developed airborne radio and electronic equipment was a major contributor to the success of the attack, particularly in the saving of paratroopers. Lt. Col. George F. Metcalf, chief of the electronics division of the Signal Corps, Aircraft Radio Laboratory at Wright Field, said on his return from England: "Our radio equipment was more successful than anybody could imagine, and was used more extensively and more completely than in any other operation — and with greater effect!"

Linked with these super accomplishments was, of course, many an individual communications achievement — smaller in scope, but also of vital importance. The stories of these achievements must await another recital. But we can tell here of the work of the Signal Corps in earlier operations in the Mediterranean area which paved the way for the European assault.

North African Invasion

On November 8, 1942, combined Allied forces attacked simultaneously at various points along the North African coast from Safi to Philippeville. Signal Corps units landed with the assault troops and fought along with the infantry to establish beachheads — shooting down planes, clearing mine fields. Above all they established and maintained the main arteries of communications throughout the combat zone, often under strafing and heavy bombardment.

At one hotly disputed point near Casablanca where a Signal Corps detachment landed with the first wave, one man yanked a .30 caliber machine gun off a landing boat, set it up on the beach and downed an attacking enemy plane. He and his crew fought with the infantry throughout the day until their radio equipment was landed, their carbines and the commandeered machine gun furnishing the fire power to hold their sector of the beachhead.

Winning the coastline of North Africa was only the first step. Gruelling months of fighting in the interior were to follow. A graphic account of typical field operations is given in this report by a Signal Corps officer, written under direct enemy fire:

"As I dictate this in our field set-up here in the woods at 2200, we are in the midst of a mobile, fast-moving operation with a very fluid front. This operation might be compared to a football game where the corps command post is in the position of quarterback, well back of the line of scrimmage, directing a play with its full force on one end of the line; and then, without waiting

Signal Corps troops set up a mobile message center at an airdrome in North Africa. *Top* — Members of an aviation engineers unit dig a canvas-walled shelter for the SCR-299 near Youka les Bains in Algeria. *Center* — The radio truck is driven into its shelter and camouflage netting drawn over the top. *Above* — Additional camouflaging completes the job. *Right* — Mobile signal battalion message center in Tunisia.

to call a new set of signals, the play is suddenly shifted to the extreme opposite end of the line — some dozens of miles across from end to end.

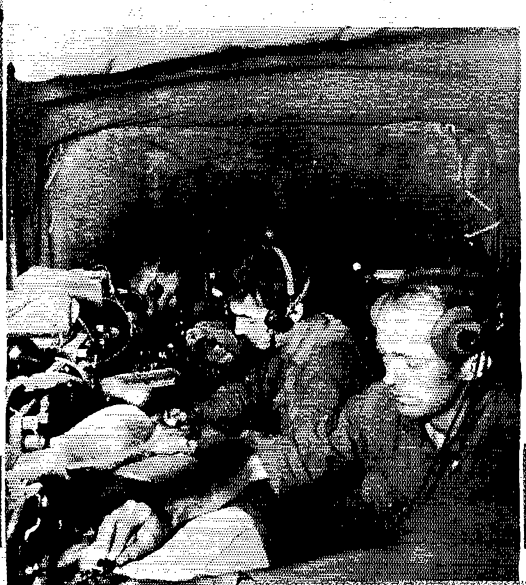
"At the moment . . . the corps radio officer is arranging details to cover emergency radio communication on one end of the line where the enemy has suddenly withdrawn and where communication at the moment is rather uncertain. . . . Corps radio, wire, teletypewriter, and message-center teams are moving to the other end of the line to an advance corps signal center being established there, from which we will give more detailed instructions to the teams later tonight as the tactical plan unfolds. By midnight we hope to have both ends of the line well in hand."

Battling the Afrika Korps

In the field as well as on the invasion beaches, signal personnel saw plenty of combat. Pvt. Milton Peterson and six other members of a signal unit were on their way to the front in Tunisia to repair tank radio sets when they were ambushed by a German paratroop group armed with machine guns.

"I was hit as I jumped out of the truck to take cover," Peterson said. A bullet entered his left side and went through his stomach and right arm. Another bullet split his scalp, releasing streams of gore. As he lay sprawled in a ditch, face covered with blood from the scalp wound, he saw his comrades captured. Peterson himself remained perfectly still until the Germans went away, leaving him for dead. Picked up later by soldiers from another U. S. unit, he subsequently recovered from his wounds.

Time and again Signal Corps troops began installing communications links before the tactical staff had completed its plans. One corps signal officer wrote: "Success is due mostly to a thorough anticipation or a damn good guess as to what somebody else will decide later. . . . If the signal officer waits . . . it might be too late."



Winner of a Silver Star award for "calm and courageous conduct," Lt. David C. Buscall, jr., established a signal center in a blackout during the battle of Kasserine Pass, under heavy shellfire directly behind the front lines near Sbeitla.

"Trouble on the lines was frequent," he related, "due to bombing and strafing. On several occasions our main link was cut by bombing, but immediately our radio set was put on the air and stayed there. At no time did the radio fail to reach the main signal center."

As the counterattacking enemy surged past the town of Sbeitla, Lt. Buscall, refusing to quit, succeeded in evacuating his men and equipment.

Following the historic battle of Kasserine Pass the tide turned, and within two months all of North Africa was in Allied hands. Thereafter the region became the base for future operations in the Mediterranean zone.

Messages from the new Allied Force headquarters, the nerve center from which was directed the Allied triumph in the Italian theater, went out over a grapevine — or, to be more precise, over a grape arbor.

At least that's the story told by Capt. Roy L. Knight, W3RT. "We could find no metal to make a relay rack to hold the receivers, so I tore down a large iron grape arbor and had it reassembled in the form of a passable imitation of a rack."

Such is typical of the improvisation at the Allied Force signal center in those first days.

Needed materials were collected on foraging expeditions around the docks and warehouses. W3RT bartered away most of his issued cigarettes and soap to get the coöperation of workers and tradesmen. Components were made of scrap metal, fabricated by local workmen. Even 'phone jacks were made by hand. Breadboard construction was revived. Capt. Knight himself rewound defective and non-standard power transformers by hand.

Now, of course, the signal center compares favorably with the most modern installation anywhere. Yet some of the equipment still in use was created by the original personnel despite limited facilities and shortage of parts.

That was the kind of spirit that won the battle of North Africa, as well as those which followed — the unquenchable will to win, whether the fight was with the enemy, atmospherics, or shortages of matériel.

Landing in Sicily

Sicily, next on the list of Allied objectives, was swept clean of the enemy in 38 days. Throughout this time the communication nerve centers of the Signal Corps coördinated the operations of the fast-moving American and British forces.

"When radio silence was lifted, all radio nets were quickly established and communications re-

Fire Control in Italy

Field artillery forward observation post and fire control radio operation under combat conditions. *Above* — A forward observation team, including an artillery captain, a sergeant and a private, observe the shelling of Mt. Trocchio in the Cassino area, and transmit results of the fire over their SCR-609.

Above — Radio and wire are both in use at the executive's post behind the lines near an artillery battalion gun position in the Mt. Trocchio area. *Below* — Well "dug-in" in an evacuated basement in the Mignano area, this T/5 radio operator is fully alerted at his simplified-control a.m. SCR-543.

The ruggedness of Alaskan operations is portrayed in this forward division command post established by the Signal Corps on Attu in the Aleutians.

mained excellent during the landing phase of the operation," according to a report from Seventh Army headquarters.

The breath-taking drama underlying that matter-of-fact statement is revealed in the experiences of T/Sgt. Thomas R. McLean, a licensed amateur operator from Royal Oak, Mich. McLean was chief radio operator in the division signal company of the Seventh Army's 45th "Thunderbird" Division.

On July 10th McLean and his radio-equipped peep were lowered into an LCV. He and his comrades were put ashore on Green Beach between the third and fourth infantry assault waves, their mission to establish the first communications between the land troops and the headquarters ship still anchored in the harbor. It was the crew's first taste of combat.

Carefully searching the smoke screen-shrouded Sicilian shoreline, they drove across the beach. Suddenly enemy machine-gun fire spattered around them. Diving from the vehicle, they stretched out flat in the sand like statues. As the smoke screen lifted a Seventh Army machine gun sprayed the Ities concealed in the bush and they saw the Italian crew abandon their gun and come forward in surrender.

They drove on until they were hemmed in by engineers' tape on both sides and across their path in front, marking the limit of the area the minesappers had cleared.

About this time the division signal officer landed. He ordered the engineers to speed up the work of clearing a path for the radio peep. Meantime, McLean removed the waterproofed covering from the radio set and tuned it up. He was ready to go when the signal officer returned with the first message to be transmitted from the shore troops to the command ship anchored off-shore. The message reported that Seventh Army infantrymen had pushed the enemy back from the shore to a depth of one thousand yards.

Mortars and Messages

A bit later an enemy mortar shell landed a hundred feet to the right of McLean's peep. Shaken by the burst, the crew again dove for the sand. This time they left the headphones dangling over the side of the peep so that they could hear any incoming messages.

Suddenly code with an ominous sound started pouring out of the 'phones. When transcribed through a deciphering device, the message read: "Air reconnaissance shows eight enemy tanks approaching Green Beach."

McLean notified the division operations officer, who had just come ashore. Later he learned that infantrymen intercepted the approaching tanks with bazooka fire.

While awaiting further action, McLean came across a second radio peep that had just come ashore. The crew was having trouble making the transmitter function. He located a loose wire, and soon there was another transmitter on the air. Overhead all the while enemy planes were bombing the shoreline. Allied pursuits, racing to meet them, engaged the Jerries in dogfights and drove them off before they could get a good look through their bombsights.

McLean no sooner got back to his peep than another enemy mortar shell landed near by, this time only fifty feet to the left of his position. Deciding he didn't care for that spot, he drove as far down the beach as the engineers would permit, where the crew again hit the sand. Soon afterward they received news that the enemy mortar emplacement had been knocked out.

The minesappers completed their work and the signal crew moved on. Driving through a cane field infested with enemy snipers, McLean and his comrades parked their peep on a rise of ground. Sheltered by leafy fig trees, they watched the Luftwaffe pilots unsuccessfully bomb the harbor.

Finally they found the division command post, which had been established in a clearing a

A Signal Corps sergeant in a signal service company at an underground message center somewhere in Australia is assisted by his pet wallaby, "Oscar."

mile and a half inland. The general greeted McLean and his men enthusiastically. "I felt as though he had been waiting for me to show up so that the war could begin," McLean said.

Traffic moved fast until dusk, by which time the infantry advance enabled the command post to move another mile inland. There they took time out to dig foxholes. That night enemy artillery shelled the area. They heard machine-gun and rifle fire and could see the greenish-white tracers in the darkness.

During the night Navy crews dismantled machine guns from their beached boats and set them up on shore. The next day McLean was called on to acquaint a Navy crew with Army radio operation and assist in getting a transmitter going for the sailors. The Air Corps officer who was supervising the job was so impressed that he had McLean direct the installation of a dozen or more Navy radio sets brought ashore for use in directing naval air support.

On the second night unidentified transports dropped paratroopers immediately following an enemy air attack. Soon the radio system was jammed with messages relating to the identity of the "invaders," — who turned out to be Seventh Army reinforcements.

Said McLean: "There we were, sitting in the peep and pounding out messages, while overhead we could see the low-flying transports and the paratroopers coming to earth. When we finally learned they were our own troops, everyone sure heaved a sigh of relief."

By then there were Seventh Army troops everywhere. The Heinies and Ities all had been either driven back to the interior or captured. The Allied beachhead was won.

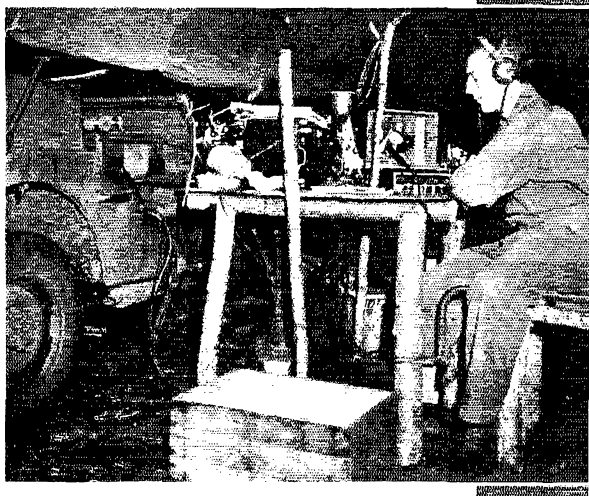
McLean operated a high-power transmitter throughout the Italian campaign, from Salerno to the Anzio-Nettuna beachhead and during the successful march on Rome. In recognition of his performance he was promoted to the rank of warrant officer (jg) on July 15, 1944 — a year after the first landing in Sicily.

"As a civilian I was a professional photographer," said McLean, "my ham training enabled me to make emergency repairs which would have stumped most Army-trained radio operators."

The famous 45th "Thunderbird" Division had at least ten hams on its roster, with six others besides McLean in the signal company. All of these "Thunderbird" hams went through the Sicilian campaign, then fought from Salerno to Venafro in Italy and later moved on to the embattled-bridgehead at Anzio. Other radio operators in the company were Sgt. Archie Foster, W8OSH; Cpl. William Potts, W7FJY; Sgt. Wilbard W. Harr, W2GEZ; and Cpl. Everett Cook (operator's license only). Working in the radio repair section of the company were Sgt. Joseph G.

Three command-post message centers in New Guinea, ranging from fixed to distinctly mobile, are shown in this panel.

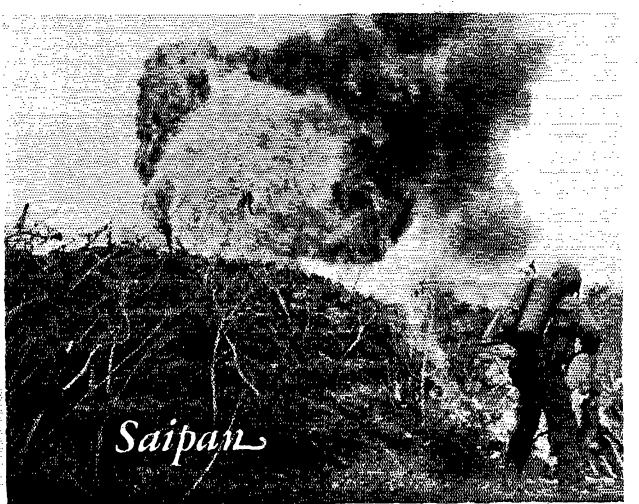
Above — This is the receiving and remote-control operating position for the main base radio station at Army GHQ in the New Guinea area. Transmitters are remotely controlled in a location distant from this semi-permanent control installation.



Above — Temporarily installed under a makeshift tent shelter until its dugout is completed, this jeep-powered task-force communications center is somewhere in New Guinea. *Below* — SCR-193 radio jeep, *pressed into service as a temporary headquarters* station when a Jap bomber demolished the original dugout location. Heavy sandbagging saved the Signal Corps operators and their equipment.

Signal men with an SCR-300 maintain communication with a tank squadron and provide the battalion CP in the rear with a blow-by-blow report as the tanks move forward to blast Japs out of three U. S. pillboxes captured by them during infiltration of the American camp.

WIDE ANGLES AND CLOSE-UPS



Covered by a vigilant U. S. infantry detail, an American flamethrower advances to burn out Japs holed up in a well-concealed pillbox on Saipan. Note the SCR-536 handie-talkie slung on the back of the rear getaway man in the central five-man group of the formation.

Dube, W2HVC, and Sgt. George F. Huether, W2IHO.[2]

Among other amateurs participating in the invasion of Sicily were five members of a Signal Corps platoon who landed in a radio-equipped "duck": Lt. Robert Crynack, W8RTQ; M/Sgt. J. A. Stippick, W9BLB; T/Sgt. A. J. Koves, W8RCX; Cpl. Arthur Johnson, W2MWA, and T/Sgt. C. M. Duer, W5KLS.[2]

Lt. General George S. Patton, jr., commenting on the rapid advance made in the first ten days, said that the accuracy with which the fleet batteries laid their fire on targets whose location was radioed them by shore parties was "nothing short of phenomenal." General Patton expressed particular appreciation for the Signal Corps troops who, he said, although often working "without food, favor or affection," nevertheless got the messages through.

Italy

In September, the Fifth Army struck Italy, making its first landing at Salerno. Major General Mark Clark directed first-hour operations from the deck of his command vessel in Salerno Gulf over an SCR-300 net. This net was established by Signal Corps soldiers who landed with the first wave and fought their way up the beaches under enemy fire, carrying their walkie-talkies. Huge amphibious "ducks" with SCR-399s followed them ashore to extend the signal links.

[2] Photographs of these hams appeared in *QST* for July, 1944, pp. 28 and 29.

The immediate need was to establish contact between the U. S. forces and British elements attached to the Fifth, each of which had effected landings on separate beaches. The Signal Corps unit assigned to this hazardous operation piloted a "radio duck" over bombed and shell-torn roads to a point just behind the front lines. Immediate contact was made with the British headquarters, but the detachment underwent fourteen consecutive hours of German shelling, bombing and strafing concentrated on their installation before the Krauts were pushed back beyond artillery range.

The work of the Signal Corps in Italy included dangerous observation and reconnaissance missions. To furnish the high command with the information necessary to complete the combat picture, signal men operated right up with the front-line troops. In one sector a signal company out ahead of the infantry sent information back to the heavy guns of the destroyers, cruisers and other craft offshore which brought about the destruction of counterattacking German Mark VI tanks which threatened the entire landing operation.

An official observer's report cited the repulse of a German patrol by the radio team of a signal battalion during the bitter struggle for the Salerno beachhead. At a critical stage in the fighting this unit "prevented a confused military situation from becoming a chaotic one."

"Sixteen powerful radio sets had been installed when a heavy German attack was launched north of a highway which crosses the Sele River," reported the observer. "The attack was successful in that it forced a temporary withdrawal of all Allied units — all except this radio team, which received orders to hold at any cost.

"For twenty hours this detachment remained the most advanced unit of the Fifth Army, almost four miles ahead of any possible support. At no time during the enemy thrust had communications been lost, although a German patrol crossed the river at one point and attempted to destroy a transmitter installation. Radio operators, maintenance men and officers grabbed submachine guns, rifles and carbines and repulsed the patrol with losses."

In both r.f. power and firepower the Signal Corps overwhelmed the Nazis, as borne out by this note in a report from the commander of a division fighting at Paestum, south of Salerno:

"Our radios worked fine. It turned out that the Germans were on the same frequency, but ours were stronger and frequently blocked out their messages. I heard that the Germans complained about this 'unsporting' state of affairs."

On the morning of Sunday, June 4th, moving slowly on to Rome with forward elements of

(Continued on page 90)

The conquest of Kwajalein Atoll. *Above* — With the Stars and Stripes flying victoriously from the topmost point on the atoll, Major General Charles H. Corlett, commander of the 7th Infantry Division, and a staff officer gaze westward toward their next steppingstone on the route to the Rising Sun.

Above — All that remained of Japanese communications on Kwajalein after furious preinvasion bombing and shelling, this damaged building housed the radio headquarters and powerplant. *Below* — Supported by a radio-equipped tank, American infantrymen move in to wipe out remaining Japs on the atoll.

IN THE SERVICES

THE Signal Corps gets first place this month, since that branch of the service is being featured in this issue. Incidentally, in the three years this department has appeared in *QST*, no less than 2500 hams serving in the Signal Corps have been listed in these pages.

That's a pretty good showing, but we know there must be more signal troops — not to mention communications men in the other branches — who haven't yet registered with us the essential facts of their wartime service. If you are one of them, or if you know another ham in uniform who hasn't AWSRd, turn to page 64, read the instructions appearing there, and take appropriate action.

We hope that W4HXS — ex-W1DLX and W5FAH will feel well rewarded for their diligent efforts when they see the splendid list of OMs who are working for Pan American Airways published in this issue. Though not in Uncle Sam's attire, they are operating under Navy contract and their radio duty aboard the flying clippers ferrying cargo to hundreds of vital spots is a truly essential one. They are aptly called "The Merchant Marine of the Air."

ARMY—SIGNAL CORPS

1NIE, Wishnefsky, Pfc., foreign duty
2GSY, Connolly, Lt., Arlington, Va.
2KWT, Pasqualoni, Camp Crowder, Mo.
2MLI, Bialo, Pfc., Camp Crowder, Mo.
2NC, Rechert, S/Sgt., foreign duty

W/O (jg) Thomas R. McLean, ASC, an amateur-operator licensee, won a promotion to his present rank by his fine performance as a Signal Corps crew chief with the 45th "Thunderbird" Division's signal company during the Sicilian and Italian campaigns. His story is told in "The Signal Corps in Combat," p. 42 in this issue.

2NHQ, Nemoyten, Cpl., foreign duty
2NOG, Wilkos, T/5, Sunmount, N. Y.
3CBR, Conover, Pvt., Camp Crowder, Mo.
3DBO, McCausland, T/5, foreign duty
3FCQ, Gierman, Pvt., Camp Crowder, Mo.
3FUR, Bedford, Lt., MacDill Field, Fla.
3IEF, Berger, Cpl., Ft. Monmouth, N. J.
3JTR, Dopilka, Cpl., foreign duty
4DGR, Stroop, 2nd Lt., Camp Polk, La.
4DYW, McDade, Pfc., Camp Crowder, Mo.
4HGK, Greenberg, Pfc., Camp Edison N. J.
ex-5BKA Hutchinson, Sgt., foreign duty
5IDV, Smith, Camp Crowder, Mo.
6BKW, Julian, foreign duty
6JGY, Koehler, Cpl., foreign duty
6TTS, Darlington, DeRidder, La.
K7CZY, Sebring, Cpl., Walla Walla, Wash.
7DHR, Hanawalt, Lt., foreign duty
7DKW, Haven, Camp Crowder, Mo.
7EBH, Taylor, Sgt., address unknown
7EKA, Wesley, T/Sgt., foreign duty
7FFR, Byram, T/Sgt., foreign duty
7HIV, Lovberg, Pvt., Camp Crowder, Mo.
7IRA, Hucka, T 5, Camp Bowie, Texas
8GBI, Harner, Lt., address unknown
8ICC, Steiger, W/O (jg), foreign duty
8PEI, Varos, T/3, Camp Polk, La.
8RAF, Meyer, T/4, foreign duty
8RTI, Groff, M/Sgt., foreign duty
8SHX, Friedman, Pvt., Camp Crowder, Mo.
8SKY, DeHaan, Pfc., foreign duty
8TZK, Mathews, T/Sgt., foreign duty
8UPJ, Ciezak, Lt., foreign duty
8VIU, Nowicki, Cpl., Ft. Jackson, S. C.
9AXO, Gruetzmacher, Sgt. foreign duty
9CGO, Hoffman, T/5, Ft. Monmouth, N. J.
9CPL, Soper, Sgt., foreign duty
ex-9DIL, Lamb, Camp Crowder, Mo.
ex-9DO, Hatch, Col., Washington, D. C.
9EJC, Flickner, Camp Crowder, Mo.
9KS, Janes, Lt. Col., foreign duty

These are four of the amateur gang in a Signal Corps company 'way back in the Australian Bush. *Left to right, kneeling:* Lt. J. E. Fritz, W9QLK, and Sgt. W. H. Meyer, jr., W8RAF. *Standing:* T/Sgt. A. D. Etheridge, W4EZM, and T/Sgt., Paul Sloan, W7HTS. Every ham in the outfit holds a rating and a key position in his section. FB!

ex-9NYE, Werner, T/5, Camp Crowder, Mo.
9OIO, McConnell, Capt., Long Branch, N. J.
9TFG, Martin Pfc., Kettleman City, Calif.
9TFW, Dickinson, foreign duty
9UCT, Kientz, S/Sgt., Camp Campbell, Ky.
9UPX, Prince, Pfc., foreign duty
9UUY, Bethge, Lt., Kelly Field, Texas
9YAW, Frits, Pvt., Camp Crowder, Mo.
9YFR, Driver, Camp Crowder, Mo.
9YJW, O'Brien, T/Sgt., foreign duty
9YNO, Sunderland, T/Sgt., Camp Davis Calif.
9ZCN, Pivan, Pvt., Ft. Monmouth, N. J.

Operator's license only:

Bristow, T/3, Camp Butner, N. C.
Donovan, M/Sgt., Ft. Monmouth, N. J.
Maier, Pvt., Camp Crowder, Mo.
Tetreault, T/Sgt., foreign duty
Thompson, T/5, Camp Barkeley, Texas
Tobias, Lt., foreign duty
Trettevik, Pvt., foreign duty

NAVY—SPECIAL DUTY

1LQB, Goveia, CRT, Annapolis, Md.
1MEC, Fricke, CRM, foreign duty
ex-2CVM, Podwall, RT3c, Del Monte, Calif.
2GXX, Kinz, CRT, foreign duty
2IQT, Murnighan, CRT, Treasure Island, Calif.
3FSP, Kidwell, RT2c, Washington, D. C.
3FZA, Ripani, RT2c, Bainbridge, Md.
4GHT, Callahan, RT3c, Clarksville, Ark.
6AEJ, Vitzelio, RT2c, Treasure Island, Calif.
ex-6HYD, Greaney, RT3c, Bellevue, D. C.
6LLA, Wilson, CRT, Treasure Island, Calif.
6MUO, Saunders, CRT, Treasure Island. Calif.
6NTJ, Pennywell, RT1c, foreign duty
6PLD, Carpenter, RT2c, foreign duty
K6QOF, Burns, CRT, Treasure Island, Calif.
6TLG, Wachner, RM1c, Gulfport, Miss.
6URK, Rasmusson, RT1c, Treasure Island, Calif.
8ASV, Oncken, RT1c, Charleston, S. C.
8PSE, Taylor, RT1c, Clarksville, Ark.
9BUF, Van Vliet, RT1c, Treasure Island, Calif.
9IEF, Fragassi, RT2c, foreign duty
9NLN, Potect, RT1c, Annapolis, Md.
9VHO, Schaeperkoetter, RT1c, foreign duty
9WIE, Sanders, S1c, Great Lakes, Ill.
9ZAW, Swafford, Ens., Cambridge, Mass.

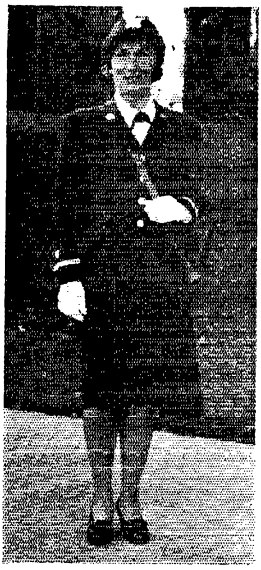
Operator's license only:

Mask, CRT, foreign duty
Worthington, RT3c, Bellevue, D. C.

ARMY—AIR FORCES

SGT. R. W. HIETT, JR., ex-W6CDX, who is somewhere in New Guinea doing all types of aircraft radio repair work, was lucky enough to find a VK with whom to chew the rag on a recent visit to a nearby RAAF camp. But the highlight of the occasion came when Ralph spotted a copy of the December, 1940, "25th Anniversary," issue of *QST*, for which he promptly traded a carton of Camels.

1KDW, Szarek, 2nd Lt., George Field, Ill.
1LCA, Dunham, A/C, State College, Miss.
1LDI, Blanchard, Pvt., March Field, Calif
ex-2DWO, Griggs, Pvt., Camp Luna, N. M.
2JRF, Steiges, Capt., foreign duty



Our one and only YL Spar to date — Ens. Amy H. Medary, W1KRO. Ens. Medary was commissioned out of the Coast Guard Academy, New London, Conn., and now is stationed in New Orleans. She received her ham ticket in 1937, is a member of ARRL and the Rag Chewers' Club.

2MVL, Threlkeld, Major, Miami Beach, Fla.
2OFL, Neuman, A/C, Fletcher Field, Miss.
ex-3ASE, Dunne, Pvt., Rome Field, N. Y.
3CLN, Kovacs, Sgt., foreign duty
3CTT, Rothman, Sgt., Boynton Beach, Fla.
3EHU, Stead, T/Sgt., Miami, Fla.
3ETX, Richardson, M/Sgt., foreign duty
3FIS, Lippert, M/Sgt., foreign duty
3IJF, Gossard, S/Sgt., foreign duty
3IWS, Hayden, S/Sgt., Harvard Field, Neb.
3JDI, Martin, Lt. Col., Rome Field, N. Y.
4DSY, Dawson, Capt., Charlotte, N. C.
ex-4FHD, Wilkins, 2nd Lt., Cambridge, Mass.
4HZL, Gibson, A/C, Courtland Field, Ala.
4QA, Randolph, foreign duty
5CVN, Griffith, Sgt. Camp Pinedale, Calif.
5EVR, Batson, Pvt., address unknown
5FSP, Haines, Pvt., MacDill Field, Fla.
5JNN, Watelski, 2nd Lt., Boca Raton, Fla.
5KOA, Day, Capt., Aloe Field, Texas
6DF, Farran, Major, Asheville, N. C.
6JQV, Simpson, Fairfield, Calif.
6OYV, Clarke, A C, San Antonio, Texas
6PFX, Allen, 2nd Lt., New Haven, Conn.
6QGE, Whitaker, Lt., New Haven, Conn.
7IDZ, Patrick, Capt., foreign duty
K7IGA, Brown Lt., Lubbock Field, Texas
8IHC, Mack, Pvt., Boca Raton Fla.
8JYI, Herrick, Sgt., Belleville, Ill.
8PPW, Acker, S/Sgt., Charleston, S. C.
ex-8RCI, Labuzeta, A/C, Cochran Field, Ga.
8REH, Drummond, T/Sgt., foreign duty
8SRN, Link, M/Sgt., Robins Field, Ga.
8TBV, Lamb, 2nd Lt., foreign duty
9DTM, Laird, Capt., foreign duty
9JNW, Sikora, foreign duty
9JQN, Rosenow, Pvt., Amarillo Field, Texas
9YWI, Williams, S/Sgt., foreign duty
9ZJV, Monahan, Lt., Springfield, Mo.

On one of Captain Merrill Sulzman's tours of duty as a chaplain in the Army, he ran across these hams somewhere in the Aleutians and joined them for this picture. *Left to right:* Pvt. J. M. O'Donnell, W8CNR; S/Sgt. R. C. McClellan, W4IAO; Capt. M. Sulzman, K7IPN, and Cpl. H. Heckert, W9SXS. Since then, Father Sulzman has moved on to Ft. Bliss, Texas.

Operator's license only:

Abruzzo, Tampa, Fla.
Bell, Lt., New Haven, Conn.
Bell, T/Sgt., Bedford, Mass.
Hinkle, Lt., Sedalia Field, Mo.
Lessner, Pfc., Santa Ana, Calif.
Mataska, T/Sgt., foreign duty
Millsap, Pfc., Liberal Field, Kans.
Moskowitz, Pvt., Yuma Field, Ariz.
Schoeffler, A/C, New Haven, Conn.
Thomas, Sgt., Peterson Field, Colo.
Werber, Lt., Alexandria, La.

ARMY—GENERAL

Now that Lt. R. T. Peck, W8CTP, is back in the U.S.A., our Circulation Department is having less of a headache in mailing his copy of *QST* each month. During the latter part of 1943, W8CTP read the October issue in Oran, the November issue in Algiers, and the December issue in Italy. More or less of a nomad, isn't he?

1GPK, Prout, T/Sgt., foreign duty
1IKW, Birnbaum, Pvt., Ft. McClellan, Ala.
2KNP, Rosen, Pvt., Camp Upton N. Y.
2KQI, Tietgens, S/Sgt., Ft. Constitution, N. H.
2LBI, Cohen, Pvt., Camp Hood, Texas
4CCH, Carstarphen, Pvt., Ft. Bragg, N. C.
5DWD, Dillon, T/4, foreign duty
5FYN, Hasbrook, Pvt., Camp Joseph T. Robinson, Ark.
6ROS, White, Pfc., Camp Davis, Calif.
8GGY, Schneider, T/Sgt., foreign duty
8HDW, Rogowin, M/Sgt., Camp Campbell, Ky.
ex-8IGJ, Weisman 2nd Lt., address unknown
8PFC, Mollman, Pvt., Camp Chaffee, Ark.
8UZC, Lahti, Pvt., Camp Swift, Texas
8VPU, Golubowsky, foreign duty
8VTY, Reiser, Cpl., Camp Shelby, Miss.
8WJQ, Blakeslee, Pvt., Camp Van Dorn, Miss.
8WNC, Stewart, Lt., foreign duty
9CGT, Eastland, Sgt., foreign duty
9CHU, Simonsen, Cpl., Ft. Sill, Okla.
ex-9EPO, Wing, Cpl., foreign duty
9FDS, Rush, Pvt., Clifton, N. J.
ex-9HIC, Rannie, Pvt., Camp Joseph T. Robinson, Ark.
9JCJ, Wise, foreign duty

Operator's license only:

Downey, Pvt., Pullman, Washington
Fleming, Sgt., foreign duty
Golden, Pvt., Camp San Luis Obispo, Calif.
Jahn, Pvt., Camp Hood, Texas
Mandler, Pvt., Pullman, Washington
Smith, foreign duty
Talcott, Pvt., Ft. Benning, Ga.
Weber, Pvt., Ft. Knox, Ky.

NAVY—GENERAL

1BV, Cumming, Lt. Comdr., Washington, D. C.
1GKK, DeGrenier, S2c, New London, Conn.
1JTB, Harrison, Lt. Comdr., foreign duty
1NGL, Heibeck, Ens., Washington, D. C.
2AMR, Van Handle, RM2c, foreign duty
2AYN, Borsody, Lt., New York, N. Y.
2DFW, Wolfe, EM3c, foreign duty
2NLL, Martin, S1c, Great Lakes, Ill.
2NXC, Ross, Lawrence, Kans.
3AAE, Wall, RM3c, foreign duty
3BSE, Williams, RE, Washington, D. C.
3HRK, Warren, RM1c, San Bruno, Calif.
3IGW, Trout, CRM, foreign duty
3JFN, Johnson, RM3c, San Diego, Calif.
4CYT, Harrell, RE, foreign duty
4FRY, Groce, S1c, Great Lakes, Ill.
4FXG, Polleys, Lt., foreign duty
5BOT, Sharp, RM1c, Chicago, Ill.
5IXQ, Flatt, S1c, Great Lakes, Ill.
6BEW, Ryland, Ens., Treasure Island, Calif.
6CIS, Hughes, RE, foreign duty
6EJH, Cameron, Ens., foreign duty
6HIP, Gilbeau, RE, Treasure Island, Calif.
6HKO, Wetzel, Lt. (jg), San Antonio, Texas
6KBF, Holmes, RM3c, Quantico, Va.
6LBN, Edwards, CRT, Treasure Island, Calif.
6PAR, Arnold, Ens., New York, N. Y.
6QNV, Scott, S1c, Great Lakes, Ill.
6RFX, McQueen, ML3c, El Monte, Calif.
6ROE, Duket, SM2c, foreign duty
6SM, Lindquist, RM3c, foreign duty
6TOT, Rolph, Y3c, Port Hueneme, Calif.
7JCJ, Perkins, S2c, Farragut, Idaho
7JDB, Daily, S1c, Gulfport, Miss.
8ENH, Wolford, S1c, Chicago, Ill.
8IMS, Stoner, RM1c, Annapolis, Md.
8JMK, Knisely, S1c, Great Lakes, Ill.
8KYT, Shaw, S2c, Oxford, Ohio
8NMS, Wilks, F1c, Newport, R. I.
8PMA, Patrick, RM1c, Chicago, Ill.
8SNJ, Roode, S1c, Michigan City, Ind.
8SPF, Brabb, Lt., Port Hueneme, Calif.
8SZV, Watkins, RM1c, foreign duty
8TMI, Cummings, Lt. (jg), Vero Beach, Calif.
8VDY, Swiss, S2c, Chicago, Ill.
8VIV, Mick, RM3c, foreign duty
ex-9COR, Woods, Lt., foreign duty
9DEA, Collett, RM1c, Philadelphia, Pa.
9DPZ, Robertson, S1c, College Station, Texas
9FRB, Epley, S1c, Great Lakes, Ill.
9HHB, Adamson, S1c, Great Lakes, Ill.
9KYX, Shallon, S1c, Great Lakes, Ill.
9LCI, Beatty, Midshipman, Annapolis, Md.
9MKI, Magnuson, S1c, Great Lakes, Ill.
9PPD, Meinholtz, S1c, Great Lakes, Ill.
9QGR, Bayer, S1c, Great Lakes, Ill.
9QWM, Schrock, S1c, Del Monte, Calif.
9RKG, Schuler, Lt., Brooklyn, N. Y.
9SZS, Underwood, RE, Treasure Island, Calif.

Operator's license only:

Anthony, S1c, Great Lakes, Ill.
Horton, S1c, Great Lakes, Ill
Krasnovsky, RM1c, Brooklyn, N. Y.
Larson, S1c, Great Lakes, Ill.
Linitz, S2c, Memphis, Tenn.
Myers, A/S, Dallas, Texas
Zacharias, Midshipman, Annapolis, Md.

NAVY—AERONAUTICS

1DDX, Dillman, ACRT, Patuxent River, Md.
1NES, McGiveney, ART3c, Corpus Christi, Texas
ex-2DYL, Zwitzen, ARM2c, Corpus Christi, Texas
2ING, Rogoff, Lt., Corpus Christi, Texas
2ISV, Falk, ACRM, Jackson Heights, N. Y.
3DLW, Slaughter, ART1c, Floyd Bennett Field, N. Y.
3FYA, Beidlman, ART1c, address unknown
5DFC, Englehardt, ART3c, Corpus Christi, Texas
5IHL, Lechenger, Lt. (jg), foreign duty
5IQL, Brown, ART1c, Lakehurst, N. J.
6KWU, Strassner, ART1c, Klamath Falls, Ore.
6LS, Shepard, Ens., foreign duty
6PMY, Roberts, RM1c, Athens, Ga.
6SPF, Oliver, ART1c, address unknown
7ENJ, Bean, ARM3c, Hollywood, Fla.
8OOO, Hucik, ART3c, Ward Island, Texas
8VNE, Higgins, ART2c, foreign duty
8WSK, Zuehlke, RM2c, Moffett Field, Calif.
9BFY, Holmstrom, ART1c, Clinton, Okla.
9DLC, Black, ART2c, Corpus Christi, Texas
9IGP, Hargrave, ART2c, Gulfport, Miss.
9KRM, Shrefler, ACRT, Camp Kearney, Calif.
9YPX, Luoma, ACRM, College Station, Texas
9YWA, Oboikovitz, Sp(P)2c, Norfolk, Va.

Operator's license only:

Graham, ACRM, foreign duty
Mullins, ART1c, foreign duty

MERCHANT MARINE AND MARITIME SERVICE

THE yokel who made quite a splash on 160 meters, as he expresses it, is now pounding brass on the high seas. W. R. French, W2NYC, spent two years as FRO with PAA, but as nothing eventful happened to him he joined the merchant marine to see places truly "on the land, in the air, and on the sea."

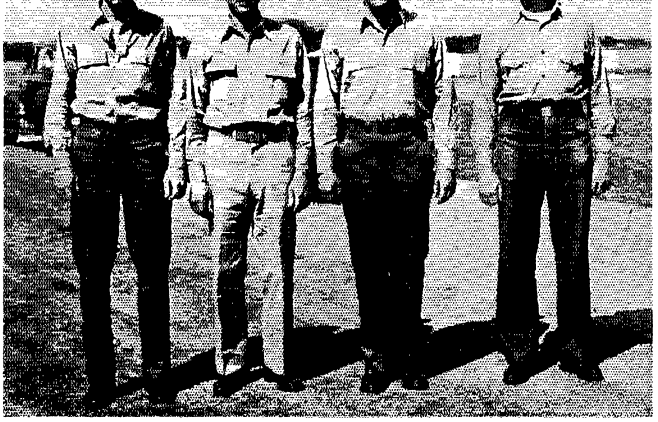
ex-2DM8, Lumb; 3HVK, Phelps; ex-4EKF, Brewer; 4GKL, Shackelford; 4HPA, Goodloe; 5BEH, Stark; 5IDE, Spencer; ex-6CAC, Niklas; 6ESW, Saueressig; 6LER, Orelli; 6MVL, Glass; 7BOH, Kelsey; 7HLA, Roberts; 7HPF, Gilbert; 8AGS, Mazurkiewicz; 8ROI, Hayton; ex-9DWB, Prewitt; 9HGS, Johnson; 9NQP, Munger; 9TKX, Schoening; 9WVB, Wilson. Cool, Doane, and Lewis hold operator's licenses only.

CIVIL SERVICE

ex-1AUI, Cash, Nantucket, Mass.
2DCF, Szumski, Sayville, N. Y.
ex-2ERS, Heisler, OWI, foreign duty
2GVT, Kupferman, Instructor, New York, N. Y.
2HRA, Vallefuoco, CAA, Sayville, N. Y.
2IVD, Storck, SC, Philadelphia, Pa.
2JXF, McNally, Washington, D. C.
2NHF, Guardi, Navy Dept., inspector, Brooklyn, N. Y.
2NWY, Morin, CAA, Sayville, N. Y.
3ACQ, Moffatt, FCC, Washington, D. C.
3BWU, Hollomon, Navy Dept., Portsmouth, Va.
3CBY, Stevens, OWI, foreign duty
3GAW, Ree, SC, inspector, Philadelphia, Pa.
3GHI, Levine, Navy Dept., inspector, Norfolk, Va.
3HLQ, Windes, Silver Spring, Md.
4IR, Jones, College Park, Ga.
5EEN, Anderson, FCC, monitoring officer
5EHR, Jessup, Oklahoma City, Okla.
ex-5EUD, Williams, CAA, aircraft communicator, Moriarty, N. M.
5HHB, Guillot, CAA, aircraft communicator, Beaumont, Texas
5HYL, Boyd, SC, radio repairman, Ft. Sam Houston, Texas
5KCR, Crouse, CAA, aircraft communicator, Brownsville, Texas
5LM, Coleman, Temple, Texas
6EGR, Letsinger, SC, radio engineer, Wright Field, Ohio
6NAU, Rulon, SC, Washington, D. C.
6OMU, Calkins, CAA, aircraft communicator, Daggett, Calif.
K6OTH, Rea, engineer, foreign duty
7ABU, McFadden, Navy Dept., San Diego, Calif.
7BOP, Frost, Navy Dept., inspector, Seattle, Wash.
7CE, Criswell, SC, radio inspector, foreign duty
7FP, Wilson, SC, radio inspector, foreign duty
7HNQ, Manring, CAA, radio electrician, foreign duty
7UK, Schmitt, Navy Dept., radio inspector, Astoria, Ore.
7UO, Barton, SC, radio engineer, foreign duty
8ILR, Litzenberg, engineer, Cleveland, Ohio
8KSM, Gearhart, Navy Dept., radio inspector, Sunbury, Pa.
8MZT, Toney, SC, radio engineer, Red Bank, N. J.
9FTQ, Kiese, SC, inspector, Albany, N. Y.
9GNS, McFall, CAA, aircraft communicator, Minot, N. D.
ex-9OZM, Locatelli, FCC, Allegan, Mich.
9PXW, Boswell, CAA, foreign duty
ex-9YTR, Skoog, engineer, Cleveland, Ohio

Operator's license only:

Clark, CAA, radio electrician, Sayville, N. Y.
Haase, AAF, instructor, Sioux Falls, S. D.



Lt. Arthur M. Monsees, W6HJP, on foreign duty with the AACS, had this picture snapped while he was at an officers' rest home somewhere in the Central Pacific.

PAN AMERICAN AIRWAYS

1BNA, Fisher, CFRO, address unknown
ex-1CJP, Coates, FRO, Coconut Grove, Fla.
1CKI, Ryder, Miami, Fla.
ex-1DLX, LaFantasie, FRO, Coconut Grove, Fla.
1ETV, Johnson, Miami, Fla.
1FAN, Jones, Miami, Fla.
ex-1FHG, Deane, FRO, Coconut Grove, Fla.
1GUO, Roberts, FRO, Miami Springs, Fla
ex-1HZT, Kendall, FRO, Miami, Fla.
1JDE, Greene, FRO, Brownsville, Texas
1JFM, Koivu, FRO, Coconut Grove, Fla.
1JGG, Reed, FRO, Miami, Fla.
1JMZ, Wilbur, RM, Miami, Fla.
1JVP, Fitzgerald, FRO, Miami, Fla.
1KFF, Guertin, FRO, Miami, Fla.
1KIE, Conly, address unknown
1KRN, Maher, FRO, Coconut Grove, Fla.
1MIR, Witherspoon, Miami, Fla.
1MKO, Innis, FRO, Miami, Fla.
1MWT, Heileman, FRO, Coconut Grove, Fla.
1NIH, Lamoureaux, FRO, Miami, Fla.
1NKC, Buckler, FRO, foreign duty
1NRT, Colby, FRO, Miami, Fla.
1NSK, Ellsworth, FRO, Miami, Fla.
1YS, Trop, Miami, Fla.
2NKQ, Shreve, FRO, Miami, Fla.
2NTE, Thompson, address unknown
ex-2NZ, Strout, Brownsville, Texas
3DPQ, Voshell, FRO, Coral Gables, Fla.
3CJI, Brown, FRO, foreign duty
3FBI, Majewski, FRO, Coconut Grove, Fla.
4CNZ, Smith, Miami, Fla.
4CW, Skipper, Brownsville, Texas
4CY, Wade, Miami, Fla.
4EB, Ducat, Miami, Fla.
4GCE, Nehring, FRO, Miami, Fla.
4GGL, Smith, foreign duty
4GNT, Popko, RM, Miami, Fla.
K4GWE, Rogers, FRO, Miami, Fla.
4HFQ, Wyatt, FRO, foreign duty
4HHD, Olsen, FRO, Miami, Fla.
4HLR, Kukla, FRO, foreign duty
4HLV, Hannum, FRO, Miami, Fla.
4HVS, Gilbert, FRO, Miami, Fla.
4HZY, Christy, FRO, foreign duty
4IP, Murphy, Miami, Fla.
4NB, Bowers, Miami, Fla.
4NZ, Pettijohn, Miami, Fla.
4VV, Seignious, Miami, Fla.
ex-5AVB, Miller, Brownsville, Texas
5BIM, Davidson, SFRO, Brownsville, Texas
5BSQ, Miller, FRO, Brownsville, Texas

Another foursome. These amateurs had their picture taken while attached to an aircraft service group on foreign duty. *Left to right:* ACRM H. E. Kchlenbeck, W2MJM; ACRM H. A. Strecker, W9LVW; ACRT F. E. Henry, W8TVD, and ART1c J. W. Campbell, W3BRS.

5CFK, Phares, Brownsville, Texas
5CNX, Serrill, Brownsville, Texas
5CON, Schaefer, SFRO, Brownsville, Texas
5CUX, Hughes, Miami, Fla.
5CZF, Bouer, Brownsville, Texas
5DGU, Mozart, FRO, Miami, Fla.
5EEZ, Hannibal, ACFRO, Brownsville, Texas
5EGP, Hill, Brownsville, Texas
5FAH, Porter, SFRO, Brownsville, Texas
5FEB, Foot, Brownsville, Texas
5FIW, Voss, SRO, Brownsville, Texas
5FPL, Spcer, SFRO, Brownsville, Texas
5FTA, Stuckey, Brownsville, Texas
5GBT, Blackburn, SFRO, Brownsville, Texas
5HIZ, Giese, SFRO, Brownsville, Texas
5HOW, Hill, Brownsville, Texas
5HXV, King, FRO, Brownsville, Texas
5IAY, Dodson, FRO, Brownsville, Texas
5IBA, Rasmussen, Brownsville, Texas
5IFP, Andrews, FRO, address unknown
5JFL, Tell, Brownsville, Texas
5JJC, Cunningham, SFRO, Brownsville, Texas
5JKL, Cleveland, FRO, Brownsville, Texas
5JNU, Bristow, Brownsville, Texas
5JQQ, Watson, FRO, Brownsville, Texas
5JRL, Austin, Brownsville, Texas
5KCJ, Bowers, FRO, Brownsville, Texas
5KQK, Stephens, SFRO, Brownsville, Texas
ex-6AEB, Simpson, Brownsville, Texas
ex-6DEU, Walker, FRO, Coconut Grove, Fla.
6FWJ, Gebhart, FRO, address unknown
6MZV, Best, SRO, Brownsville, Texas
6NPW, Sherbeck, SRO, Brownsville, Texas
6OLL, Leach, RO, address unknown
6RJN, Wiseman, FRO, address unknown
7FUQ, Pine, foreign duty
7GAO, Cross, RM, Brownsville, Texas
7HYS, Eastman, RM, address unknown
7IAN, Harland, FRO, San Mateo, Calif.
8BXI, Batson, Miami, Fla.
8CFJ, Knoth, RM, Brownsville, Texas
8DV, Bloom, FRO, Brownsville, Texas
8EDN, Hanson, Miami, Fla.
8EME, Lehmann, RO, address unknown
8HQN, Trenaman, FRO, address unknown
8IP, Kalmbach, FRO, Brownsville, Texas
8LWB, Todd, FRO, Miami, Fla.
8NAX, Wigton, FRO, Coconut Grove, Fla.
8NVX, Nydoske, FRO, Coconut Grove, Fla.
8PIA, Dankert, Miami, Fla.
8QJM, McNichol, FRO, Brownsville, Texas
8TXP, Newcomer, FRO, Miami, Fla.
8VZL, McClure, JFRO, Brownsville, Texas
8WJI, Freyvogel, FRO, Miami, Fla.
9CXP, Strout, RM, address unknown
9CVR, Marshall, RM, address unknown
9DIN, McIntosh, RM, Brownsville, Texas
ex-9FYG, McAtee, FRO, Miami, Fla.
9GSF, Hughes, RO, foreign duty
9HNI, Nickel, FRO, Brownsville, Texas
9HVN, Potcet, FRO, Miami, Fla.
9IE, Winters, FRO, Miami, Fla.
9JMN, Goodell, SFRO, Brownsville, Texas
9KBG, Lee, FRO, Miami, Fla.
9LDC, Victery, SFRO, address unknown
9NQE, Seits, Brownsville, Texas
9OFN, Graff, Brownsville, Texas
9QMD, Morwood, Miami, Fla.
9RUV, Landfather, FRO, address unknown
9SCB, Gehrs, foreign duty
9TPH, Ransom, FRO, Miami, Fla.
9TSI, Leo, Miami, Fla.
9VDT, Burris, foreign duty
9VFI, Bruce, FRO, Miami, Fla.
9WCZ, Pierson, FRO, Miami, Fla.
ex-9YCM, Nenninger, FRO, Coral Gables, Fla.

Operator's license only:

Betros, Miami, Fla.
Christensen, Brownsville, Texas
Cohick, Flushing, L. I., N. Y.
Ewers, FRO, Miami, Fla.
Jerguson, Miami, Fla.
Kern, Brownsville, Texas
Konash, FRO, address unknown
Patton, FRO, address unknown
Saeger, FRO, Coral Gables, Fla.
Woustto, Brownsville, Texas

These radio artificers at the Naval W/T Station, Newport Corners, N.S., send 73 to all of their amateur friends. *Left to right:* Al Derry, VE3AYN; Ken Walker, VE2GC; Ron Miller, VE4AFH; and Horace Swonnell, VE4AFD.

CANADA

Two hams share the honors for helping make this section as long as it is this time. PO/Tel. Scholes, VE5DY, and R/N Holmes, VE3KT, have sent in separate lists, the gleanings from which have provided us with the majority of VEs listed below. Tnx for your help, OMs. We hope your example will be followed by some other enthusiastic amateur before copy time two months hence.

RCA

4APW, Gillespie, Esquimalt, B. C.
5AFY, Watts, address unknown
5AHK, Walker, foreign duty
5CH, Green, Lt., Victoria, B. C.
5CX, Brand, address unknown
5DH, Kennedy, Lt., address unknown
5OP, Larrigan, Victoria, B. C.
5OQ, Burwood, Victoria, B. C.
5RS, Smith, address unknown

Operator's license only:

Fulmore, Gunner, Victoria, B. C.

RCAF

1CP, Burton, address unknown
3AGH, Wood, address unknown
3ARE, Mack, F/O, foreign duty
3AXB, Graham, Cpl., foreign duty
3ET, Lawrence, S/Ldr., foreign duty
3JP, Laing, address unknown
3SE, Harris, F/O, foreign duty
4ADZ, Caveney, address unknown
4ASL, Hollingshead, P/O, Edmonton, Alta.
4MM, Watts, F/Sgt., address unknown
5AIU, Irons, P/O, Halifax, N. S.
5BI, Naylor, F/O, Vancouver Island, B. C.
5CL, Mather, address unknown
5HE, Toy, address unknown
5HW, Thornburn, address unknown
5SM, Chapman, address unknown

Operator's license only:

Kail, F/O, Edmonton, Alta.

RCCS

3AJR, Hill, Cpl., Ft. Norman, N.W.T.
3BQ, Hodgson, Sub/Lt., Toronto, Ont.
4ALE, Williams, S/Sgt., address unknown
4AMF, Marsden, S/Sgt., address unknown
5EV, Emerslund, foreign duty
ex-50A, Rapp, Major, foreign duty
5UW, Harvard, S/Sgt., address unknown

RCN

2GC, Walker, R/A, Newport Corners, N. S.
2KY, Walton, L/Tel., foreign duty
2PI, Edwards, R/A, St. Hyacinthe, Que.
3AYN, Derry, R/A, Newport Corners, N. S.
3MF, Kernohan, Sub/Lt., Toronto, Ont.
3RO, Walker, Lt., foreign duty

Operator's license only:

Benson, Seaman, Regina, Sask.

RAF TRANSPORT COMMAND

J. A. McLaughlan, who got his operator's license early in the war, expects to rate a VAC rather than a WAC by the time the war ends since his duty as a radio operator with the RAF Transport Command is taking him to all parts of the world. And note the group of other amateurs who are also "Visiting All Continents" in connection with their "ferrying" jobs.

1DH, Tupper, R/N, Dorval Airport, P. Q.
1ES, Meagher, R/O, Dorval Airport, P. Q.
1EU, Highfield, R/O, Dorval Airport, P. Q.
1FT, Fraser, R/N, Dorval Airport, P. Q.
1HT, Cummings, R/O, Dorval Airport, P. Q.
1JK, Tanner, R/O, Dorval Airport, P. Q.
1KV, Shreve, R/O, Dorval Airport, P. Q.
2DF, Mosher, R/N, Dorval Airport, P. Q.
3AFU, Loughridge, R/O, Dorval Airport, P. Q.
3AIK, Rush, R/O, Dorval Airport, P. Q.
3AQM, McMann, R/N, Dorval Airport, P. Q.
3ARL, Gascoigne, R/O, Dorval Airport, P. Q.
ex-3BU, Cross, R/O, Dorval Airport, P. Q.
ex-3EU, O'Brien, R/O, Dorval Airport, P. Q.
3HS, McKinnon, R/O, Dorval Airport, P. Q.
3JB, McIntyre, R/O, Dorval Airport, P. Q.
ex-3KT, Pollock, R/N, Dorval Airport, P. Q.
3LK, Newby, R/N, Dorval Airport, P. Q.
4ARO, Witeman, R/O, Dorval Airport, P. Q.
4CP, Douglas, Pilot, Dorval Airport, P. Q.
4FV, King, Pilot, Dorval Airport, P. Q.
4HI, Newby, R/N, Dorval Airport, P. Q.
ex-4IC, Wileman, R/O, Dorval Airport, P. Q.
5AET, Thorburn, R/O, Dorval Airport, P. Q.
5BY, Hodgson, R/N, Dorval Airport, P. Q.
5DS, Matheson, R/N, Dorval Airport, P. Q.
ex-5JY, Archer, R/O, Dorval Airport, P. Q.
5ML, Johnson, R/N, Dorval Airport, P. Q.

A Receiving-Tube 112-Mc. M.O.P.A.

A WERS Transmitter using 6V6GTs

BY DAWKINS ESPY,* W6UBT

It would seem that almost everything which could be said about receiving-tube transmitters for WERS work has appeared in print. In this article, however, W6UBT shows how to use the much-abused 6V6GT in a new role. The compact m.o.p.a. which he describes is not only more stable than the usual modulated oscillator, but it delivers a 7-watt wallop to the antenna — an output over twice that of a receiving-tube high-C oscillator.

OBTAINING satisfactory high-frequency performance from tubes designed for use at low radio or even audio frequencies has been a constant problem facing the v.h.f. experimenter. On the 112-Mc. band the chief disadvantage of such tubes is their high input and output capacities.

The problem of designing an oscillator-amplifier transmitter to use the 6V6GTs available to KGIL seemed a difficult one. Although this tube has proven its ability as an oscillator, there had been no indication of successful use of it as an r.f. amplifier at frequencies above 14 Mc. or so.

Circuit

The oscillator circuit used in the experiments is the well-known ultraudion with adjustable grid-to-ground capacitance as shown in Fig. 1. Conventional coil-and-condenser tanks were used in both the oscillator and amplifier circuits. It was found that a coil of the dimensions used has as high a Q and is as stable under vibration as the horseshoe-type tank circuit.[1] The failure of the horseshoe to have a higher Q than the coil seems only logical when one considers that if the current is to follow the shortest path, it must soon be following the inner edge of the horseshoe which affords no greater surface than No. 12 wire, since the depth of penetration of the radio-frequency current is less than 1/10,000 inch for copper at 112 Mc. Thus, the path of the current should be made as wide as possible because depth greater than several times the depth of penetration does not assist in carrying the current nor in reducing the resistance. A horseshoe formed from a flat strip of material bent flat-wise instead of edge-wise, so that when seen as a horseshoe, or a **U**, the edge of the material, instead of the flat part, is viewed gives a higher Q because of the larger amount of surface used for conduction.

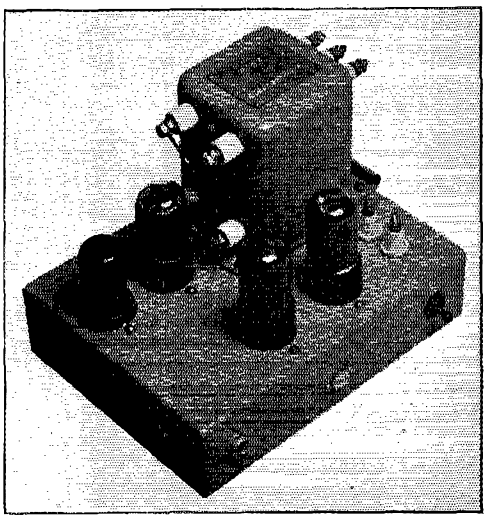
Three different amplifier circuits were tried. First, a 6V6 was connected as a conventional triode with the plate and screen-grid tied together. Plate neutralization was employed and condenser coupling was used between the oscillator plate and the amplifier grid. This system loaded the oscillator heavily, neutralization was difficult and the controls interlocked.

The second amplifier circuit tried was a neutralized grounded-grid triode, sometimes called the inverted amplifier. The cathode was driven while the filament was grounded for r.f. In this instance the tube cathode-to-filament capacity shunted the input, having an effect which was too severe for satisfactory operation. To prevent this, it would be necessary to feed the filament through r.f. chokes. It was decided that the grounded-grid arrangement would not be used because of the two additional chokes required.

The third and most successful circuit was one using a 6V6GT as a conventional plate-neutralized pentode. This connection is shown in the transmitter schematic in Fig. 1. The neutralizing capacity is the stray capacitance of the circuit. Additional neutralizing capacity did not improve the operation with this layout, but may be necessary with different physical arrangements. Bypassing the plate-coil tap to ground causes a marked reduction in output because the point of plate-supply feed is not necessarily the r.f. ground

* WERS Chairman, Linn County Radio Club, 362 30th St. Drive S. E., Cedar Rapids, Iowa.

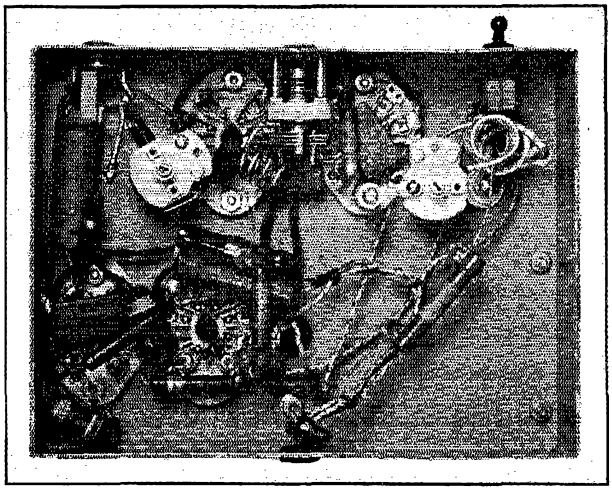
[1] Grammer, "A 112-Mc. Emergency Transmitter," *QST*, December, 1941, p. 14.



Top view of the 6V6GT m.o.p.a. The oscillator tuning condenser, C_1, which controls the frequency is adjusted by screwdriver from the covered opening in the front edge of the chassis. The two audio tubes are at the rear, while the oscillator and r.f. amplifier tubes are in front. The transformer is the modulator-output coupler.

on the coil. The use of the plate choke allows the circuit to be fed at a "hot" point without grounding out any r.f. energy. The stray capacity of the circuit acts as an r.f. ground return.

The audio system consists of a 6C5 speech amplifier bridging the microphone and a 6V6GT modulator. Microphone voltage is supplied from the cathode resistor, R_7, fed through R_8, and blocked from the grid of the speech amplifier by C_8. This system replaces the usual microphone transformer and battery. Such a large modulation transformer was used because it was included in the parts available to the KGIL WERS group.



In the bottom view of the transmitter the three air tuning condensers are at the top. Coils are soldered directly to the condenser terminals, the coils being mounted so that their axes are at right angles.

Construction

The transmitter is built on a chassis $2 \times 6 \times 7\frac{1}{2}$ inches. In the top-view photograph, the 6C5 speech-amplifier tube is at the left along the back edge. The 6V6GT modulator is in the center and the modulation transformer to the right. In front, the tube on the left is the oscillator, and the r.f. amplifier is on the right. The antenna terminals are at the extreme right. On the front vertical portion of the chassis are the microphone jack, the oscillator tuning condenser, C_1, and the send-receive switch, S^1.

In the bottom-view photograph, the feed-back condenser, C_3, is shown in the upper left-hand corner, fastened to the grid and unused No. 6 terminals of the oscillator-tube socket. C_1, the oscillator tuning condenser, is in the center and C_5, the amplifier-plate tuning condenser, is on the right. L_1, the oscillator plate coil, is mounted directly on its associated variable condenser, while L_2, the final-amplifier plate coil, is supported between the amplifier plate tuning condenser and the plate terminal of the amplifier-tube socket. The oscillator and amplifier sockets are placed just far enough apart to accept the length of the coupling condenser, C_4. C_6 is shown as a stray neutralizing capacity. Neutralization can be checked by the usual grid-current method.

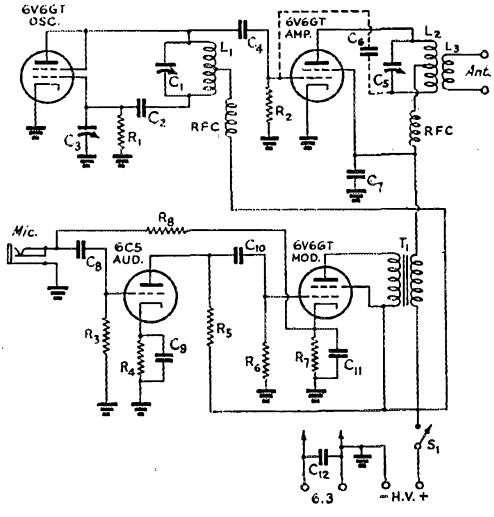
The oscillator grid condenser, C_2, may be seen between the oscillator tank coil and the oscillator feed-back condenser. The oscillator grid resistor is under the oscillator feed-back condenser. The amplifier plate-circuit by-pass condenser and grid resistor are just to the right of the oscillator tuning condenser. The r.f. chokes may be seen in the lower portion of the photograph.

The arrangement of the audio parts is conventional. The microphone lead is shielded to eliminate any tendency toward r.f. feed-back.

The oscillator frequency is set by adjusting C_1. C_3, the feed-back control, should be varied to obtain maximum output. C_3 also affects the frequency, thus readjustment of C_1 may be necessary

Fig. 1 — Circuit diagram of the 6V6GT m.o.p.a.

C_1, C_3, C_5 — 30-$\mu\mu$fd. midget variable.
C_2, C_4 — 100-$\mu\mu$fd. midget mica.
C_6 — Neutralizing capacity. (See text.)
C_7, C_{12} — 0.002-μfd. mica.
C_8, C_{10} — 0.01-μfd., 400-volt paper.
C_9 — 25-μfd., 50-volt electrolytic.
C_{11} — 10-μfd., 25-volt electrolytic.
R_1 — 25,000 ohms, 1 watt.
R_2 — 30,000 ohms, 1 watt.
R_3 — 350,000 ohms, ½ watt.
R_4, R_8 — 2000 ohms, 1 watt.
R_5 — 100,000 ohms, 1 watt.
R_6 — 350,000 ohms, ½ watt.
R_7 — 350 ohms, 10 watts.
L_1 — 3 turns No. 12, ½-inch diameter, ⅝-inch long, center tapped.
L_2 — 5 turns No. 12, ⅝-inch diameter, ⅞-inch long, center tapped.
L_3 — 2 turns, ⅝-inch diameter, flexible wire.
RFC — Ohmite Z-1 or 1⅛-inch winding of No. 28 wire single cotton-covered close-wound on ¼-inch form.
T — Modulation transformer, 5000-ohm primary, 5000-ohm secondary.
S — S.p.s.t. toggle.



to obtain the desired frequency. At a plate potential of 325 volts, the oscillator draws about 50 ma. when loaded, and the grid current of the amplifier is approximately 1 ma. C_6, the plate tuning condenser of the amplifier, next should be tuned to a dip of 50 ma. with the antenna connected. The entire tuning operation may be accomplished with a loosely coupled pilot-light tuning loop, once the antenna coupling has been adjusted. Proper adjustment of the antenna coupling will reduce the pilot-light brilliance to approximately one-third of the unloaded value.

The gain of the audio system is sufficient for most single-button carbon microphones. The gain may be increased by using a 6F5 or 6SF5 in place of the 6C5 speech-amplifier tube. There is no volume control. The 6V6GT modulator delivers 4.5 watts output and draws 65-ma. plate current.

The improvement in using a 6V6GT as an r.f. amplifier compared with operation as an oscillator is quite marked. Approximately 7 watts output can be obtained which is considerably more than that available from the oscillator alone. The high grid losses which must be supplied in the case of the oscillator undoubtedly account for the large difference in efficiencies. Frequency modulation is negligible and over-modulation more difficult to obtain than with a modulated oscillator.

Acknowledgment

Appreciation is expressed to Noble Hale, W9JIH, radio aide, and to John Reed, WERS operator, for their assistance in the design and construction of the transmitter, and to Clifford Lawrence, W9FPE, who took the photographs.

SEPTEMBER, 1919, *QST* reports with mounting indignation that amateur radio is not yet reopened and no information is forthcoming why. The Navy Department, which has had control of radio during the war, had an order prepared to reopen us on August 1st but simultaneously postponed it without explanation and sent a letter to both houses of Congress requesting "a comprehensive system of regulation and control" of radio, with new legislation which would give the Navy a monopoly of international and ship-to-shore radio. While there seems to be no connection between the two actions, the sad fact remains that we are not open. Secretary of the Navy Daniels is in Hawaii. We have interviewed the assistant secretary, Franklin D. Roosevelt. He says that Mr. Daniels personally disapproved the reopening order and he doesn't know why. We plainly pointed out to Mr. Roosevelt "the bad odor overhanging the whole affair and the extreme desirability of a statement by the Navy explaining why we are held up and what we may expect, if the suspicion with which the amateur world regards the Navy Department is to be eliminated" — in view of the Navy's attempts late the previous year to eliminate us. He promised to radio Mr. Daniels, who apparently is personally responsible. Our Board of Direction [1] is fed up with the delay and has appointed a committee to go to Washington to arrange for the introduction of a resolution demanding the restoration of amateur radio and to take any necessary actions to oppose any increase in the difficulty of the regulations surrounding amateur radio.

Canadian amateurs have been released since May 1st, with a power of 500 watts but with odd wavelength restrictions: If within 75 miles of a government or commercial station or navigation route, a wavelength of 150 meters may be used. If within 25 miles, 100 meters is the maximum wavelength; while within 5 miles, one must get down to 50 meters.

Several clubs have been affiliated under the recently-announced program. The first one to form this tie with ARRL is the Council Bluffs (Iowa) YMCA Radio Club.

There are no ham signals to listen to, so we're still copying long waves. Bill Woods, 9HS, draws on his Navy experience at Otter Cliffs and describes a fixed loop 40 feet long, 10 feet high, 3 feet above ground, bearing 10 turns spaced 8 inches on cross-arms. J. A. Crowdus, 9HN, gives a design for a three-circuit receiver with home-made spool coils that will go to 12,000 meters. Block "B" batteries, as made by Burgess for the military services, have appeared on the amateur market and are a great convenience. Jewell has brought out a h.f. ammeter embodying a thermocouple instead of the usual expansion wire. Some of the war's inventions must be debunked, however: Loops, although good, do not answer everything; to be as good as an aerial they must be as big as an aerial. The new hard tubes are good as oscillators and excellent as amplifiers but are insensitive as detectors — our old soft amateur tubes are much better. Talking tube transmitter circuits, the editor wonders "how long it will be before we have sets transmitting and receiving on the same tubes and oscillating circuits." An editorial points out that it's the combination of the small boy plus the spark-coil squeakbox that causes QRM troubles; hasn't somebody a scientific design for a spark-coil set that even a small boy can use without getting into trouble? The editor also presents a fancy design for a high-speed nonsynchronous rotary gap that ought to offer exceptional quenching. It has ball bearings, a hydrocarbon envelope, dissimilar metals in its electrodes, and streamlining. He hasn't actually built one — he hopes that somebody else will.

[1] The Board of Direction at this time consists of Hiram Percy Maxim, president, Hartford; R. H. G. Mathews, vice-president, Chicago; J. O. Smith, traffic manager, Rockville Center, L. I.; C. R. Runyon, jr., treasurer, Yonkers, N. Y.; K. B. Warner, secretary, Hartford; Victor F. Camp, Brightwaters, L. I.; John C. Cooper, jr., Jacksonville, Fla.; Frank M. Corlett, Dallas; W. T. Fraser, Buffalo; W. Treadway Gravely, Danville, Va.; Arthur A. Hebert, Nutley, N. J.; H. C. Seefred, Los Angeles; Chas. A. Service, jr., Bala-Cynwyd, Pa.; Capt. W. H. Smith, Denver; Howard L. Stanley, Babylon, L. I.; Chas. H. Stewart, St. David's, Pa.; and Clarence D. Tuska, Hartford.

"Tiny Tim"

A "QSL"-Size Portable Receiver

BY PAUL J. PALMER,* W8UGR

"Hi, there, fellers," said Tuffy 6L6G, "dat nut 8UGR's back agin — he soitenly mus' like ta see his name in de poipers — but ennyhoo, here's a swell lil outfit t' match dat putter outer in July Quist. 'Tiny Tim' 'll pull 'em in t' beat de dickens. Hey! Don't trow dat — d' ya wanna hoit sumbuddy? Put dat pineapple down 'n' crawl in de fox hole. Well, gang, me lil pal 1D8GT — de haff pint — 'll durn near knock dem cans offen yer bean. 'Tiny Tim' kin stow in yer lunch box 'n' help ya keep de code up t' date 'n' t' wot dat dere perfishensy stifficket sez ya kin do. So, fellers, keep d' chin up 'n' hows 'bout a P.O. sked wid sum ob de ol' boys wot's stuck at home? Gud luck 'n' 73."

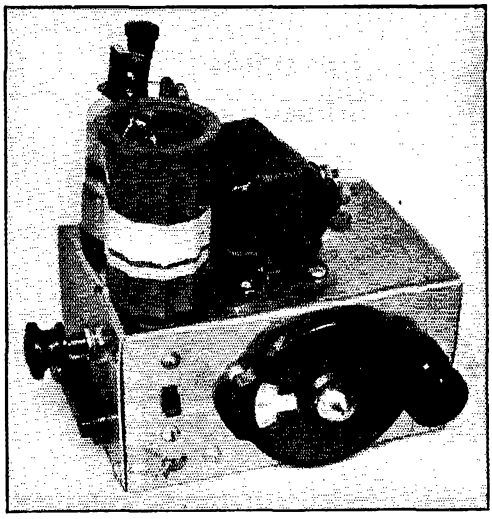
IN PRESENTING "Tiny Tim," the writer has endeavored to provide a companion piece to the "QSL"-size transmitter described in the July issue of *QST*.[1] It is a single tuber, but has the capacity to produce as much volume as did the two-tube receivers of a few years back. The circuit diagram is shown in Fig. 1. The multipurpose-type 1D8GT tube possesses the desired qualities for just such a receiver as this one — an ultra-portable unit complete with batteries. This tube is a combination diode, triode and pentode in one envelope. The diode portion is not used; but the triode section performs as a regenerative detector, while the pentode section serves as the audio amplifier.

The familiar parallel-condenser system of bandspread tuning is used. C_1, mounted in the coil form, is the bandset condenser, while C_2 provides bandspread tuning and is controlled by the tuning dial. With S_3 open, the system is designed to tune to the 3.5-Mc. band. Closing S_3 short-circuits part of the winding of L_1, making it possible to tune to the 7-Mc. band. By resetting C_1, an unbroken range of about 2200 to 8500 kc. may be covered in steps. Simple capacitive antenna coupling is used.

Regeneration is controlled by a low-resistance variable resistor, R_2, in series with a fixed condenser, C_6, shunted across the tickler winding, L_2. This system is well known to be very quiet in operation and to have a minimum of detuning effect with very smooth control of regeneration.

A 45-volt hearing-aid battery supplies plate voltage for both detector and audio amplifier, while a single flashlight cell suffices for filament supply. Since the drain on batteries is light, they should last for a considerable length of time.

Transformer coupling is used between the detector and the audio amplifier which feeds the headphones. At the plate voltage used, 4.5 volts of grid bias is required. This may be obtained from three small "penlite" cells connected in series.



Front view of the "Tiny Tim" portable receiver. The coil, tube and audio transformer occupy the top of the chassis. To the left of the tuning dial are the coil-shorting switch, S_3, above, and the "B"-battery switch, S_2. On the left-hand edge are mounted the regeneration-control resistor, R_2, and the tip jacks for connecting headphones. The antenna terminal is fastened to the open end of the coupling condenser, C_4.

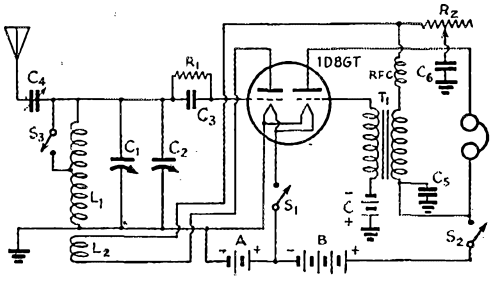


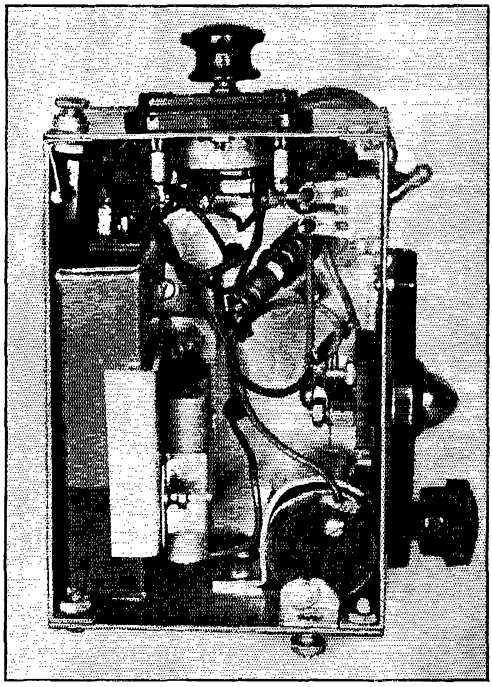
Fig. 1 — Circuit diagram of the "QSL"-type portable receiver.

C_1 — 100-$\mu\mu$fd. midget-type air trimmer.
C_2 — 20-$\mu\mu$fd. midget variable.
C_3, C_6 — 100-$\mu\mu$fd. mica.
C_4 — 3-30-$\mu\mu$fd. mica trimmer.
C_5 — 0.5 μfd.
R_1 — 3 megohms.
R_2 — 6000-ohm variable with switch, S_1, attached.
L_1 — 40 turns No. 28 d.s.c., 1½ inches diameter, 1¼ inches long, tapped at approximately 8th turn from ground end.
L_2 — 7 turns No. 28 d.s.c., on same form as L_1, turns close wound.
S_1 — S.p.s.t. (attached to R_2 mentioned above.)
S_2 — S.p.s.t. switch.
S_3 — Low-loss s.p.s.t. switch.
T_1 — Interstage audio transformer.
RFC — 2.5-mh. r.f. choke.

A — 1.5-volt flashlight cell, large size.
B — 45-volt hearing-aid battery.
C — 4.5-volt "C" battery (three "penlite" cells connected in series).

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

[1] Palmer, "A QSL-Type Transmitter with Transformerless Supply," *QST*, July, 1944, p. 56. (Note correction under "Feedback," *QST*, August, 1944, p. 80.)



The bottom view of the "QSL"-type receiver shows the wiring and batteries underneath the chassis. The "B" battery is held along the left-hand side of the chassis by means of a metal clamping piece. The three "penlite" cells which form the "C" battery are immediately to the right, while the flashlight-cell "A" battery may be seen in the lower right-hand corner. The variable condenser at the right is C_2, the bandspread tuning condenser. The regeneration-control resistor, R_2, is at the top.

Construction

Details of construction may be followed by referring to the photographs and sketches. The chassis is the same size as that used for the little transmitter described in the July issue, being $3\frac{9}{16} \times 5\frac{9}{16} \times 3$ inches. The lay-out sketch of Fig. 2 shows the construction of the chassis. The small flanges at either end of the front and rear sections are bent to fit inside the right- and left-hand sections to which they are fastened by means of machine screws and nuts. This constitutes an improvement over the chassis described for the companion transmitter, since the result is a much stronger job. At the same time, this method of construction entails no additional material and very little extra work.

The two sockets are located at the left, with the five-prong socket for the coil in front and the octal socket for the tube at the rear. They should be of the snap-ring-mounting type so that they may be mounted close to the edge of the chassis. The audio transformer is mounted in the center of the chassis.

The tuning condenser, C_1, and dial are mounted on the front edge of the chassis slightly to the right of the center so as to provide room for the stand-by and band-change switches, S_2 and S_3. Care should be taken to leave sufficient space for the "A" battery in the corner when the tuning condenser is installed.

The regeneration control, R_2, and the filament switch, S_1, are combined and the unit is fastened underneath on the left-hand edge of the chassis. Below it is the 'phone-tip-jack block. This should be of the fully insulated type.

Underneath, a small Z-shaped metal bracket fastened to the top of the chassis clamps the "B" battery in place. Another smaller U-shaped clamp fastened to the Z clamp holds the bias-battery cells in position. The "A"-battery cell is held in the corner by means of a large cable-type clamp. This clamp also contacts the zinc or negative terminal of the battery, while a bakelite-mounted contact fastened to the end of the chassis furnishes the positive connection.

Coil Winding

While a coil form without pins could be mounted permanently on the chassis and thereby eliminate the necessity for one of the sockets, the plug-in arrangement will be found convenient in making coil adjustments. The sketch of Fig. 3 shows how connections are made to the coil-form pins and the socket prongs. There should be a space of about one-eighth inch between the tickler winding, L_2, at the bottom of the form, and the grid winding. The required number of turns for L_1 should be spaced out so that the length of this section of the winding is $1\frac{1}{4}$ inches long. The turns of L_2 are wound close together.

The tap for 7 Mc. can be made quite easily by temporarily spreading the turns either side of the

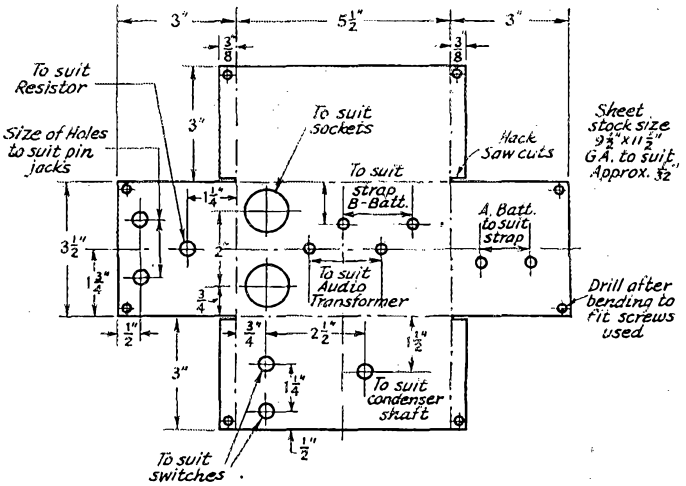


Fig. 2 — Sketch showing "Tiny Tim's" chassis lay-out and dimensions. The chassis is cut from light aluminum sheet.

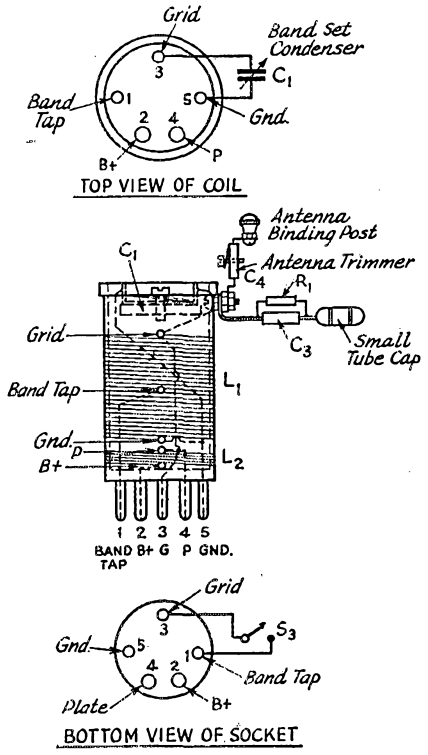


Fig. 3 — Sketch showing connections to the coil and socket for the portable receiver. The antenna coupling condenser, C_4, as well as the grid condenser, C_3, grid resistor, R_1, and the tube cap connector are fastened to the top of the coil form by a small machine screw. C_3 is mounted inside the form with a connecting lead running from each of its terminals to pins in the bottom of the form. L_1 and L_2 should be spaced about ⅛ inch.

tapped turn, drilling a small hole in the form alongside the turn and then pushing a lead up through Pin No. 1 and thence through the hole so that it can be soldered to the turn. After the tap has been made and the windings adjusted for proper operation, the wire should be given a coat of coil dope to hold the turns in place.

The bandset condenser, C_1, is of the midget air-variable type which will fit inside the coil form. The antenna coupling condenser, C_4, is fastened to the top of the coil form by means of a small machine screw, as shown in Fig. 3. This sketch also shows how the grid leak, R_1, grid condenser, C_3, and the grid cap for the 1D8GT are mounted by the same screw.

Adjustment

There are a few preliminary adjustments which must be made experimentally before the receiver is ready for use. First, with S_3 open, the bandset condenser, C_1, should be set at maximum capacity. If the detector does not oscillate over the range of the bandspread condenser, C_2, with the antenna connected and R_2 at half maximum resistance, it may be necessary to add a turn or two to L_2. If oscillation ceases at only one or two spots in the range, it should be possible to eliminate these "dead" spots by readjustment of the antenna coupling condenser, C_4.

The next step is to adjust the tuning to cover the 3.5-Mc. band. This can be done with sufficient accuracy with the aid of an absorption-type frequency meter. With C_1 set at approximately half maximum capacity, the frequencies with C_2 set at minimum capacity and at maximum capacity should be checked. The band of frequencies covered should be somewhat wider than 500 kc. If the band is less than 500 kc. wide, the capacity of C_1 should be reduced slightly and the bandwidth checked again. This process should be repeated until the desired band coverage has been obtained.

If the *band* is too low in frequency after the correct band-width has been reached, turns must be removed from L_1. On the other hand, if the band is too high in frequency, a turn or two may have to be added. Each time the coil is changed, the band-width as well as the position of the band should be checked as described above.

The same process is followed in adjusting the coil to cover the 7-Mc. band with S_3 closed, except that it should be borne in mind that this band is only 300 kc. wide and that coil adjustments are made by moving the tap instead of changing the number of turns. For proper bandspread at 7 Mc., C_1 should be set near maximum capacity as a starting point. The shaft of C_1 should be marked in some manner so that it may be reset accurately each time a shift is made from one band to the other. Frequencies in between the bands may be covered by setting C_1 for the desired band of frequencies.

As a final adjustment, the regeneration should be checked to make sure that control is satisfactory on both bands. This may call for a slight alteration in the number of turns on L_2. It should be possible to find a compromise setting for C_4 which will provide both satisfactory signal strength and freedom from "dead" spots.

The cost of this little receiver should run not much more than five or six dollars, including batteries and tube. Together with the "QSL"-type transmitter described in the July issue, one should be able to build a complete station at a cost of around fifteen dollars, perhaps less if the junk box is raided for old parts.

★ FEEDBACK ★

ON page 23 of June *QST*, right-hand column, a couple of plus (+) signs got in where equal (=) signs should have been. The corrections are as follows:

$$Y_2 = \frac{250{,}000}{Z_2^2} - \frac{j(-200{,}000)}{Z_2^2}$$

$$= \frac{250{,}000 + j200{,}000}{250{,}000^2 + 200{,}000^2}.$$

And a few lines further down the page:

$$Y_{ab} = Y_1 + Y_2 = 10 + j0 + 2.44 + j1.95$$
$$= 12.44 + j1.95 \text{ micromhos.}$$

Kw. vs. Kva.

The Effect of Power Factor upon Transformer Ratings

BY HENRY B. O. DAVIS,* W4HZI

In simple language, W4HZI explains why transformers are rated in kva. or volt-amperes instead of kw. or watts. The article is written particularly for the man in the service who may have to work with transformers, even though he has had little opportunity to delve deeply into a.c. theory.

DESPITE the volumes of material written on the subject, each new crop of radio men from the many training schools now in session brings a large percentage of men into the radio field to whom the terms *kva.* and *kw.* are one and the same thing to be used interchangeably. This is largely because sufficient stress has not been placed on alternating-current theory. Radio-installation engineers are often called upon to calculate the power requirements for a station and its associated buildings housing a large variety of electrical equipment. The importance of having in mind the distinction between *kw.* and *kva.* (or the smaller units *watts* and *volt-amperes*) cannot be over-emphasized.

When studying Ohm's Law we say that power in watts may be calculated by multiplying volts and amperes.

$$W = EI = VA,$$

where W = power in watts

$E = V$ = voltage

$I = A$ = current in amperes

Thus, when we are dealing with direct-current circuits, the power in watts is equal also to the volt-amperes. With alternating-current circuits, however, the *power* delivered to the load may be but a small percentage of the volt-amperes delivered by the transformer or alternator. The reason for this is, of course, that in many a.c. circuits the current and voltage are not in phase.

At this point it might be well to say a few words concerning the relation between power factor and phase angle. In Fig. 1-A we have a simple circuit consisting of an inductive reactance in series with a resistance. Such a circuit might represent an induction motor under a certain load condition. While the same current flows in all parts of the circuit, the voltage across the resistance is in phase with the current, but the voltage across the inductance leads the current by 90 degrees. The terminal voltage, E, is the resultant of these two voltages and leads the current by an angle, θ, or as more often expressed, the current lags the applied voltage by the angle θ. This angle is called the phase angle and may be computed from the circuit parameters by

$$\tan \theta = \frac{X_L}{R}$$

The cosine of this angle is called the power factor, or

$$P.f. = \cos \theta = \frac{R}{Z},$$

Where Z is the load impedance resulting from the combination of X_L and R.

An examination of Fig. 1-B will show that since the terminal voltage E is not in phase with the current it is not all effective in producing power. There is a component of E, designated

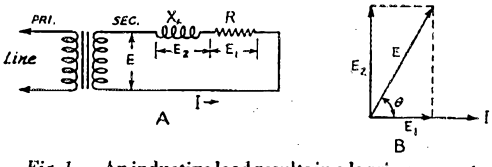


Fig. 1 — An inductive load results in a lagging current. A — Typical transformer circuit with inductive load. B — Equivalent vector diagram.

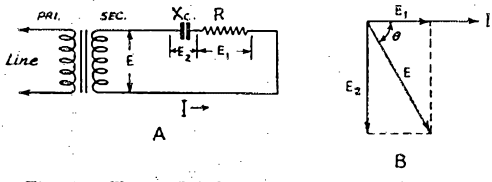


Fig. 2 — These sketches illustrate the effect of a capacitive load. A — Typical circuit with capacitive load. B — Vector diagram showing phase relationships between the various voltages of A.

E_1, which is in phase with the current, I. E_1 represents the voltage developed across the resistance of Fig. 1-A and since this voltage is in phase with the current in the resistance the power developed is given by

$$W = E_1 I$$

This is the total power dissipated in the load, since no power is expended in a pure reactance. Since

$$\cos \theta = \frac{E_1}{E}$$

$$E_1 = E \cos \theta$$

or the power consumed by the load is

$$W = EI \cos \theta$$

* Adams Apts., E. Park and Franklin Sts., Tallahassee, Fla.

If the load is inductive the current lags behind the voltage and the power factor is said to be lagging. If the load is a predominantly capacitive reactance the current will lead the voltage and the power factor will be leading. Fig 2 shows a circuit developing a leading power factor. There again, power is consumed in the resistance only. Fig. 2-B shows the equivalent vector diagram.

If the current is in phase with the terminal voltage because the load is purely resistive, the angle between the voltage and current will be zero degrees. The cosine of zero degrees is 1 and, as a result, $EI \cos 0$ reduces to EI.

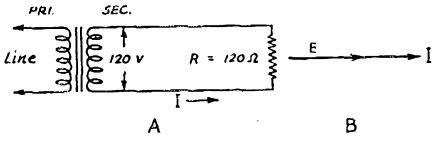


Fig. 3 — A — Transformer with a resistive load. B — Current and voltage are in phase.

In Fig. 3-A is shown a 120-volt transformer connected to a 120-ohm resistive load. The current will be

$$I = \frac{E}{R}$$

$$I = \frac{120}{120} = 1 \text{ ampere.}$$

The current and voltage are in phase so the power is equal to their product.

$$W = VA$$
$$= (120)\ (1)$$
$$= 120 \text{ watts.}$$

This is the condition for *unity* power factor.

In Fig. 4 we have assigned, for purposes of illustration, the value of 30 ohms to the resistor with an inductive reactance of 52 ohms for the coil. The circuit is similar to that shown in Fig. 1. The impedence of this load is given by the equation

$$Z = \sqrt{R^2 + X^2}$$
$$= \sqrt{30^2 + 52^2}$$
$$= 60 \text{ ohms approx.}$$

The load current will be

$$I = \frac{E}{Z}$$

$$I = \frac{120}{60}$$
$$I = 2 \text{ amperes}$$

The power factor will be

$$P.f. = \cos \theta = \frac{R}{Z}$$
$$= \frac{30}{60}$$
$$= 0.5 \text{ or } 50 \text{ per cent}$$

The power consumed by the load is, therefore,

$$W = E\ I \cos \theta$$
$$= (120)\ (2)\ (0.5)$$
$$= 120 \text{ watts.}$$

Here again we have the same power as in the first example but the current has doubled. By further reducing the load resistance and maintaining the inductive reactance constant, the current would increase as the impedance decreases, but, at the same time, the power would decrease because of the decreasing power factor. At the limiting value of zero resistance the power will have dropped to zero while the current flowing will be limited by the reactance to a value

$$I = \frac{E}{X_L},$$

where X_L is the inductive reactance. This is known as "wattless" current, since no power is delivered to the load. However, it is definitely not wattless insofar as the transformer is concerned. This current may be of such magnitude that the RI loss in the transformer is sufficient to burn it up. Thus we see that merely stating the power consumed by the load is not sufficient to determine what transformer is necessary. A transformer designed for a 1500-watt load at unity power factor would burn up very quickly if called upon to deliver that load at a power factor of 50 per cent. For this reason transformers designed for power use are rated in volt-amperes or kilovolt-amperes.

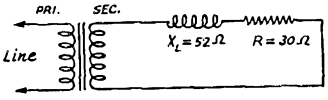


Fig. 4 — Circuit illustrating computations in text.

As an example, a transformer rated at 1.5 kva. and connected for 220-volt operation is designed for a full-load current of

$$I = \frac{1500}{220}$$
$$= 6.82 \text{ amperes}$$

This is the maximum current which should be drawn from the transformer continuously at 220 volts, regardless of the power factor. At unity power factor this would be equivalent to 1500

(Continued on page 69)

TABLE I

Power available from 1.5-kva. transformer at various power factors. Output constant at 1500 volt-amperes

P.f.%	*E*	*I*	*Load Power Watts*
100	220	6.82	1500
80	"	"	1200
60	"	"	900
40	"	"	600
20	"	"	300
0	"	"	0

HAPPENINGS OF THE MONTH

AMATEUR FREQUENCIES

IT IS now possible to report some progress in the study of postwar radio allocations in this country, including amateur, which we know will be good news to you all.

Studies have been going on for many months in several quarters. In general, these can be thought of as two independent kinds of postwar planning, one by Government and one by the civilian radio services and industry. The time will come when these two will merge and result in a final U. S. plan. Although that is still a considerable time away, definite progress has been made.

On the civilian side, a considerable number of nonprofit organizations in the radio art have combined to form the Radio Technical Planning Board, which after extensive studies will publish recommendations, including suggested frequency allocations, for the information of Government (meaning chiefly FCC), the industry and the public. ARRL is one of the contributing sponsors in RTPB and an active participant in its work, being represented therein by Messrs. Bailey, Grammar, Read and Warner. RTPB has an administrative committee and thirteen study panels, the latter being divided into numerous committees. They hold their meetings chiefly in New York. Hundreds of people are participating in the work. The mimeographed minutes and documents come out by the ton. Everybody in the radio art has had to buy a new filing cabinet to accommodate RTPB documents. Most of the panels represent individual radio services. While, in addition to dealing with their interior standards, they individually report what frequencies are needed for their services, the task of reconciling the conflicts and arriving at a recommended allocation ladder is lodged in a separate panel, No. 2, under the chairmanship of Dr. C. Byron Jolliffe. It has two committees, dividing the work at 30 Mc. The studies of the other panels have now progressed to the point where Panel 2 has some grist to chew on, and meetings have begun. Some of the panels have not yet reported their frequency requests but, as of this writing, we can say that the statements of requirements so far put forth, with one very minor exception, do not at all trespass upon amateur bands. It is too early to assume that there will be no competition from the "commercials" for our frequencies, but we are pleased to report to you that there is a universal disposition to recognize the high national value of the amateur. While in any event ARRL, as one of the sponsors, has the right to make a separate minority report if necessary, members will be glad to know that the other groups in RTPB accept us as a service for which a thoroughly satisfactory allocation must be made. It should also be borne in mind that RTPB represents only the civilian industry, can only recommend, and that final determinations are of course to be made only by the Government, pursuant to its usual processes. It will probably be late in the year before RTPB finishes its recommendations.

The Department of State is engaging in extensive postwar studies in many fields, through special committees. One of these is its Special Committee on Communications. SCC's subcommittees include one on technical matters, made up of ranking experts from various government agencies — personnel of the same caliber as make up the Interdepartment Radio Advisory Committee which handles allocations for the Government. Indeed, IRAC itself has participated in the work, for it embarked upon a postwar allocation study in its own name many months ago. The Government committee has now prepared a first draft of proposed postwar changes. This was a closed Government job, of course, without outside participation — indeed, a "classified" project — but it was done by representatives of those Government departments with which the League perpetually maintains close contact as a matter of course, and to whom amateur radio is well known. The Department of State, it is now announced, will hold a series of meetings at which interested groups in the radio art will be asked to assist in a further examination of the work. ARRL will participate, in representation of the amateur. Although RTPB work will not be finished in time for these meetings, industry and Government will be getting together to work out the best possible plan for the country. We wish we could tell you about the proposed changes, for they are immensely interesting, but they are restricted and may not be published. In any event they are but a first draft and there are months of work ahead before final decisions will be made.

It is important to remember, in the interests of perspective, that U. S. planning does not settle the matter, either. The country is a free agent only with respect to frequencies that cause no international interference. The rest must be subjected to regional or world treaty conferences, so the road is a long one. To a considerable extent it is true that all this United States work simply looks ahead to the next world-wide conference, whenever that can be held. Meanwhile, it is reported that an Inter-American Regional Conference, originally scheduled for last year in Rio de Janeiro, will be held in that city next January.

Thus, although the process of revamping the world's radio rules is a long and exceedingly complex one, it can be said that progress is being made and that the shape of things begins to be

visible. The officials of ARRL keep themselves in close touch with this work — always have done so. The fact that you don't read about it very often in *QST* doesn't indicate the contrary — and don't let anyone tell you so. We're sorry that we can't report interesting news oftener in *QST*. We're itching to, but we can't. The most interesting developments are of a nature that cannot be made public during the war's restrictions. We are, however, right in there, even though we can't talk about it.

Meanwhile, we know no reason why we cannot say that there are no grounds for pessimism over the future of amateur radio. Amateur radio has stronger friends than ever before, because it has proved itself an invaluable institution in this war. Nothing has been settled yet and we can speak only of the past year of hard work when we say that the outlook for our future was never better. We do not know with certainty what the impact of commercial needs will be on us. We do not know what the outcome of the inescapable international conferences will be. We don't know that we're not going to be run over by a truck tomorrow, either.

But we've got plenty of accident insurance against the contingency — and the same is true of ARRL and amateur radio with respect to getting back on the air. We do know that things have gone well, that the outlook is good, and that if the traditional friends of amateur radio have their way, an adequate provision for postwar amateur radio is assured.

Washington, D. C.
From recent developments here in Washington, I firmly believe amateur radio will go back on the air after this war is over.
— *George W. Bailey, President, ARRL*

KILOWATT 'PHONES WANTED

BROADCASTERS have difficulty buying transmitters these days. Occasionally ARRL Hq. has a call from a broadcaster wanting to know where he can purchase a good solidly-built kilowatt ham 'phone transmitter, complete with speech end, capable of being rebuilt to a broadcast frequency. We think some of you fellows would possibly like to sell your rigs, with a view to building new ones after the war. You can probably get a very decent price now. Unlike all the other requests we have previously received, composite or homemade transmitters are acceptable in this service if the job is well done. And if the rig is capable of operating at a California kilowatt, so much the better.

If you're interested in selling your rig, write to ARRL, describing it and attaching a photograph. Give the tube line-up, including the speech end. State the lowest frequency on which the rig operates. Estimate the highest Class-C input power under which it would stand up in *continuous* duty. Describe the rig sufficiently to give a prospective purchaser a good impression of it. Name your cash price, boxed and delivered to local transportation agency. We'll pass your dope along to inquirers and the rest will lie between them and you.

ELECTION NOTICE

TO ALL Full Members of the American Radio Relay League residing in the Central, Hudson, New England, Northwestern, Roanoke, Rocky Mountain, Southwestern and West Gulf 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 1945–1946 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, 1944, 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 1945–1946 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, 1944. 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 Full Members in good standing. It is not necessary that a petition name candidates both for director and for alternate but members are urged to interest themselves equally in the two offices.

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

Present directors and alternates for these divisions are as follows: Central Division: director, Goodwin L. Dosland, W9TSN; alternate, Everett H. Gibbs, W8AQ. Hudson Division: director, Robert A. Kirkman, W2DSY; alternate, George Rulffs, jr., W2CJY. New England Division: director, Percy C. Noble, W1BVR; alternate, Clayton C. Gordon, W1HRC. Northwestern Division: director, Karl W. Weingarten, W7BG; alternate, R. Rex Roberts, W7CPY. Roanoke Division: director, Hugh L. Caveness, W4DW; alternate, J. Frank Key, W3ZA. Rocky Mountain Division: director, C. Raymond Stedman, W9CAA; alternate, Willard C. Wright, W9BQO. Southwestern Division: director, John E. Bickel, W6BKY; alternate, Eldridge E. Wyatt, jr., W6ARW. West Gulf Division: director, Wayland M. Groves, W5NW; alternate, Jennings R. Poston, W5AJ.

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 1, 1944.

MIDWEST ELECTION RESULTS

CHESTER A. COLVIN, W9VHR, of Omaha, is the new alternate director of the Midwest Division, filling the unexpired remainder of the 1944–45 term of the late Captain William H. Graham, W9BNC. Both Mr. Colvin and Ray E. Bolin, W9EAG, of St. Louis, were nominated, but the Executive Committee was obliged to find Mr. Bolin ineligible by reason of part ownership of a company which sells radio apparatus. Mr. Colvin being eligible and the only other candidate, he was declared elected without balloting by the membership.

Mr. Colvin is secretary and acting general manager of the Omaha & Council Bluffs Street Railway Company, operating a mass transportation system in those cities. He was vice-chairman of the local amateur group which staged the 1938 Midwest convention in Omaha.

NOTICE TO MEMBERS DISCHARGED FROM THE MILITARY SERVICES

THE requirement of continuous membership in the League for eligibility to ARRL offices has been waived for members serving in the uniform of the United States. See particulars on page 23 of *QST* for July last. Those desirous of taking advantage of this arrangement are asked to claim the right when renewing membership, stating the beginning and ending dates for their military service.

National Electronics Conference

THE first National Electronics Conference is to be held October 5th–7th at the Medinah Club, 505 N. Michigan Ave., Chicago 11, Ill. A comprehensive program is planned covering television, ultrahigh-frequency and radio developments in the communications field, industrial measurements, electronic controls, induction heating, and power and medical applications of electronics. The speakers for the technical sessions, who will be prominent engineers and scientists, will discuss broad perspectives of progress in the various fields and expectations for future developments. Registrations for the conference may be made with Prof. P. G. Andres, Illinois Institute of Technology, 3300 Federal St., Chicago 16, Ill.

Practical Applications of Simple Math

Part V—Video-Amplifier Design

BY EDWARD M. NOLL,* EX-W3FQJ

THE television video amplifier is similar to an ordinary resistance-coupled amplifier, but special consideration is given to the maintenance of a linear frequency response over an extremely wide range of frequencies. The typical video amplifier employs special compensating circuits which are inserted at various points to hold the response constant over a range of 30 cycles to 4 Mc. or more. Thus the main factors which distinguish a video amplifier from the common resistance-coupled audio amplifier are the use of special tubes with high mutual conductance and low interelectrode capacities, the operation of the video stage with a low value of plate resistance, and insertion of special high- and low-frequency compensating circuits.

Mutual conductance (g_m) is a measure of the effectiveness of a tube in converting a small change in grid voltage to a large change in plate current. With a given value of input signal, a tube with a high g_m produces a greater change in plate current than a tube with a lower g_m. Furthermore, if the tube is a pentode the variation of plate current across the high resistance in the plate circuit is sufficient to produce a considerable output voltage. To secure a reasonable amount of gain under limitations which are special to the video amplifier, it is necessary to employ a pentode with a high mutual conductance. However, it is an inherent property of a vacuum tube that its interelectrode capacities increase as the mutual conductance is made higher. Thus the real figure of merit to be used in selecting a tube for video-amplifier work is the ratio of its mutual conductance to the sum of its input and output capacitances. These points will be demonstrated clearly by the use of simple math.

Voltage Gain

The equivalent circuit of a vacuum tube with a resistive load is shown in Fig. 1. The voltage e_s represents the signal voltage applied to the grid of the tube. Since μ is the tube amplification factor, the a.c. voltage to be found in the plate circuit is μ times e_s or μe_s. However, the voltage μe_s is not the useful output voltage of the tube, since a portion of this a.c. variation is lost across r_p, the internal plate resistance of the tube. Thus the *stage gain* of the resistance-coupled amplifier is always less than the amplification factor of the tube. Simple application of Ohm's Law permits us to determine the gain of the stage.

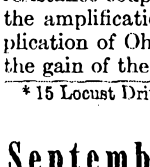


Fig. 1

1) The current through the series combination of internal plate resistance, r_p and total plate load resistance, R_l, is

$$i_p = \frac{\mu e_s}{r_p + R_l}$$

2) The voltage, e_o, across the output is the series current, i_p, times the resistance of the output load, R_l.

$$e_o = i_p R_l = \frac{\mu e_s R_l}{r_p + R_l}$$

3) The gain of the circuit is the ratio of output to input voltages, or:

$$\text{Gain} = \frac{e_o}{e_s} = \frac{\dfrac{\mu e_s R_l}{r_p + R_l}}{e_s} = \frac{\mu R_l}{r_p + R_l}$$

4) Since it is convenient to express the gain of a tube in terms of mutual conductance instead of μ, the μ can be removed from the gain formula by substituting its equivalent value $\mu = g_m r_p$. The formula then becomes

$$Gain = \frac{g_m r_p R_l}{r_p + R_l}$$

As a practical example, the gain of a 6AC7 resistance-coupled stage can be calculated as follows:

g_m = 9000 micromhos with a screen voltage of 150
r_p = 750,000 ohms
R_l = 500,000 ohms

$$Gain = \frac{g_m r_p R_l}{R_l + r_p}$$

$$= \frac{(9000)\ (10^{-6})\ (0.75)\ (10^6)\ (0.5)\ (10^6)}{(0.5)\ (10^6) + (0.75)\ (10^6)}$$

$$= \frac{(9000)\ (0.375)}{1.25} = 2700$$

If the value of the load resistance is made less the gain will be decreased correspondingly. Thus if the load resistance is 7000 ohms the gain becomes

$$Gain = \frac{(9000)\ (10^{-6})\ (0.75)\ (10^6)\ (0.7)\ (10^4)}{(0.7)\ (10^4) + (0.75)\ (10^6)}$$

$$= \frac{(90)\ (0.75)\ (0.7)}{(0.757)} = 62.4$$

Inspection of the formula shows that the tube plate resistance is effectively in shunt with the

* 15 Locust Drive, Asbury Park, N. J.

load resistor.[1] Consequently the gain of the stage for low values of plate load resistance is determined almost entirely by the value of the load resistance. If values of plate load resistance, R_l, which are low in comparison with the plate resistance, r_p, are used, the gain formula becomes

$$Gain = g_m R_l$$

This point is demonstrated by substituting the value of plate load resistance assumed in the previous example in the new formula, and comparing the results.

$$Gain = g_m R_l$$
$$= (9000)\ (10^{-6})\ (7000) = 63$$

The reason for this is, of course, that the connection of a high resistance in parallel with a low resistance produces a resultant which differs only slightly from the value of the lower resistance.

It is evident if we use a low value of plate load resistance, as we do in a video amplifier, a reasonable gain requires the use of a tube with a high mutual conductance. It is also evident that greater gain is obtained with the highest permissible value of plate load resistance. Since the value of the plate resistance is inversely proportional to the total shunt capacity of the stage, a tube with low interelectrode capacities permits a higher value of load resistance and therefore a greater stage gain.

Total Load Resistance

Thus far we have considered R_l to be a single resistor. Actually, however, the value R_l represents the total effective load resistance presented to the tube. As shown in Fig. 2, the effective value of plate load resistance at the middle range of frequencies consists of the plate load resistor, R_p, effectively in parallel with R_g, the grid coupling resistor of the succeeding stage, if we consider the reactance of C_c to be negligible at these frequencies. However, as in the case of the tube's internal plate resistance, the resistance of the grid resistor may be neglected if it is large compared to that of the plate load resistor. With this qualification, the gain of the stage is $g_m R_p$, where R_p is the value of the plate load resistor only.

As the frequency is decreased, the reactance of the coupling capacitor, C_c, increases and a portion of the signal is lost across the coupling capacitor, the percentage of loss increasing as the frequency decreases. The gain of a resistance-coupled amplifier is measured from grid to grid. In the case of the middle range of frequencies the signal variation at the plate appears essentially in its entirety at the grid of the succeeding tube as explained previously. However, at low frequencies the coupling capacitor and grid resistor form a voltage dividing network across the output of the tube. Thus the voltage at the plate of the first tube is still $\mu e_s g_m R_p$ but the voltage at the grid is dependent on the vector division of voltage by the coupling capacitor and grid resistor, R_g, the voltage across the grid resistor representing the useful output. The gain of the stage at low frequencies therefore becomes

$$Gain = (g_m R_p)\left(\frac{R_g}{\sqrt{R_g^2 + X_{C_c}^2}}\right)$$

The latter term of the equation represents the ratio of grid resistance to series impedance which is actually the percentage reduction in signal voltage resulting from the drop across the coupling capacitor. Thus if it were necessary to have linear response down to 10 cycles, the reactance of the coupling capacitor at 10 cycles numerically must be one-tenth of the resistance of the grid resistor, as explained in the previous installment in the August issue. In previous examples a grid-resistance value of 500,000 ohms was chosen. Using this value,

$$X_{C_c} = \frac{R_g}{10} = \frac{500{,}000}{10} = 50{,}000 \text{ ohms}$$

$$C_c = \frac{1}{2\pi f X_{C_c}} = \frac{1}{(6.28)\ (10)\ (50{,}000)} = 0.32\ \mu\text{fd}.$$

Low-Frequency Compensation

It is apparent that the low frequencies can be passed without serious loss by the interstage coupling system only if the RC combination is sufficiently large. A large time constant (RC) however, encourages relaxation oscillations and the larger physical dimensions of the parts increases stray capacities to ground causing high-frequency degeneration. The proper time constant for most applications does not exceed 0.05 seconds. In the last example the time constant, t, would be

$$t = RC = (500{,}000)\ (0.32)\ (10^{-6})$$
$$= 0.16 \text{ seconds}$$

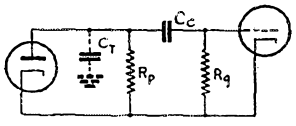
Therefore, to prevent low-frequency degeneration and still not exceed the 0.05-second

[1] This statement becomes apparent when it is considered that the last expression for gain given above may be written in the form

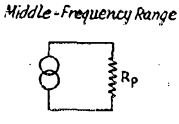
$$Gain = (9000)\ (10^{-6})\left[\frac{(750{,}000)\ (7000)}{750{,}000 + 7000}\right].$$

Written in this manner it is clear that the last term is the expression for the resultant of r_p and R_l in parallel. — Ed.

Fig. 2



A

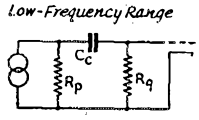


Middle-Frequency Range

$R_g \gg R_p$

Gain = gm R_p

B

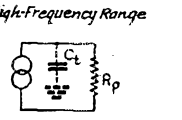


Low-Frequency Range

$X_{C_c} + R_g \gg R_p$

$Gain = (g_m R_p)\left(\frac{R_g}{\sqrt{R_g^2 + X_{C_c}^2}}\right)$

C



High-Frequency Range

$R_g \gg R_p$

$Gain = (g_m R_p)\left(\frac{X_{C_t}}{\sqrt{R_p^2 + X_{C_t}^2}}\right)$

D

time constant another means of compensation is employed.

A low-frequency compensating circuit (R_fC_f) is shown in Fig. 3.

In this circuit the time constant of R_gC_c is assumed to be 0.05 second and is equal to the time constant of R_fC_f. The value of R_f is 10 times the reactance of C_f at the lowest frequency to be passed. Thus the R_fC_f combination is not only a low-frequency compensator but also is a decoupling network which minimizes any tendency for the stage to oscillate. At the middle and high ranges of frequency the reactance of C_f is negligible and the load presented to the tube is the value of R_p.

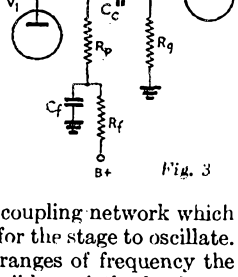


Fig. 3

As the frequency decreases, the reactance of the capacitor C_f increases, effectively increasing the total plate load resistance, R_L, and, in turn, increasing the gain of the stage at low frequencies. In order to equalize the response at the grid of the succeeding stage, therefore, the compensating network must increase the gain of the stage by the same percentage as that by which the coupling network decreases the gain. Let us assume that the voltage across R_g is 10 volts at 10 kc., and drops to 7 volts at 10 cycles without compensation. When compensation is added, the *plate* signal at 10 cycles must be increased to a value which will develop 10 volts across R_g regardless of the degeneration caused by the coupling capacitor. Since, as stated previously, the gain of the tube is proportional to the plate load resistance, this required increase in voltage may be obtained by choosing compensating-network values which will increase the plate load resistance by a corresponding amount.

Without compensation the gain of our amplifier is, of course,

$$Gain = (g_mR_p)\left(\frac{R_g}{\sqrt{R_g^2 + X_{C_c}^2}}\right)$$

With compensation the gain formula takes on another factor and becomes

$$Gain = \left(g_m\sqrt{R_p^2 + X_{C_f}^2}\right)\left(\frac{R_g}{\sqrt{R_g^2 + X_{C_c}^2}}\right)$$

To facilitate further calculations, the numerator and denominator are multiplied by R_p or

$$Gain = \left(g_m\sqrt{R_p^2 + X_{C_f}^2}\right)\left(\frac{R_g}{\sqrt{R_g^2 + X_C^2}}\right)\left(\frac{R_p}{R_p}\right)$$

Combining,

$$Gain = (g_mR_p)\left(\frac{\sqrt{R_p^2 + X_{C_f}^2}}{R_p}\right)\left(\frac{R_g}{\sqrt{R_g^2 + X_C^2}}\right)$$

Observation of the last two terms will show that each one is a ratio. The third term indicates the fractional loss of voltage across the coupling capacitor, while the second term shows the ratio by which the gain of the amplifier is increased by the presence of the compensating capacitor. Since the gain of the amplifier at the middle range of frequencies is g_mR_p, the same gain must be maintained at the low frequencies for linear response. Thus it is evident the product of the last two terms should be unity or

$$\left(\frac{\sqrt{R_p^2 + X_{C_f}^2}}{R_p}\right)\left(\frac{R_g}{\sqrt{R_g^2 + X_{C_c}^2}}\right) = 1.$$

Solving,

$$\frac{R_g\sqrt{R_p^2 + X_{C_f}^2}}{R_p\sqrt{R_g^2 + X_{C_c}^2}} = 1$$

$$R_g^2(R_p^2 + X_{C_f}^2) = R_p^2(R_g^2 + X_{C_c}^2)$$

$$R_g^2R_p^2 + X_{C_f}^2R_g^2 = R_p^2R_g^2 + R_p^2X_{C_c}^2$$

$$X_{C_f}R_g = R_pX_{C_c}$$

$$\frac{R_g}{C_f} = \frac{R_p}{C_c}$$

$$R_gC_c = R_pC_f$$

Therefore the low-frequency response can be held constant by maintaining the above relation. The resistance of the decoupling resistor, R_f, must be 10 times the reactance of the coupling capacitor at the lowest frequency to be passed. However there is a limit to the size of the resistor, because if it is too high it will drop the plate voltage to a low value. This, in turn, will lower the gain of the stage.

Compensation for Cathode Degeneration

It is necessary also to compensate for the loss of gain caused by the increasing reactance of the cathode by-pass capacitor, C_k, at low frequencies. A similar type of compensation is employed as shown in Fig. 4.

As discussed in a previous installment, the alternating potential developed across the cathode resistor and capacitor at low frequencies can be considered in series opposition to the applied grid signal. Thus at low frequencies the effective decrease in grid signal arising from cathode degeneration must be compensated for by a capacitor and resistor combination in the plate circuit which will increase the gain of the stage at low frequencies, the proper amount to equalize the response once again. As before, this is accomplished by having the time constant

$$C_kR_k = C_fR_f.$$

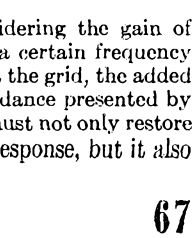


Fig. 4

However, in this case, definite relations must exist between the components, considering the gain of the tube. For example, if at a certain frequency the signal drops off one volt at the grid, the added plate reactance or plate impedance presented by the compensating capacitor must not only restore the one volt to equalize the response, but it also

may have to restore ten or fifteen volts, because all frequencies have been amplified by tube action. Thus if we have a deficit of one volt at the grid and the gain of the stage is 15, we have a deficit of 15 volts in the plate circuit. Since the same value of plate current flows in the cathode and plate circuits, the impedance added to the plate circuit must be equal to the gain of the tube times the cathode impedance at that frequency, or

$$X_{C_f} = (g_m R_p)\ (X_{C_k})$$

$$\frac{1}{2\pi f C_f} = \left(g_m R_p\right)\left(\frac{1}{2\pi f C_k}\right)$$

$$\frac{2\pi f C_k}{2\pi f C_f} = g_m R_p = \frac{C_k}{C_f}$$

$$C_f = \frac{C_k}{g_m R_p}$$

Similarly,

$$R_f = g_m R_p R_k$$

High-Frequency Compensation

The response at high frequencies is limited by the distributed capacities to ground from the plate and grid circuits of the tubes. These distributed capacities consist of the input-and output-interelectrode capacities of the tubes, plus the capacities to ground of the wiring and parts. As the frequency increases, or as the distributed capacity is increased, the reactance to ground is gradually reduced and more and more of the signal is by-passed. Thus it is apparent that wiring and interelectrode capacities must be kept at a minimum to maintain high-frequency response.

The value of the plate load resistance also plays an important part in the high-frequency response. The lower the value of the plate resistance the more the high-frequency range is extended. However, the lower the plate load resistance, the lower the gain of the stage, since gain is equal to g_m times the load resistance. The plate impedance presented to the tube at high frequencies is the parallel combination of plate load resistor R_p and distributed shunt capacity, C_t, as shown in Fig. 2-D. As in all vector combinations of a single resistor and capacitor, the frequency at which the capacitive reactance falls to a value equal to the resistance of the plate load resistor is the point where the response has fallen to 70.7 per cent of the middle-range amplitude.

The following examples demonstrate the various frequencies at which the response has fallen to 70.7 per cent for various operating conditions. In the first example the total shunt capacity C_t is assumed to be 60 $\mu\mu$fd. and the load resistance, R_p, 100,000 ohms. The frequency at which the capacitive reactance equals the load resistance is

$$X_{C_t} = \frac{1}{2\pi f C_t}$$

$$100{,}000 = \frac{1}{(6.28)\ (f)\ (60)\ (10^{-12})}$$

$$\text{and } f = 26{,}520 \text{ cycles}$$

Now if we lower the value of the load resistance to 10,000, we extend still more the high-frequency limit at which the response is down not lower than 70.7 per cent, or

$$X_{C_t} = \frac{1}{2\pi f C_t}$$

$$10{,}000 = \frac{1}{(6.28)\ (f)\ (60)\ (10^{-12})}$$

$$\text{and } f = 265{,}200 \text{ cycles}$$

Now if by proper choice of tubes and careful wiring we lower our distributed capacity to 30 $\mu\mu$fd., the frequency limit is further extended.

$$X_{C_t} = \frac{1}{2\pi f C_t}$$

$$10{,}000 = \frac{1}{(6.28)\ (f)\ (30)\ (10^{-12})}$$

$$\text{and } f = 530{,}400 \text{ cycles}$$

However in television application the response, in most cases, may not drop to 70.7 per cent until the frequency is as high as 3 Mc. If our distributed capacity remained at 30 $\mu\mu$fd. what would have to be the value of the plate load resistor to permit a linear response up to 3 Mc.? In other words, what would be the reactance of our shunt capacity at 3 Mc. which would also have to be equal to the value of our load resistance in order to hold the response to not less than 70.7 per cent?

$$X_{C_t} = \frac{1}{2\pi f C_t}$$

$$X_{C_t} = \frac{1}{(6.28)\ (3)\ (10^6)\ (30)\ (10^{-12})}$$

$$X_{C_t} = 1770 = R_p$$

Thus our load resistor would have to be 1770 ohms. With the type tube mentioned earlier in the discussion our gain would be only

$$Gain = g_m R_p$$

$$Gain = (9000)\ (10^{-6})\ (1770) = 15.9$$

It is evident that if we wish a reasonable amount of gain, with linear response up to 4 or 5 Mc., some other means of compensation must be employed. The circuit shown in Fig. 5 demonstrates one simple method of extending the high-frequency range.

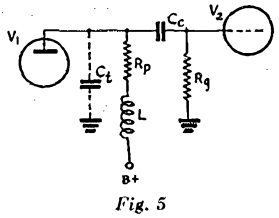


Fig. 5

An inductor, L, is placed in series with the plate load resistor and, as the frequency increases, the inductive reactance rises and adds to the plate load impedance of the tube. The value of L is chosen to add to the plate impedance in the same proportion that the shunt capacitive reactance subtracts from it. This linear balance is maintained up to the high-frequency limit chosen.

However, beyond this point the inductance and capacity hit a resonant point and the response rises sharply. It is customary to employ some other means of damping to suppress this resonant

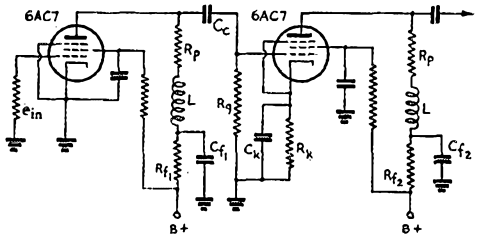


Fig. 6

rise and to cause a rapid decline in response after the high-frequency limit has been passed. The gain of the stage at high frequencies becomes rather complex.

$$Gain = g_m \frac{(R_p + jX_L)(-jX_{Ct})}{R_p + j(X_L - X_{Ct})}$$

If this equation is broken down by means of the *j*-operator method and set equal to the gain at the middle range of frequencies, the value of the inductance is found to be

$$L = \frac{R_p^2 C_t}{2}$$

when $R_p = \dfrac{1}{2\pi f_o C_t}$

with f_o equal to the highest frequency to be passed.

For more complete information the reader is referred to the manipulation of the *j* operator in October, 1943, *QST*[2] and for the actual development of the equation, to an article in the September, 1943, issue of *Radio*.[3]

Practical Design

As a practical example, let us calculate the values of the compensating inductor and capacitors in the circuit of Fig. 6.

$$R_pC_f = C_cR_g \qquad R_kC_k = R_{f_2}C_{f_2}$$

g_m of 6AC7 = 9000 μmhos
Input capacity of 6AC7 = 11 $\mu\mu$fd.
Output capacity of 6AC7 = 5 $\mu\mu$fd.
Wiring capacity = 9 $\mu\mu$fd.
Total shunt capacity = 25 $\mu\mu$fd. = C_t
Maximum frequency 3 megacycles = f_o
Minimum frequency 10 cycles = f_c

1) $R_p = \dfrac{1}{2\pi f_o C_t} = \dfrac{1}{(6.28)\ (3)\ (10^6)\ (25)\ (10^{-12})}$
$= 2125$ ohms.

2) $L = \dfrac{R_pC_t}{2} = \dfrac{(2125^2)\ (25)\ (10^{-12})}{2} = 56.5\ \mu$h.

3) *Gain of stage*
$= g_mR_p = (9000)\ (10^{-6})\ (2125) = 19.13$

4) $R_g = 500{,}000$. Grid time constant, t, = 0.05 seconds, and the value of C_c becomes

$$t = R_gC_c$$
$$0.05 = (500{,}000)\ (C_c)$$
$$C_c = 0.1\ \mu\text{fd.}$$

5) $R_gC_c = R_pC_{f_1}$
$(500{,}000)\ (0.1)\ (10^{-6}) = (2125)\ (C_{f_1})$
$C_{f_1} = 23.5\ \mu$fd.

6) $R_{f_1} = 10X_{Cf1} = \dfrac{10}{2\pi f_c C_{f_1}}$

$= \dfrac{10}{(6.28)\ (10)\ (23.1)\ (10^{-6})} = 6890$ ohms

7) R_k for correct bias on 6AC7 is 160 ohms. Assign a practical value of 25 μfd. to C_k

8) $C_{f_2} = \dfrac{C_k}{g_mR_p} = \dfrac{(25)\ (10^{-6})}{(9000)\ (10^{-6})\ (2125)}$
$= 1.31\ \mu$fd.

9) $R_{f_2} = (160)\ (g_mR_p) = (160)\ (19.13)$
$= 3060$ ohms.

Many of the circuit applications discussed in this article may be used to advantage in audio circuits. However, it must be remembered that the calculations have been based on pentode operation with a low value of load resistance. For higher values of load resistance or triode operation the calculations must involve the plate resistance and the value of the grid resistor in the succeeding stage.

[2] Noll, "Meet Mr. *j*," *QST*, October, 1943, p. 21.
[3] Noll, "Wide-Band Amplifier Design," *Radio*, September, 1943, p. 37.

Kw. vs. Kva.

(*Continued from page 61*)

watts, while at a power factor of 75 per cent the power would be only

$$W = EI\cos\theta$$
$$= (220)\ (6.82)\ (0.75)$$
$$= 1125\ \text{watts}$$

A capacitive reactance in the load will cause the same current increase for a given load as an equal amount of inductive reactance. However, the capacitive load will give a leading power factor while the inductive load will have a lagging power factor.

Table I illustrates the manner in which the available power from a transformer will decrease with power factor. A 1.5-kva. transformer is assumed for this illustration. The voltage is assumed to be constant, and the current maintained at full-load rating of 6.82 amperes. This table also illustrates why power companies quote power rates at specified power factors to large consumers. For low power factors the power company must supply a relatively high current with its accompanying large copper loss in the lines and transformers while getting paid only for the power used by the consumer.

A 6-ELEMENT VERTICAL ARRAY FOR 113 MC.

I HAVE had good luck with a six-element vertical array for 113 Mc. which employs the principle of the extended double "Zepp." It lowers the angle of the "dome" radiation, putting it out at an angle of about 4 degrees in a pattern extending around the horizon. Consequently, the array does not need to be rotated and permits fast operating.

The vertical radiator consists of six elements each $\frac{5}{8}$ of a wavelength and all connected by phasing stubs which are approximately $\frac{3}{32}$ of a wavelength. The stubs connecting the two end elements to the array are 16½ inches long. The two next to the center elements are 14½ inches long. All are spaced 3¼ inches. The radiating elements are each 5 feet, 4 inches long.

The matching stub at the center of the array is 3¾ inches long, also spaced 3¼ inches, as is the transmission line. The matching stub is connected to the feeders at a point approximately 10¾ inches from the radiator. Plus or minus ¼ inch from this point should cover the adjustment for maximum results.

The antenna is constructed of No. 12 copperweld wire. The transmission line and the matching stubs are of No. 14 copperweld wire, which is of course somewhat easier to handle than the No. 12. The copperweld wire is stiff enough so that the phasing stubs extend almost at right angles from the radiator. It is not important to have them in line with each other. They may whirl in space around the radiator provided they remain approximately at right angles to the radiator.

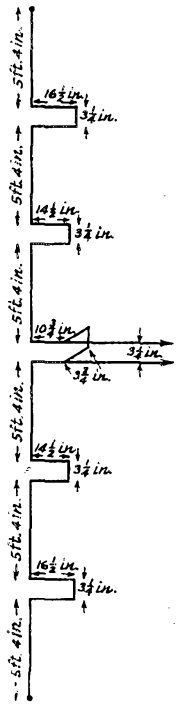


Fig. 1 — Arrangement and dimensions of a six-element stacked vertical array, using the extended double "Zepp" principle, to operate on 113 Mc.

The transmission line should extend at a right angle to the radiator for a distance of at least 10 feet before making any bend. It is spaced with Johnson No. 134 feeder bars at intervals of 18 inches. Johnson No. 104 antenna insulators are used between each of the elements of the radiator at the points where the phasing stubs and the transmission line are connected.

My array is hung from a messenger cable between two 90-foot poles. In the preliminary testing, the array was raised and lowered several times before the exact maximum dimensions were determined, with the aid of a field strength meter.

— *Don C. Wallace, W6AM.*

REGENERATIVE R.F. STAGE USING 6L7 PENTAGRID MIXER

THE circuit shown in Fig. 2 resulted from an attempt to use regeneration in a t.r.f. receiver for best reception of c.w. signals. As the circuit also provides greatly increased gain and is stable in operation, it should interest those amateurs who prefer to use a t.r.f. receiver.

Regeneration is maintained by means of feedback to the injector grid of the 6L7 r.f. amplifier. Using the values shown in the diagram a tremendous amount of regeneration is available, so that it is necessary to reduce it to a practicable degree. This is done by experimenting with the primary of the r.f. coil to secure proper coupling and impedance.

Proper phasing is also important in the r.f. coil. If the circuit will not regenerate, the primary leads should be reversed.

Among the advantages of this circuit is the fact that the regeneration control will have no effect upon circuit resonance. Since the method of feedback is primarily that of a multivibrator, synchronization with the input signal is easy if the latter is quite close to the resonant frequency. As a result a wide channel is available for the reception of voice or even of music frequencies, even while the circuit is actually oscillating. The zero beat will be quite broad.

If the size of the regeneration control is reduced the circuit will not function as it should. In order to reduce regeneration by any other than the method of adjusting the r.f. coupling and impedance, it is necessary to add a resistor in series with the regeneration control, of such a value as to maintain a total of 10,000 ohms in the circuit as the value of the control is reduced. This method is not practicable on an all-wave or multiband receiver, since adjustments would have to be varied for each band. Only a pruning of the coils would permit the setting of each band so as to secure satisfactory all-wave operation with this method.

Some sort of sensitivity control should be used with the input tube, since this circuit will block

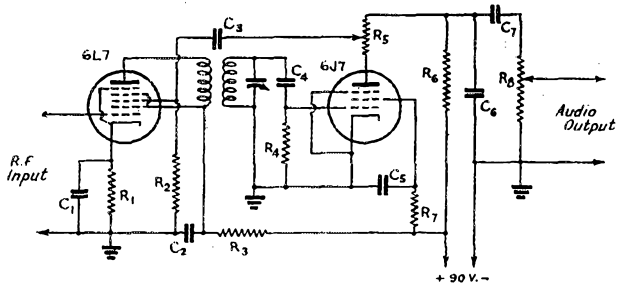


Fig. 2 — Diagram of regenerative t.r.f. circuit for c.w. reception and additional gain.

C_1 — 0.05-μfd. paper.
C_2 — 0.1-μfd. paper.
C_3 — 0.0001-μfd. mica.
C_4 — 0.00025-μfd. mica.
C_5 — 0.03-μfd. paper.
C_6 — 0.002-μfd. paper.
C_7 — 0.01-μfd. paper.
R_1 — 250 ohms, ½-watt.
R_2 — 0.5 megohm, ½-watt.
R_3 — 1000 ohms, ½-watt.
R_4 — 2 megohms, ½-watt.
R_5 — 10,000-ohm potentiometer, regeneration control.
R_6 — 0.25 megohm, ½-watt.
R_7 — 1 megohm, ½-watt.
R_8 — 0.5-megohm potentiometer, volume control.

easily. One method of accomplishing this would be the use of an a.v.c. circuit, requiring a separate a.v.c. tube. — *L. G. Genung, FPO 822, % PM, New York.*

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SENSITIVE BATTERY-OPERATED TEST RIG FOR W.E.R.S.

A SENSITIVE field-strength and frequency meter employing miniature 1.4-volt tubes is shown schematically in Fig. 3. This compact unit has proved its usefulness in adjusting WERS antennas and transmitters for maximum output, and for checking frequencies. It is also useful as an overmodulation indicator.

The circuit uses a 1T4 grid-leak detector and a direct-coupled 3S4 amplifier. When a signal is tuned in, bias on the grid of the 1T4 effects a decrease in the plate current of that tube. This decreases the bias on the grid of the 3S4, resulting in a rise in its plate current. The 3S4 is not biased to cutoff, since to do so would bring the operation of the tube into an unfavorable portion of its curve, which would result in lowered amplification.

The purpose of the battery and rheostat, R_6, in the meter circuit is to balance out the static plate current of the 3S4. The connections of the filament switch, S_1, permit the tubes to draw current the instant that the "B" voltage is applied. Otherwise, before the filaments were heated a reverse current of 4 or 5 ma. would flow through the meter with possible disastrous results.

Everything except the "B" battery is assembled in a sheet-metal box measuring about 7 × 4 × 3 inches. The tubes and tuned circuit are mounted on a shelf placed just far enough down from the top so that tubes can be inserted and the tuned circuit will clear the box cover. Other components, including the 1.5-volt dry cells, are mounted below the shelf. A cable leading through a grommet in the side of the box is used to connect to the "B" battery.

Flashlight cells are used for the tubes and meter circuit, while one of the Signal Corps BA-32s made available for WERS installations supplies the high voltage. A voltage divider, R_3, R_4, R_5, is placed across the 144-volt section of the BA-32 to supply the various voltages required in the direct-coupled amplifier.

When the unit is used for checking modulation, it will be observed that the meter kicks up to about twice its normal reading, on peaks, with 100 per cent modulation.

Satisfactory indications are obtained at distances of 20 to 30 feet from the usual types of mobile rigs, and up to 100 feet from the more powerful fixed stations. — *Robert S. Smith, LSPH, 3019 Ruckle St., Indianapolis 5, Ind.*

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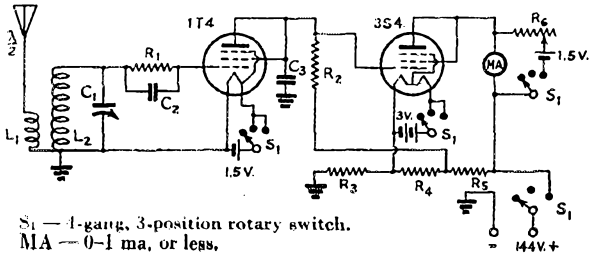
SIMPLE MAGNETIC HOLDER FOR FERROUS NUTS AND LOCK WASHERS

J. R. STEEN of Harvey-Wells Communications contributes the following suggestion which has been found useful in speeding up manufacturing production:

It is an old wrinkle to magnetize a screwdriver (and, in fact, there are many on the market so prepared), but a method of holding nuts and their closest companions, lock washers, has been quite neglected.

Here is a very handy method of assembling steel nuts and lock washers in hard-to-get-at places. Take your ordinary socket wrench or spintite, wind about a dozen turns of insulated wire around it, and touch the ends of the wire across the storage battery. A single touch is enough to magnetize the wrench sufficiently so it will hold both the nut and lock washer.

Fig. 3 — Circuit diagram of WERS field-strength and frequency meter.
C_1 — 2-plate midget variable.
C_2, C_3 — 0.0001-μfd. mica.
R_1 — 1 megohm, ½-watt.
R_2 — 0.5 megohm, ½-watt.
R_3 — 4000 ohms, ½-watt.
R_4 — 15,000 ohms, ½-watt.
R_5 — 10,000 ohms, ½-watt.
R_6 — 1200-ohm potentiometer, wire-wound.
L_1 — 2 turns No. 14 wound at grid end of L_2.
L_2 — 3 turns No. 14, ½-inch diameter, spaced diameter of wire.



S_1 — 4-gang, 3-position rotary switch.
MA — 0–1 ma. or less.

STRAYS

According to an Associated Press dispatch, Radio Guam on July 25th sent its first message since December 10, 1941, when it informed Pearl Harbor that Japanese planes were attacking the island outpost. The message, one of greeting to "Pearl," was sent by a Signal Corps staff officer who landed with U. S. troops who were already well along in their reconquest of the island.

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The American Expeditionary Station on Guadalcanal (See *QST*, June, 1944, p. 56) conducts a program known as "The Swap Shop." One of the station's most popular regular features, it broadcasts lists of items offered for trade or desired by servicemen on the island. Swap items vary from dress shoes to horses, with radio receivers and Japanese souvenirs much in demand.

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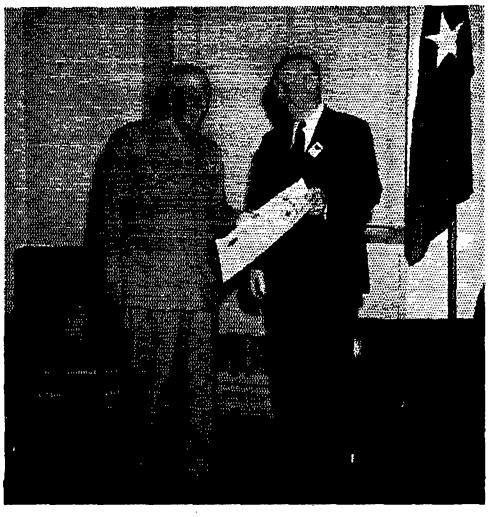
Code classes at the Eastern Signal Corps Schools at Fort Monmouth, N. J., are interrupted for brief periods at hourly intervals with fast-moving, action-packed dramatizations produced in order to impress upon the students the necessity for security in code transmissions. The sound effects artist for these "soap box operas" is Lt. Joseph P. Sahm, W9SDS.



Dr. Edwin H. Armstrong, noted inventor in the radio field, was presented with the Chief Signal Officer's Certificate of Appreciation by Major Gen. H. C. Ingles, Chief Signal Officer, at a recent ceremony in Washington. The Certificate, designed as a testimonial to individuals and companies not eligible for the Army-Navy "E" award, was given to Dr. Armstrong in appreciation of his notable contributions to the war effort in waiving all royalties on the use of seventeen of his patents covering frequency modulation radio equipment purchased by the War Department, and for his undertaking vital development work for the Signal Corps.

W7CIL, stationed at Sacramento, Calif., reports that the f.m. band went crazy on July 7th, stations from all over the U. S. coming in R9 plus.

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A new type of multi-output dynamotor has been developed by the Carter Motor Co., Chicago, which will deliver as many as three separate outputs simultaneously from the same unit. It is possible, for instance, to use 6.3 volts a.c. as well as "B" power for a receiver and also have high voltage for a transmitter available at the flick of a switch. The unit is especially desirable where space is at a premium, such as in an airplane, or where a.c. and d.c. are needed at the same time.

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The Westinghouse Research Laboratories has announced two new synthetic resins which are so secret that their chemical composition cannot be revealed. The first, now being applied to units in radio and radar equipment, is called Fosterite, and is a solventless impregnant giving 100 per cent fill and, in addition, moisture-proofing. The second synthetic material is a new resin superior to natural shellac.

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Competition between a.m. and f.m. b.c. stations may be resolved by the invention of a set able to receive both types of transmission, and on which W. D. Houghton of Setauket, N. Y., has been issued a patent. The receiver employs a single circuit for receiving a.m. signals while f.m. is received by throwing a switch that adjusts the circuit for f.m. Patent rights are assigned to RCA.

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A method of using radio heat for drying penicillin, has been developed by Dr. George H. Brown, a research engineer of RCA. Since ordinary heat methods of evaporation destroy the effectiveness of the chemical, the bulk reduction at present is accomplished by evaporation in a high vacuum at below freezing temperatures. The new method accomplishes this step 48 times as fast as "freeze-drying" and affords a considerable reduction in cost and space requirements.

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At the Hammarlund Mfg. Co. a "glitch" is an undesirable oscillation occurring in the r.f. circuit of a radio transmitter.

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The following appeared in the San Francisco *Chronicle* for June 30, 1944:

"HAM, sugar pro. commun. recvr.; excel. cond., type S. X. rack mt. P. M. spkr., 8 mtrs. to 12.5 Mc; $500. Call BE 0853J bet 7-9 P.M. June 27, 29 or 30 only."

I would say it was a "sweet" receiver in every respect except price. Perhaps the latter may be attributed to the extra sweetening. — *W6CBX*.

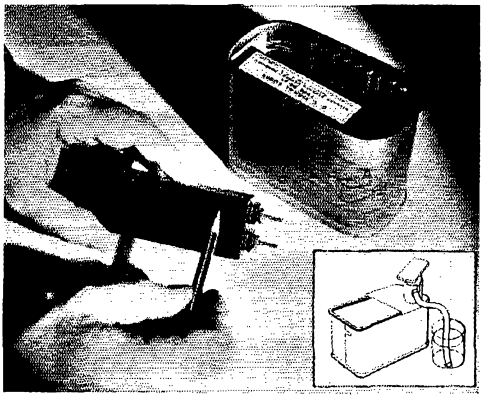
New Apparatus

THE smallest high-voltage storage battery ever produced commercially was recently announced by the Willard Storage Battery Company. The 36-volt unit measures slightly over 4 inches in length, just under 1½ inches in width and less than an inch in height, and weighs only six ounces. Its case is made of polystyrene, which is immune to corrosion, lighter than glass and stronger than hard rubber.

For use in a combination "B" and "A" pack, four batteries — three 36-volt units and one 6-volt unit — are packed in a lead-plated container from which the air is exhausted. The batteries retain their charge indefinitely and are ready for immediate use after electrolyte has been added.

When the batteries are about to be placed in service the metal container is punctured by a special filling device, shown in the insert drawing in the lower right-hand corner of the photograph. Because of the vacuum in the can the electrolyte is drawn into the 18 miniature vent holes in each battery, and in a few seconds each of the batteries is filled and ready to go to work. This application of the "vacuum-pack" principle eliminates the necessity of using a small syringe to fill separately each of the 18 cells in each battery.

One of the principal applications of these Willard "vacuum-packs" is the supplying of power for radiosonde transmitters, borne aloft into the sub-stratosphere by balloons for the purpose of transmitting to weather stations records of humidity, temperature and barometric pressure.



The pencil is pointed to one of 18 vent holes in a 36-volt unit of the "vacuum-packed" storage battery. The metal container is shown at the rear, while the insert drawing at right shows how the four batteries are prepared for instant use by means of a special filling device.

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Within the past year, dry cell batteries have become one of the most critical products in our war production program, according to a WPB official. The dry cell industry has expanded more than three times its peacetime size to supply the types of batteries required in walkie-talkies, buoys, submarine detectors, direction finders, bazookas, and more than fifty other military items.

★ ★ ★ ★ ★ ★ ★ ★

Gold Stars

LT. EDWARD R. DOWNIE, W5HZT, was killed January 26, 1944, when his plane crashed while on a regulation instrument check flight.

W5HZT was an enthusiastic amateur. He built all of his transmitting equipment and spent a good deal of time working DX with low-powered gear on 7-Mc. c.w. He also operated on 28-Mc. 'phone. An advocate of short calls, correct spacing and in general good technique on the air, he sought to inspire others to operate in the same manner. W5HZT held membership in the Rag Chewers' Club and was a member of the San Antonio Radio Club and the University of Texas Radio Club.

Lt. Downie enlisted in the Air Corps in August, 1941. After receiving his pilot's wings at Mather Field, Calif., he served as a basic instructor at Merced Field, Calif., and Pecos Field, Texas. He received training in B-24s at Albuquerque, N. M., and Mt. Howe, Idaho, and had nearly completed his training at Wendover Field, Utah, when his plane failed to return from a routine flight.

ENS. BERNARD F. NOLAN, USNR, W3IRI, 20, was killed May 2, 1943, when the airplane in which he was instructing a cadet crashed at Norman, Okla. Their plane became caught in a wind pocket and the cadet was unable to straighten it out. It dove to the ground, killing Ens. Nolan instantly, although the cadet escaped.

Ens. Nolan started flying at the age of seventeen. He enlisted in the Navy in September, 1942, and received his wings at Corpus Christi, Texas. He was the youngest of the eighty-eight members in his class to graduate and also was one of the youngest commissioned officers in his branch of the service. At the time of his death he was attached to the Naval Air Station at Norman, Okla., as a flight instructor.

W3IRI received his ham ticket while in high school and became well known on the air as "Turk" Nolan. He was a member of the Delaware Valley Radio Association.

★ ★ ★ ★ ★ ★ ★ ★

CORRESPONDENCE FROM MEMBERS

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

CREDIT THE SIGNAL CORPS —AND THE HAMS

Little Creek Mine Base, Ft. Story, Va.

Editor, *QST:*

. . . It is true that, in the end, all credit may rightly revert to the Signal Corps for its magnificent job of furnishing men and equipment for the vital business of maintaining the Army's backbone — communications. But it is also true that many branches of the Army furnish their own men for operating and maintenance, and they in turn are doing their jobs well.

In every instance of which I have knowledge, the amateur is the nucleus, the reliable source of information and "know-how," and the man who sets the example. He is indispensable and not at all expendable.

I would like to tell you something of my work, but deem it unwise. But one thing I can say — without my background of amateur radio I'd hesitate to think I qualified for my job! . . .

— *S/Sgt. Wm. R. Breen, W1JSC*

WHAT THEY'RE FIGHTING FOR

Somewhere in England

Editor, *QST:*

I was just up on the bridge of my ship watching a squadron of fighter planes take off in the distance and head for the Reich.

I wonder what the pilots of those planes were thinking? Probably wondering how much the world will change come peace. But they are not giving their lives for changes. No, the men I've come in contact with want to go home to the life they knew before the war; to live with their families and to go back to their jobs which they so gallantly left. Many of them want to get back on the ham bands, or do a little experimenting with a new idea. . . .

These are the things for which free men the world over are unselfishly giving their lives. I know the folks at home and our government do not want these men to die in vain. Yes, I feel perfectly confident that we will have ham radio back again, along with the other freedoms which we have enjoyed. . . .

— *CRO W. T. Mitchell, W8SYK, MM*

UNIONIZED

C. A. School, Fort Monroe, Va.

Editor, *QST:*

Gosh — you know the League is a wonderful thing! I don't know why, but it seems as though it is just the sort of organization I've always wanted to belong to. I've been in it for, let's see — five or six years now. . . .

All amateurs owe their pleasures on the kilocycles to the League — even those who are not members of ARRL, but whom the League helps anyway.

I think that almost everyone hates political tie-ups and the meanness of corrupt leaders in certain labor unions, but the League is an example of a "union" working in the best possible way. We really are unionized. . . . All unions should take a look at the ARRL. . . .

Just bought a copy of the *Handbook* to take along with the "training aids" for my organization when we go overseas, and I read the Amateur's Code on page 8. The thing that strikes me especially is that it's exactly what all amateurs do even though they may not have heard of the Code. . . .

I am classified as a radar maintenance officer, but when being interviewed at one time by a captain who was inspecting my classification card, I found out how much many Army men think of amateurs. He saw that I had a Class A ticket and thereupon decided that I also should be classified as a radio officer — a rank for which I had never received any training in the Army. At that same camp I found another joy due me as a result of my ham days. Officers were required to learn the International Morse code and be able to copy at 8 w.p.m. I passed at the first shot and was the envy of many, for I had free all of the time the other officers had to spend at code practice.

None of my men here are hams, but when we leave, another "training aid" will be a code-practice set. Maybe, when the job is finished, I can bring them back to the States all ready to take their exams. . . .

— *Lt. George A. Barnard, III, W1NSS*

ALL BECAUSE OF HIS HAM TICKET

APO 986, c/o Postmaster, Seattle, Wash.

Editor, *QST:*

This is to tell you exactly what my ham license has meant to me; namely, a commission in the United States Army.

As you probably know, one of the requirements for the communication officers' course at Scott Field is two years of engineering at an accredited college, or the possession of an amateur radio operator's license. As I was not an engineer, my only alternative was the old ham license. It was accepted without question.

I also might add that more friendly relationships with other officers and enlisted men have resulted as soon as calls were exchanged. . . .

— *Lt. Dave Goggio, AC, W9GHD*

IN INDIA WITH THE A.T.C.

Somewhere in India

Editor, *QST:*

. . . I can't tell you the work I'm doing at present or my exact whereabouts, but you can no doubt imagine what my duties are.

Static elimination is one small problem suffered in this part of the globe, due to the extremely adverse weather conditions "over the Hump" to China. The phenomena known as "St. Elmo's Fire" is encountered at any time, silencing both transmission and reception.

You can be sure that the enormous cargo volume flown to China by the Air Transport Command would be impossible without the aid of all modern radio facilities.

There are a number of hams in the various departments here, several of them pilots. . . .

— *Lt. Ashton Tyler*

KNOCKING AROUND

Somewhere in Italy

Editor, *QST:*

. . . Have been overseas for the past twenty months knocking around in the Libyan, Tunisian and Italian campaigns. Boredom is something that gets us all down over here. Those highly appreciated copies of *QST* and the *Handbook* certainly have helped pass the time in good fashion, and my copies of *QST* have become quite dog-eared from constant use.

I have been reading and using *QST* and the *Handbook* for seventeen years now, and they're still my favorite reading matter. The *Handbook* is indispensable in my work — poking a good signal out from behind a sand dune or a mountain requires good ham knowledge.

Wish you would tell those guys back home to quit knocking the good old CAA as they occasionally do. I'm an old "droop-snooter" who stood many a midwatch before Pearl Harbor and I'm kinda touchy about my old outfit. If those guys want to come over and swap jobs with me, I'm ready anytime. And I've got ten years' service in this Army. Hi! When the war is over, it's back to the CAA for me — even back to those damn mids. . . .

— *Capt. Bert E. Martin, jr., W2NT–ex-W4FDB*

A HAM IN THE MEDICAL CORPS

Medical Research Laboratories,
Edgewood Arsenal, Md.

Editor, *QST:*

You may be interested in the tale of a ham who thought he wasn't going to use his ham experience in this man's Army when he was called to active duty to dust off tired GIs as a doctor in the Medical Corps.

When I joined my outfit I found, neatly cased in crates, what amounted to a nice 80-meter c.w.-'phone station and three classy 5-meter jobs which the regular operators had been a little afraid to unpack. The CO discovered I was a ham and immediately a demonstration was arranged, using the outfit's equipment. After convincing the "operator" that the antenna meter would push up above the pin if he didn't try to tune the State of Mississippi against a 30-foot counterpoise, it went off well. Obviously *he* had never been a ham!

Shortly afterward I was transferred to the Medical Research Laboratories. There I found one three-stage and one five-stage d.c. amplifier and one regular a.c. circuit which had been used for various medical studies. All were defunct. Now all perk nicely, courtesy of W2GCC. In addition to maintaining all electronic equipment in this huge lab, I repair radio receivers because no service work is available within miles.

Sometimes I wonder how I could have got along in the Army without having been a ham. . . .

— *Lt. Maynard B. Chenoweth, MC, W2GCC/3*

WITH THE ARMY MINE PLANTERS

14th C. A. Mine Planter Battery,
Fort Stevens, Ore.

Editor, *QST:*

The July issue of *QST* contained a letter from O. C. Crossland, W9IXV, which I found very interesting. You see, he was on the Army mine planter *Hunt* some years back, and it so happens that I have been in the Army mine planter service as a chief operator for over two years.

Most of the chiefs on these tubs are hams and the best operators that can be had. Among the boys upped to chief op on my former ship were W1JSC, W1JCI and Johnny Tietgens. These boys were the greatest gang to work with, and you can rest assured that these planters couldn't have been better manned.

The Army mine planter branch of the service is seldom mentioned, but you can bet that we have tried to do our bit in this melee. We can't as yet relate our experiences, but after this war is over there will be many an interesting story about the Army's "sailjors." . . .

Hams surely are doing their part in this war and they should receive all the recognition that is possible. . . .

— *S/Sgt D. C. Greenwood*

KEENLY APPRECIATIVE

c/o Postmaster, New York City, N. Y.

Editor, *QST:*

. . . For several years I have taken advantage of the technical publications of the League, having been engaged in radio set building as a hobby before the war. Later, as a student in radio engineering at the University of Cincinnati, I found convenient use for the *Handbook* material, and even later, when employed in Signal Corps work at the Aircraft Radio Laboratory at Wright Field, I used and found others using ARRL publications, from the installation hangar to the electronics lab.

Last year, having read in *QST* of the Gallups Island Radio School, I joined the Maritime

Service and subsequently was stationed there. It might seem repetitious to elaborate on the extensive indoctrination of ARRL publications to the curriculum at that school, or to mention the very able instructors who received their first radio instruction via ARRL publications. Truly, much could and should be said of the ARRL's participation in the field of instruction in wartime radio.

Upon graduation from Gallups Island, I, as well as others of my class, obtained not only the required radiotelegraph second-class license, but also radiotelephone first-class and amateur licenses as well. We are keenly appreciative of the aid given us by the ARRL publications in achieving our goals. . . .

— RO William L. Doane, USMS

"LITTLE GEM"

Sqdn. 1, Flt. A. 45A, 2156 AAFBU (Primary)
Decatur, Ala.

Editor, *QST:*

Thanks for your broad-mindedness and splendid sense of humor in printing the article by J. K. Bach, W4CCE/3 – ex-W9WGM, in June *QST*. It is indeed a masterpiece. Every line brought back some fond memory of the old days that I'll be back to when the war is over. . . .

I, for one, surely enjoyed reading Bach's "little gem," and feeling proud.

—A/C Barton Halter, W2NGP

BALLANTINE

16 Fremont St., New London, Conn.

Editor, *QST:*

I have just read the editorial about Stuart Ballantine in July *QST*. . . .

One of my regrets is that I never had the opportunity of meeting him, but that has never prevented me from reading his many articles, particularly his papers in the *Proceedings* of I.R.E. I can think of no greater inspiration to a technically minded amateur than Mr. Ballantine's paper which appeared in the December, 1924, issue. No radio engineer will leave more lasting monuments.

To what you have written I can add only this: "Well done."

— E. B. Redington, W1NDD

TAKE YOUR PICK

432 So. Richard St., Bedford, Pa.

Editor, *QST:*

I noted in the July issue of *QST* the article, "*QST* Cruises With The Maritime Service," by Clinton B. DeSoto.

Having had some fifteen years of sea service and made several trips to the Persian Gulf and elsewhere on a Liberty ship, I was rather surprised to find that I must have been asleep all those months. Where in the devil did Mr. DeSoto find a Liberty ship of 10,000 tons, and, also, where did he find that array of radio equipment with the h.f. equipment as shown at the bottom of page 11? The Liberty ships come with . . . all of the gear in one panel. There is no h.f. equipment on board except one h.f. receiver.

. . . The speed of the Liberty ship is between 9 and 13 knots, depending on the weather and wind. It seldom does 13. It is also the hottest thing this side of the original hot place, so let's have the facts.

Some of the new C-type ships and special jobs are very nice, but as far as the Liberty ship is concerned — well, I suggest Mr. DeSoto make a trip to the Persian Gulf with the temperature at 140 degrees (which is mild) and then take a look at his equipment. Most of the ships are rushed out of the yards without their bulkheads being insulated, in which case if it's a hot climate they are terrible. Should it be the Russian run, they are just as unbearable, as there is only one radiator. In some cases a second radiator is being installed.

Also, I doubt if any training ships of the U. S. Maritime Service are of the Liberty type. At least I have yet to see one.

— G. M. Cozier

War Shipping Administration,
Washington 25, D. C.

Editor, *QST:*

I have just finished reading the July, 1944, issue of *QST* which contains your feature article on the trip of the U. S. Maritime Service Training Ship *American Mariner*. . . .

I can say quite truthfully that I seldom have read a more accurate, informative, and pleasing article on the U. S. Maritime Service, and I might also add that I was hardly surprised in view of your excellent articles about our radio training program at Gallups Island in previous issues of *QST*, which I recall very well.

Please accept my congratulations for this fine feature and my sincere appreciation for your evident great interest in the work of the U. S. Maritime Service.

— Telfair Knight,
Assistant Deputy Administrator for Training

A WORD OF PRAISE

c/o Fleet Post Office, San Francisco, Calif.

Editor, *QST:*

Thoroughly enjoy reading *QST* from copy to copy and from page to page. It is consoling to hear that we have personnel actively guarding amateurs' hard-won rights and looking after our interests. . . .

SCM reports are very interesting as they add to the individuality that makes the magazine distinctive. I wonder if the SCMs realize that overseas readers do more than peruse their monthly reports? It's our only way of knowing what goes on in our districts in the line of amateur activities. A word of praise, then, to these individuals who give us their time and effort with the universally-known ham spirit.

— Carl W. Bettner, RT1c, W8QMW

OPERATING NEWS

CAROL K. WITTE, W9WWP
Acting Communications Manager

LILLIAN M. SALTER
Communications Assistant

Could It Happen Here? There has been considerable discussion lately about whether or not we can expect enemy robot bombs or similar contrivances to make an appearance on our shores before the end of the war.

A recent United Press dispatch disclosed the information, revealed by a non-Spanish diplomat in Madrid, that Adolf Hitler had approved a plan for an imminent attack on New York City, with robot bombs launched from submarines in the Atlantic. According to the plan, submitted to Hitler by his Navy Chief, Admiral Doenitz, the flying torpedoes would be launched in the direction of Manhattan skyscrapers, from specially-rigged platforms on the decks of the submarines which then would submerge.

It is not the purpose of this piece to debate the pros and cons of such a possibility, for the scores of articles on the subject appearing currently in newspapers, magazines and periodicals seem to be covering the matter very well. Rather, it is our purpose to urge continuance of activity and wary preparedness on the part of our existing civilian protection services, and more particularly, on the part of the stations in the War Emergency Radio Service. Since we know that some sort of last-ditch retaliatory revenge would not be beyond the powers of the weakening enemy, it seems that we should redouble our efforts in these anxious months to avoid any possibility of being caught off guard in a situation reminiscent of Pearl Harbor.

If such an event did occur, you are all acquainted with the immediate results — paralysis or overburdening of communications and transportation, disrupting and delaying the relief functions of fire and police departments, Red Cross, and other municipal safety agencies. How important it is, then, that the most dependable means of emergency communication, the stations of the War Emergency Radio Service, be ready and equipped to work in close conjunction with these services, having worked out plans and completed preliminary tests beforehand, simulating the exact procedure to be used in an actual emergency.

In one eastern state, the Red Cross liaison officer has worked out a plan for the use of WERS facilities by that organization on a state basis. Regional Red Cross representatives have contacted each regional radio representative (radio aide) to work out local details of the scheme.

We know that quite a few other WERS communities have already outlined such plans, but we have no information on the scope or type of operation visualized. To these groups we appeal for further information, so that we can pass on helpful details to other WERS groups who are anxious to affiliate with local safety services.

State WERS Meetings. Some states are holding state-wide meetings periodically, in which discussions of technical details of all local groups, WERS paper work and operating procedure result in improvement and cohesion of WERS nets throughout the state. In addition, meetings of this type have resulted in the licensing of WERS in many new communities, including strategic industrial centers of large population, which had not previously been fully aware of the importance of WERS during a time of natural emergency disaster as well as during a possible enemy attack.

However, to be effective, meetings of this nature must be carefully planned beforehand, and must have the wholehearted support of all local WERS groups before being considered.

Removal of Telephones from DWCs. Reports have filtered in of the removal of telephone equipment in some district warning and local control centers, because the authorities wish to use the telephone equipment for other services. At this time we are advising licensees to request the authorities to maintain at least one telephone in control centers, if at all possible. It is important that some means of telephone communication be available, both for practice operating in connection with the local safety services, and

Ham Yarns

What is the most unusual experience you have ever had in connection with ham radio? Have you ever had a QSO that took place under peculiar circumstances, or that resulted in an exciting adventure? Have you ever been surprised, terrified, or highly amused at some incident that occurred during the good old days when you were operating your ham rig?

CD invites you to submit your story of the most unusual ham yarn you know of, whether experienced by yourself or a fellow amateur, for possible publication in Operating News. All stories should contain approximately 500 words, must be true, and must center about the subject of ham radio.

Each winning "Ham Yarn" will be published in this department, and the author may select a bound *Handbook* (Defense or regular edition), *QST* binder and League Emblem, Lightning Calculators, or any other combination of ARRL supplies of equivalent value ($2.00), as his prize.

All entries should be marked "Hams Yarns" and addressed to the Communications Dept., ARRL, West Hartford 7, Conn.

for the possible need which would arise in any emergency disaster. In general, it will be found that telephone companies are willing to leave all cables, terminals and wiring intact, at least, for possible quick reinstallation of service in the event of emergency.

Reminder. Better get those Christmas packages off to your ham brethren in the services overseas between September 15 and October 15. (If you're thinking of including a full rig in rack and panel, now is the time to consult the postal authorities.)

Personals. We receive quite a few inquiries about our CM and former ACMs. Most include a request for mail addresses, so here's a brief word about these members of CD who are on leave for the duration.

Lt. Colonel Francis E. Handy is once again to be found at Headquarters, Army Air Forces, in Washington. Mail will reach him addressed to Lt. Colonel F. E. Handy, AC, Air Communications Officer, Organizations Division, Room 5D-169, Pentagon, Washington 25, D. C.

Our Coast Guard representative, CRM John Huntoon, is also located in Washington, and may be reached at 4413 River Road, N. W., Washington, D. C.

And last but not least, we have fast-rising Cpl. George Hart, who received a new stripe and orders to report to OCS school in Texas, all in the same week. Mail will reach him at Headquarters and Headquarters Squadron, AACS Wing, AAF, City Building, Asheville, N. C.

— *C. K. W.*

WERS of the Month

Inglewood, California

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

INGLEWOOD, strategically located in the center of Southern California's many war industries, is a community in which WERS is of great importance.

The city was unusually fortunate in having Coördinator Don Lewis, W6SQC, in charge of its OCD organization. He has always been an active amateur, and ardently advocated an emergency radio system following the closing of amateur stations after the attack on Pearl Harbor. Accordingly, when WERS came into being by FCC decree in June, 1942, the city's war council authorized the establishment of a WERS group in Inglewood. After a preliminary survey of amateurs and of equipment in the Inglewood vicinity which might be available for WERS, an organization was set up. Fred Stapp, W6MSO, was appointed radio aide, and under his supervision an effective organization was developed. Much of the success of the entire undertaking is due also to the Inglewood Amateur Radio Club for its active support in all phases of WERS work.

After the expenditure of considerable time and effort in obtaining equipment and completing the requisite forms, the WERS application was submitted to the FCC. On March 25, 1943, a WERS license was issued to the City of Inglewood with the call KGIC.

The original license authorized 7 units and 8 operators. Since then, KGIC has grown considerably, and is now comprised of 18 transmitter units, 4 of which are mobile, and a total of 23 licensed operators. Fixed stations are located in CDC casualty stations throughout the city and at auxiliary police headquarters. Net control station, KGIC-1, is located at the CDC control center.

The principal function of the KGIC net is to provide emergency communications between the CDC control center and the various casualty stations throughout Inglewood. Dispatches and reports on medical equipment and personnel are handled. Also, in the event of failure of the regular telephone system, KGIC handles air-raid warden reports, instructions from control center to CDC personnel, and dispatching of auxiliary services.

Regular weekly net drills are held, in which a portion of each period is devoted to practice in handling simulated air-raid incident reports and various types of CDC emergency messages. This feature has been particularly stressed in the KGIC operating procedure. The balance of the drills is devoted to tests of equipment, frequency checks and reports. Occasionally inter-net operations are held with selected stations of other WERS licensees. Weekly group meetings are scheduled for construction of equipment. In addition, periodic meetings of the entire WERS group are held by the radio aide to discuss general operating procedure, equipment and operating problems.

Since the Inglewood CDC has been a very active organization during the past several years, KGIC has participated in numerous incident drills. This has afforded excellent operator training under realistic conditions. During a recent test blackout in which the entire telephone system was

This is a view of the Inglewood, Calif., WERS control station, KGIC-1, located at the Civilian Defense control center. Shown at the left is Harry Mintun, one of the operators of the KGIC net, and at the right, Fred Stapp, W6MSO, radio aide of KGIC.

"destroyed," the KGIC net handled all communications to and from control center. CDC officials warmly praised the results.

Practically all of the network's equipment was constructed by local amateurs. Transmitter-receiver combinations are used at all fixed stations and transceivers in the mobile units. Transmitters are conventional tank coil and condenser, or parallel-rod modulated oscillators. In most stations the receivers are the 3-tube superregenerative type, having a 7A4 detector and 6J5-6V6 audio stages.

The control station, KGIC-1, consists of an Abbott TR-4, an auxiliary superregenerative receiver and a stand-by transmitter. An acorn tube, 112-Mc. superheterodyne is being installed. Antennas are vertical half-wave dipoles, using an off-center feed system. In order to improve communication between net control and several outlying units, experiments are being conducted with beam antennas.

Although the KGIC organization was originally composed largely of amateur radio operators, so many of them have been lost to the armed services that it has been necessary to conduct a WERS operator training program. One such course has been completed with good results, and another one is being planned for the near future. Non-hams who were trained in this group are proving to be excellent operators.

The entire KGIC personnel has proven to be an enthusiastic and loyal group. Participating amateurs have contributed many hours of their time and hundreds of dollars' worth of equipment. Members of the WERS staff, in particular, deserve special mention for their efforts. These staff members, each of whom is responsible for a particular activity, are: Stuart Walmsley, W6RNN, assistant radio aide; Howard Bowman, W6QIR, president of the Inglewood Radio Club; W6EKM; W6REE; W6SPT; W6ZCN, and Harry Mintun, operator license only.

—*Fred P. Stapp, W6MSO,*
Radio Aide, KGIC.

BRIEFS

From W1JAH, SCM of Western Mass., we learn that W1NFF, a Marine, got a big surprise when he pulled up alongside of W1MWE, who is now an Army radar operator, with a radio-equipped jeep on Guadalcanal. It was a great reunion for these two, and W1NFF radioed back to his base gang. In no time at all another jeep arrived, loaded with hams. Need it be said that a real hamfest ensued?

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A V-mail letter from T/Sgt. Harry M. Neben, W9YVZ, informs us that he attended a hamfest in England recently at which the following hams were present: Fogarty, W2LHC; Osbern, BRS-5297; Lang; Dymond, G3HW; Hunt, G2FSR; Crighton, G4JA; Smith, W7GHT; Marriott, G8UZ; Cohn, op. license only; Beckmeyer, W2HHC; Holstein, W4NXR; Barker, op. license only; Bevers, ex-G8VR; MacLeod; Forster, W9ENZ; Loeb, W9——, and Campbell, W6BLC.

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Wilson E. Weckel, W8AL, 2118 Tuscarawas St. W., Canton 6, Ohio, says that he can better the record set by W8AMS. (See p. 64, *QST*, June, 1944.) He has had his station in the same house and same room since 1915. He operated prewar W8AQW; after 1919, W8AL and W8QKQ, and W8AL since 1940.

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Alternating electric currents can be changed to direct currents by an apparatus which has just been patented. The apparatus is operated by a small motor and is claimed to be almost 100 per cent efficient. This rectifier is suitable for both light and very heavy direct current consumption.

— *Science News Letter*

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"Whenever the Nazis call a non-existent automatic telephone number on the European Continent, the signal returned to the caller is a perfect telegraphic code for 'V for Victory' — three short and one long impulse, according to I. T. & T. engineers who installed the automatic telephone systems on the continent before the war. One of the engineers now in this country commented that there must have been many Nazis calling V numbers in devasted areas these last few years." — *Telecommunications Reports*

Hams At Rest

BY "OL' JOE"*

The title of this article, as you may be led to believe, has nothing to do with Silent Keys, but refers to those slumbering lightning-slingers who locked up the shack when the war started, and have since forgotten all about radio.

We have such a bunch here in my city. Before the great conflict we had an active ham club, with code and theory classes for beginners, a 50-watt transmitter in the club rooms, and plenty of other equipment. Several of the boys dabbled with 112-Mc. and 56-Mc. gear, and had lively discussions on the subject at club meetings.

Then came the war, and p-f-f-f-f-t went the club. Interest on the part of members waned, and all was given up. One or two of the boys tried to reorganize the club with an idea of recruiting new, postwar members for a bigger and better organization, but nothing came of their efforts.

The regional Civilian Defense headquarters sent an officer to our city with an idea of promoting a WERS group. The original meeting was well publicized and well attended. A committee was appointed to make the necessary plans to license the group. Five outfits were ready to be used as soon as the license was obtained. All this took place eight months ago. The meeting itself rated six inches in the local paper, and that proved to be the last anyone heard of WERS in the community.

Once or twice since, the former officers of the club got together with the idea of getting things going again. Everyone had an enjoyable visit, but no action was taken because they figured that if a club were organized, soldiers from a near-by camp (who would be welcome) might come in too great numbers to be accommodated in the meeting place available.

Ol' Joe thinks this is a deplorable situation. Hundreds and probably thousands of dollars' worth of equipment is gathering cobwebs and dust; a couple dozen of fair-weather hams are gathering some mental dust, and a bunch of boys and girls who have ambitions to push out a gob of cycles after the war, and who would like to prepare for that happy day now, are being deprived of the instruction they could well be obtaining at this time.

Having read *QST* for 19 years, Ol' Joe thought the typical ham was an unselfish, enterprising and ambitious sort of guy. A lot of them are that kind, too, but none of that variety of ham can be found in this city.

After reading this far, you may have the idea that Ol' Joe is a sourpuss. He's really just a 15 w.p.m. aspirant to 30 w.p.m., with a basement full of equipment, lots of ambition, some spare time and a desire to obtain a little help in getting a Class B ticket.

Think it over, boys. If this condition exists in your home town, why not get the ball rolling in the other direction? This city's ham club may never appear on the Honor Roll, but your club might. How about helping out some of us poor lids?

* Name withheld by request.

ARTICLE CONTEST

The article by "Ol' Joe" wins the CD article contest prize this month.

We invite entries for this contest. Regarding subject matter, we suggest that you pick a topic of current interest. Amateur radio is a broad field and our ways of contributing to the war effort need discussion and emphasis. Perhaps you would like to write on Radio Training programs, club methods boosting code proficiency, Emergency Corps registering for CDC selections and WERS activity, organizing or running a radio club, getting local groups to QSO by light beam or wired wireless or ground currents now that radio is out!

Space permitting, each month we will print the most interesting and valuable article received. Please mark you contribution "For the CD Contest." Prize winners may select a bound *Handbook* (Radio Training Course or regular edition), *QST* Binder and League Emblem, or any other combination of ARRL supplies of equivalent values. Try your luck!

The Month in Canada

QUEBEC—VE2

From Lt. L. G. Morris, VE2CO:

VAL SHARP, 2CR, who has been located in Toronto for the past three years, visited his old friends in Montreal on his summer holidays. Bill Monday, 2FK, and Gordon Southam, 2AX, have finished building frequency standards. Ben Franklin, 2GN, has been experimenting with receivers. Lt. Joe Kelly, RCNVR, is now stationed at Halifax. Walter Pelly, 2CJ, keeps his fist in practice as an NCO in the RCCS reserve. As a temporary substitute for the ham game, Tommy Letts, 2BG, is trying his hand at sketching and painting.

ALBERTA—VE4

From W. W. Butchart, VE4LQ:

OUR good friend 4QX, Fred Heath, of Edmonton, returned to the city on holidays recently, and renewed old acquaintances. Fred works in a liaison capacity between the Canadian Government and a firm handling war contracts.

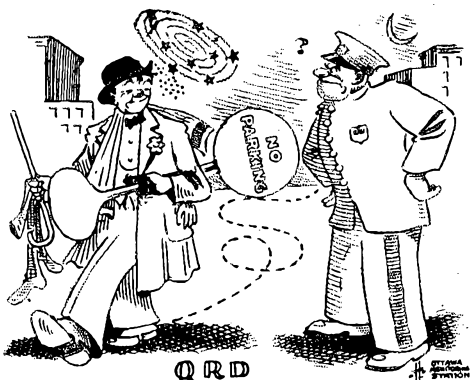
We received an air mail letter from 4ADD, Art Craig, of Edmonton, who is an FO in the RCAF overseas. Art gives a very vivid description of an air raid on London during his visit, and tells how the searchlights "coned" a Jerry plane, then how the London rocket batteries opened up and successfully brought down the marauder in flames. Art's OC is a ham, and he receives *QST* regularly, so Art is able to keep up with local doings via this column. ADD sends 73 to all the VE4 gang.

From Albert Potoski, a member of the Southern Alberta Radio Club, comes news of Lethbridge activity. 4ALI, Roy Hopkins, of Lethbridge, has done splendid work in getting the club rolling again, and as noted in our earlier write-up, the meetings are held the first Thursday of each month in the club rooms of the Lethbridge Rifle and Revolver Club. On June 1st, through courtesy of N. Botterill, station manager of CJOC, Lethbridge, a hamfest was held out at the transmitter. Among those present were: 4WR, Jack Stewart, chief engineer at the station; 4VR, Lorne Merriman; 4ALI, Roy Hopkins; 4EO, Bill Savage; 4OF, Ted Emery; 5KQ, Bill Deacon; 5EO, Geo. Good; 4AHD, Bernard Clancy; and Jim Ball, Keith Lane, Bob Reed and Albert Potoski, members without calls. After they looked over the layout, ALI served sandwiches and AHD served coffee. 4EO played a recording he had received from VK3SB, made in Australia, November 8, 1943. As soon as the transmitter signed off for the night the boys really gave it the "works." Thanks very much for the news, OM, and may we hear further from you as to club doings?

Through the kind assistance of 4ZI, Elwood Irwin, of Barons, 4LQ, writer of this column, was able to re-establish contact between 4SP, Boyd Clarke, of Picture Butte, and an old RCAF pal who since being discharged has been flying out of Seattle with Pan American Airways. Any of you chaps wishing to get in touch with 4SP may do so by writing him C/O Picture Butte, Alberta, and he'll get the QSP. By the way, SP is stationed at the Bombing and Gunnery School, RCAF, Lethbridge. 4ADY, Laverne House, erstwhile "shipbuilder" from Vancouver ship yards is back in Barons on leave. He says that he has ordered a Lincoln Welder, which will be a pretty handy thing to have around the district this Fall. 4PZ, Vic Rowe, of Barons, now with the RCAF at Calgary would like to rent ZI's Meissner Traffic Master. Vic says second-hand radio sets are scarcer than hen's teeth in Calgary. Vic's work in Calgary consists of checking radio equipment in planes at one of Calgary's air schools. 4AQP, Milson Hodgson, of Barons, is now excavating a basement for a new house. ZI finally winds up with the following: "At 4:30 A.M., June 19th, my XYL presented yours truly with his first son and heir — 8 lbs. of him. So now I'll have to sew more buttons on my vest!"

By the time this is in print, members of the Reserve Army will be going to Sarcee for annual camp. If I'm able to make the grade I'll be there, and hope sincerely to meet the many hams who attend the camp with their various units.

AAD, Jack Freeman, of Edmonton, district signal officer, M.D. 13, stationed in Calgary, has been off work for some time now due to illness. At the last report he was getting down to his office for an hour or two a day.



MAILBAG

The following notes on British Columbia hams were collected by PO/Tel. David Scholes, VE5DY.

VE5MJ was married a few months ago, and I believe he is stationed in Alberta. 5BI is stationed near Sidney, a few miles from Victoria. G3MG and G2WI, both of whom were at 5BI's present station, have returned to Great Britain. 5UL, L/Tel. Campbell Watson, is back in Victoria after a spell in the VE2 district. 5DS, L/Tel. Roland Watson, has returned to St. Hyacinthe, Quebec, after spending leave with his family at Langford Lake near Victoria. 5AHL seems to change his job every few months, but is still in Victoria. His onetime side-kick, 5AHK, is now in India. 5DV is now at Kamloops, B. C., installing a b.c. transmitter, having left his last post at the b.c. station in Flinflon. 5JZ was given an honorable discharge from the RCCS. Roger Wilson 4FG, is a W/T and in charge of a West Coast naval radio station. He passed out of classes as a Tel. in '39 along with some 16 other hams. 4MN was drafted to a station on the B. C. mainland. Andy is a PO/Tel. in the RA branch. 4YM was unable to qualify for RA and will retain his rating of Tel. (SO); he expects to return to my station, where are also stationed 4AEY, 4XY and ex-5IW.

A hamfest was held on April 14th, with the idea of giving hams in the armed forces stationed in this vicinity an opportunity to meet each other and the local ham fraternity. It was not so successful as anticipated, there being but four representatives of the Navy, four of the Army and none from the RCAF. A total of twenty-four attended and included: 4XY, 5EP, 5QH, 5GB, 5ABU, 5PO, 5IE, 5DY, 5HR, 5KL, 5SW, 5TZ, 5AHL, 5AAZ, 5AAH and ex-NC5EE.

Have received word of the promotion for 5OR; he is now F/O A. Southall, and is stationed in Ceylon.

Sgt. Norm Dixon, 5PX, has returned home after about three years of foreign service, a good part of it being in India. He is now stationed near Victoria at an RCAF station. Sgt. Jim Hall, 5AHJ, was back in Victoria about a month ago to attend the wedding of a friend, and has returned to his RCAF station in Alberta. And speaking of weddings, the engagement of 5RB, S/Lt. Stan Sellick, RCNVR, was announced about a week ago. 5EP and 5NG recently became proud possessors of a junior op. Have just learned that 5ADL has been transferred from his Dept. of Trans. station up the coast to VAK. His ham station before the war was on an island just off Victoria, so he is more-or-less at home, being a member of the VSWC. 5EC wrote from Great Britain shortly before D-day and said there were possibilities of some leave home for him, but he was keeping his fingers crossed.

F/Sgt. R. M. Watson, RCAF, stationed at an RAF base in India volunteers the following explanation:

" . . . I think it is about time that one of us VE hams apologized for the rest of the gang 'over the line.' Canadians don't seem to have a very good reputation for writing letters — neither have hams. Well, putting the two together, i.e., a Canadian ham, evidently produces a type of definitely anti-correspondence-minded guy! So, if you rave and plead in your columns for the VEs to write, or hand in their war service records, put it down to our complex. *All* the hams of my acquaintance are in the armed forces, except one or two who couldn't pass their medicals and they are doing excellent radio war work on the home front."

ATLANTIC DIVISION

EASTERN PENNSYLVANIA — SCM, Jerry Mathis, W3BES — 3HXA received a letter from 3HJE, who is in Egypt, telling that he sees 3DRJ. HJE's officer is 20A. DRJ was promoted to the rank of captain. 3CHH was home on a vacation from Wis., where he is employed. A little party was held for him at 3BES' place with 3AGV and 3BXE attending. 3GYV has real civilized quarters in Italy. 3GRF is a master sergeant now. 3FPP is working for KYW-FM. 3HFW is home on furlough. 3JUC and JSU are in the Navy stationed at Bellview, Md. Foster Reynolds (LSPH) is V-12 at Lawrence, Kans. We don't get the point, but 3GGC is going in for cactus growing. 3LN and 3APO paid us a visit. 3GC and 3DGP have an experimental model of a 6-band 1-kw. coil turret. 3GHS is building a super frequency standard beginning with a 100-kc. crystal. 3JKC is rebuilding his modulator. 3DOU will demonstrate the operation of the new Red Cross mobile headquarters station to the Haverford WERS. 3HYX has a new portable-mobile WERS rig in his car. 3JB is operating a police transmitter during the summer vacation. 3HTI took out his commercial ticket preparatory to going to sea. 3GHM and 3JBC were heard from. 73, *Jerry*.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA — SCM, Hermann E. Hobbs, W3CIZ — PV expects a call any day, having passed all his exams for 2nd-class ROA commercial. He is still engaged in teaching the rising generation at Columbia Tech. the best methods of pulling signals in through QRM and u.h.f. construction technique. Pfc. IEM is located with the AACS at station WZH. His address is: 105th AACS Sq., Box 297, MAAF, Midland, Texas. WERS is still active in this section. A few notes on the ham activities in this section would be welcomed.

SOUTHERN NEW JERSEY — SCM, Ray Tomlinson, W3GCU — ASQ reports that a new class of 48 students has just completed the studies for 3rd-class 'phone ticket, and 38 of these have taken their exams and are now awaiting FCC reply. Experimentation has been taking place with the use of a type 56 as the oscillator in the 2½-meter rigs. The superhet in control has been replaced by the receiver using the 9000 type tubes. The super is being realigned. ABS reports Hillsboro/Branchburg Twps. organization is going right along and they have revamped the transmitter at control replacing the 41 there with an HY-75. Stan has also added a 954 r.f. stage in Unit No. 3, aided by ACC and UK. Three superhets are now in operation in addition to the t.r.f. job in this set-up. A new mobile unit is being added to this net and will be identified as Unit 10, and will utilize the same line-up as the modified TR-4; also another new unit, mobile No. 11, is planned which will use an acorn 954 superregen. together with one of the low-powered triodes in the oscillator. Bridgewater Twp., WJMN, now reports 5 units successfully operating and restricted 'phone exams were given to 6 applicants on June 15th. Major Lawrence Silverborg has again been transferred and WERS participants would appreciate knowledge of his present whereabouts. It is our earnest advice to all radio amateurs and amateur clubs to consider WERS. State Aide H. Dallas Fogg, ASQ, 71 Park Ave., Hamilton Square, N. J., will gladly supply any information to all interested amateurs. New QTHs for this month include: BZX, 346 E. Park Ave., S. Winter Park, Fla.; HWO, 723 Hamilton Ave., Trenton, N. J.; Cpl. Arthur G. Hassal, APO 133, c/o Postmaster, N. Y. C., N. Y. JAG, who just recently put to sea with the merchant marine as radio operator, was somewhat taken aback just before he left when, while walking down the street in Phila. one day, sporting his gold braid, a coupla gobs came to a stiff salute as he passed by. Eddie Peters (LSPH) is "striking" for electrician's mate, and expects to get his rating soon. GER has again put to sea. VE is "Pop" again, this time for No. 6. GRW was home on leave. HWO's jr. operator, Bob jr., is at radio operator school at Ft. Monmouth and is now up to 20 per on the mill. M/Sgt. IOW is home from the So. Pacific theater of war on a furlough. AXU made an extended trip on one of our B24s recently. IUQ, who now has his 2nd class 'phone ticket, has been reported as having joined up with the ranks of commercial operators. Ex-BOI's brother, a pilot in the AAF, has been taken prisoner by the Germans. The DVRA is planning a corn roast and beach party in Aug., according to reports received from EED, president. Anybody got a Jensen Bass Reflex Speaker and professional recorder? If so, please contact S/Sgt. Edward Turner, AAFRS, 1 Ambassador Hotel, Atlantic City, N. J. J. H. Mann, C.E.M., Area B-8, CPO Hq., Camp Peary, Va., wants an Echophone or a small Hallicrafters receiver. 73, *Ray*.

WESTERN NEW YORK — SCM, William Bellor, W8MC — The Rochester Amateur Radio Association recently wound up a successful year with a picnic and an election of officers. Meetings will be resumed Sept. 6th. ACY was elected president. TWM is retiring president. WERS is now flourishing in the Rochester area; plans are under way for enlarging to 40 units. GWY is a radio electrician in the Navy and is yearning to be back on the air handling traffic again. EBF is now located in Buffalo and has a WERS operator ticket and is rarin' to go — you interested men contact him at 695 So. Tiorunda Dr. They tell us there are over 65 hams working for Stromberg-Carlson in Rochester. Monroe County-Rochester WERS is having a picnic for members, their wives, children and friends at Ellison Park. All the usual picnic features will be topped by a receiver hunt. The Syracuse WERS gang have also been invited. TVQ, AVI, NXS, GWT, IBW, MEV, VQZ, NMI and LIW are in the radio department and radio inspection department, Bell Aircraft Corp. RLI has built a lot of stuff for postwar use. 73, *Bill*.

CENTRAL DIVISION

ILLINOIS — Acting SCM, George Keith, jr., W9QLZ — ODT advises that the Joliet gang manages to hold together. YIF is doing radio maintenance at the Army Air Base at Homestead, Fla., where he has many personal QSOs with 8KKO, who is in the same shop. ZEN writes from New Caledonia that he is hoping to QSO some DX in person. The Starved Rock Radio Club had the pleasure of entertaining BIN while he was home on leave from North Camp Hood. VFS was killed in action on the Italian front July 1. 73, *Geo*.

INDIANA — SCM, Herbert S. Brier, W9EGQ — FOS reports from England that he works day and night. RDC is now ART1c. Because it took three weeks for his *Bison* to reach him, PUB wonders if the States have reverted to the Pony Express. EMQ reports that Anderson now has a radio club. OOG is at Camp Davis, N. C. UDD says the Ft. Wayne WERS receiver situation is in good shape, but they need transmitters that will stay on frequency. WXG has a full-fledged commercial ticket. DOK dreams of making new friends by ham radio while keeping the old. He reports that ARI, ARY and JDW work at Warner Gear, Muncie. DOK, FFN and HJJ are at Muncie Chevrolet. FXI is at Nickel Plate RR. HOG is at DeSoto. HYB is at Owl Drug-store. KLG is at Indiana General Service. NQB is a pvt. at Ft. Monmouth. OMD is a doctor for Uncle Sam in Calif. NSF is p.a. man and radio serviceman. OED is USES superintendent, Anderson. S/Sgt. ZNC was tickled to hear from the gang through the *Bison* for the first time in over 3 years in the Army. EHT confirms that it gets warm in Washington in the summer. YMV, radio operator for USMC in the So. Pacific, says he has seen many ports at a discreet distance of 6 or 7 miles. YDA has built WERS equipment; joined the Indianapolis Radio Club and has received WERS operator license. His wife got her Class A on her birthday. ANH is managing a wholesale radio store for the duration. The owners, IYS and another ham, call unknown, are in the services. UNS is still interested in radio, but getting the mail delivered is all he has time for. OMR services wired wireless for public service company. BQF is a corporal in the Army. EBB is dreaming of his annual vacation in Ind. HUV wants to know if AB is dead or in jail. Gary WERS stations are now installed in various fire stations. MVZ says moving 10 stations is a real job. CKY writes from APO 569 that the radio stores reminded him of those in the States in 1929, when he got on the air with a breadboard TNT 210. FDS is in the Signal Corps doing the same work as a pvt. that he did as a civilian. LMO listens every WERS test period and hears many units. PLW got a chance to use an Army handie-talkie at a Signal Corps show. He tried, unsuccessfully, to "promote" a few for Gary WERS. 73, *Herb*.

KENTUCKY — SCM, Darrell A. Downard, W9ARU — FQQ is still located at Frankfort. 8BCS is located at Eastern

Teacher's College at Richmond. Sgt. 3JKH is at Camp Chaffee, Ark. ARU has 288 consecutive copies of *QST* and will loan you an old copy if you deposit your left arm. ALR is still in the Navy, at Charleston, S. C. URG reports from England that a "Jerry" operator accused him of QRMing "Der Fuehrer's frequencies." DFW says, "They laughed when I built that antenna so carefully. How did they know it wouldn't work?" Wanted: One three-handed guy to operate ARU's rig at WJKK-26. WJKK-22, with all the inventions being tried, looks like "Rube" Goldberg was chief operator. BPE is reported to be in Italy. YAL is helping Uncle Sam at Camp Claiborne, La. SFD gives us some good operation as control station for the second district (WJKK). EDV tells us there is no allure to the South Sea ladies. CNE's legs are getting uneven from that hillside garden. BAZ and AEN failed to show up at last ARTS meeting, which, of course, didn't have anything to do with that gang of WACs who blew into town from Chi.

MICHIGAN — SCM, Harold C. Bird, W8DPE — 8UGR has sent in another construction story. 8UJL, in the So. Pacific, met 5HOT, 8POE and several other hams. His address is: Frank Lawrence, RT2c, N.A.B.U., c/o FPO, San Francisco, Calif. 8TMN fell on the ice last winter and tore muscles in his back and left arm, and on the same day came down with flu. Barney tells us that Lt. 8IBH of Port Huron, won the distinguished flying cross for his work in the So. Pacific, but is now reported missing. 8UFO, a radioman in the AAF, was killed in this country in a crash about a month ago. Barney reports the Edison Club going along fine. Lt. W. G. Bruening writes as follows: "Was just looking over some of my copies of *QST* and I see that you want to hear from more of the boys in the services. One of the main reasons that you don't get more letters from guys in the services is that there is no way to get your address. (ED. NOTE: Addresses of all SCMs appear in the front pages of each issue of *QST*.) Bill reports an audio oscillator is hooked up between his quarters and the radio shack and he talks back and forth with his men. 8RLQ writes from Scott Field. Carl would like to hear from his friends. His address: Pvt. Carl S. Krzywozycki, Section K, Barracks 723, 3505 Base Unit (TS), AAF, Scott Field, Ill. The last meeting of the DARA consisted mostly of rag-chewing and talk about postwar ideas. Ken Conroy was unable to attend because his new offspring required his attention. Radio Aide Ralph Devore reports Center Line WERS is still going strong. Pontiac WERS is still conducting drills on Mon. nights and is making good progress in message handling and correct operating technique. The class in elementary electricity has been devoting its time during the summer months to drill work instead of study. Before this column goes to press another meeting of the Michigan Chapter of the APCO will have taken place at Jackson, Mich. Pres. Conroy would like to see more of the police officers attend these meetings. 73, *Hal.*

OHIO — SCM, D. C. McCoy, W8CBI — *General:* I sincerely regret that WMQ was listed as a Silent Key in the June Ohio report. This should have been WNQ, Lloyd Victory, of Dayton. *Middletown:* DGU reports some new HY75s have been located and a new frequency meter is about ready for service. WERS license renewal has been received. *Cincinnati:* The QCEN has changed its meeting place to the Engineering Society Building. CAU, Albert Kuechler and Harold Hilge have joined the QCEN. The June issue of *The Listening Post* has two good technical articles, one on 2½-meter directional antennas and another on a 6NF long-line oscillator. At the June meeting D. E. Cartwright discussed postwar plans for the QCEN. Wm. Burkhart has been granted a 6-month leave of absence as zone two radio aide. W. D. Montgomery is acting in his absence. Charley McIntyre has been appointed deputy radio aide for zone one. Some wired wireless activity is rumored in Cincinnati. The QCEN is sponsoring MFP for SCM of the Ohio section in the coming election. Carl is well qualified. *Springfield:* EQN reports meeting LEK and his XYL in St. Louis. OUB is working out of Chicago and living near there. *Dayton:* WERS furnished communication during a recent scrap paper drive ordered as a practice Civilian Defense Corps mobilization. Other units of the Corps had an excellent demonstration of the value of emergency radio communication and obtained valuable experience in coördinating their activities with the radio units. IJ is out of the hospital and back on the job. While convalescing, a new long-line job using an RK34 with Class-B modulation was completed and put in service. RHG has also completed a similar job. DMN is back from a trip to Maine and Canada. RHH was in St. Louis for a few days. VHJ's father is now on an overseas assignment, while Tommy is continuing his bomber training. QDI is now at Naval radio school at M.I.T. MFV has been transferred to 8th A. W. Comm. Squadron and is now at Presque Isle, Me. Corp. Richard J. Sauer is now doing radio maintenance work, with the 155th Airways Comm. Sqdn., APO 845, c/o Postmaster, Miami, Fla. He wants to hear from SVI and BI and his old pals in Dayton. His group commander is 3HUZ and 9LPS is with his outfit. Miss Holloway, of the Washington, D. C., WERS, is in Dayton for several weeks on business and has been a guest at several of the local WERS drills. ENH has completed his boot training at Great Lakes and has been assigned to radio school at Chicago. *Cleveland:* The June meeting of the CRA enjoyed the largest turnout of the year. A talk by Major McRea of the 8th Air Force, on the activities and problems of that splendid group, was well received. A Westinghouse movie on the development of radio broadcasting was presented. AVH discussed the relicensing of WJJH radio stations effective June 1st. The June issue of the *CRA Bulletin* contains a list of former Cleveland area hams in the services. Members and friends are urged to write to them. CRA is preparing a petition nominating AVH for Director of the Central Division. *Piqua:* WKN reports that modified WERS license to include Miami County under the W[illegible]IK system has been granted. Four operators are ready in Troy and tests are under way to hook in the Piqua system with Dayton for simulated emergency drills. The system will be composed of portable and portable-mobile units permitting maximum flexibility of use in case of emergency. I regret that business pressure forces me to quit, but I feel the job should be assumed by someone having the time to give it the necessary attention. My interest in amateur radio is as keen and active as ever and I will do whatever I can to further the cause. 73, *Dan.*

WISCONSIN — SCM, Emil Felber, jr., W9RH — DND is busy building equipment for the armed forces at the Radio Technical Laboratories in Evanston, Ill. He sends regards to UIT. DNB is in the Navy and is studying radio at Gulfport, Miss. FVG is back in the States after working in San Juan, P. I. He recently was married and now lives at Chetek. Radio Elect. T. C. Kercher, USN, writes that he has seen some of those buzz bombs fall and doesn't like them. ZIE, RT2c, has joined the Navy and is now in Chicago. He would like the boys to write him at 190 N. State St., Radio Materials, Chicago, Ill. HRM is editor of the *MRAC Bulletin.* DIJ was married July 1st. JGE is the proud papa of a YL operator. SYT was in town and reported that he will be going to parts unknown. Lt. KFB is in England where he is with the Signal Corps in the signal maintenance section. KLN is still pounding brass for Northwest Airlines in Chicago. VDY was in Milwaukee for a few days; he is still with Raytheon doing development work. Pvt. John Rashinsky dropped a card from S. Dak. ESE has invested in a home of his own in Port Washington. 1st Lt. VKC, Air Transport Command, is receiving the club bulletins somewhere in India and said WCR also reads them. Pvt. John Holmes has been transferred to Calif. Pfc. Carl Schuppel is sending us copies of the *Camp Carson Mountaineer* and the *Timberwolf.* Cpl. John Browe writes from England that he is doing some of the transmitter and receiver installation work in jeeps and command cars. Lt. Pasquale Fannelli, ex-UHZ, Signal Corps, has reached England for the second time. Cpl. Gilbert Rink also dropped us a line from England. Sgt. LZL is doing motion picture projection and amplifier work in New Guinea. T/Sgt. CRW's mother informs us that he gave up the high speed trans-Atlantic c.w. job and asked for a transfer to the Air Force. He is now a radio operator-gunner on a big bomber. Pvt. Curtis Schultz is overseas. T/4 ANK wrote from England. Frank Jancarik, RT, USCG, was home on furlough from Fla. JWN, RM1c, wrote from the southwest Pacific and wants to be remembered to all the hams. Cpl. Frank Detzek is still in Kans. UMP is doing special radio work for the Royal Navy in England but will be back in Boston soon. Sgt. Robert Kuesel is located in India. Lt.(jg) ANA, USNR, has arrived at New Guinea en route to an unknown destination. RKP, an instructor with the Army Communication Technical Service at Scott Field, Ill., was in Milwaukee for a minor operation. EYH has been transferred to Oakland, Calif. QIH, RM1c, wrote to GPI. He is in the thick of it and experiencing super-action. Capt. JWT, USMCR, informs us that his next letter will be written from a foxhole. The WMFI WERS tests are progressing nicely. Lt. Col. George Howitt and others expressed satisfaction in the manner in which our network functioned. RH and NY installed the

antenna at Unit No. 22, located at the old police station, N. 12th and W. Vine St. During the July 10th tests RH and GVL at Unit No. 5 got the urge to try out Unit No. 22's new antenna. As 22's rig was still in the finishing stages, they picked up Unit No. 5's rig and carted it 3 miles to No. 22. They heard Chicago WERS Unit WHHI-22, located at Homewood, Ill., approximately 100 miles from Milwaukee, and also WHHI Units Nos. 10, 1 and 101. They heard WHHI-22 mention that WMFI-22 was coming in R9 down there and also said that they were hearing WMFI-10. DX on 2½ meters — ain't that "sumpin'"! 73, *Emil.*

DAKOTA DIVISION

NORTH DAKOTA — SCM, John W. McBride. W9YVF — We heard from YTX in the So. Pacific. DNI, Navy radioman, who has been in the Pacific, is home for a few days. UGM has been promoted to captain in the AAF and is in England — or somewhere in the Troup Transport Command. UGC is still at Omaha. YVF is at Sioux Falls Field. Give me a lift, fellows, so I can get a real report next month. 73, *John.*

SOUTH DAKOTA — SCM, P. H. Schultz, W9QVY — Howard White, a new ham at Delmont, is now taking boot training at Farragut. ZAL is planning for high power after the war. SGI is now working for the Willamette Ship Building Company as a marine electrician. MBA is teaching radio in the Navy. SBF, formerly of Sioux Falls, sends his address as Sgt. D. T. Meisel, APO 149, c/o Postmaster N. Y. C., N. Y. He says that he has received copies of *QST* and they are really a "pick me up." He would be glad to hear from 160-meter 'phone men from Iowa, Neb., Minn., S. Dak., and N. Dak. Sgt. FSX writes from New Guinea that he is receiving *QST* but So. Dak. news is scarce. I have his address if anyone wishes it. His brother, Sgt. ZDZ, is in the Signal Corps. APT, a member of the BHARC, is now a captain in the Signal Corps. 73, *Phil.*

DELTA DIVISION

ARKANSAS — SCM, Ed Beck, W5GED — FXO has moved to Texas and is quite busy. IGM has signed up as chief operator in the merchant marine. EVD has sold out in Little Rock and has entered confidential work in the war effort. PX managed to negotiate part of his vacation for the year, the half in which he got no fish. JHL is continually remodeling and rebuilding and has definite postwar plans. GGW is again operating broadcast and was recently visited by the stork. HDR is again pursuing the flowery path of knowledge at the U. of Ark. ARH is keeping himself very busy as the big gun of the state police set-up. FTW recently joined the ever-vast army of benedicts, and earned himself a promotion in rank also. DZE and GNV are doing their respective bits for the war effort with Raytheon Mfg. Co. ENH has been slightly off the beam with a big shot complex but will soon be clicking again with the arrival of the XYL to reside at Derrider. The regular quarterly examination at Little Rock was conducted by DU and was well attended. 73 and all the best, gang. *Ed.*

LOUISIANA — SCM, Eugene H. Treadaway, W5DKR — BYY is back in Shreveport after a sojourn in civil service radio. D. M. Baker, in Air Force radio, is in India. KJE has been doing a great job in WERS. KMC is QSY to Dallas, Texas. AGJ hopes to be active again real soon. DWW is building a new rig. HSH is convalescing in a Navy hospital. JET, chief pharmacist's mate, is home in Monroe on a well-earned furlough, after 18 months in No. Africa. KHH sends 73 to the gang. AOZ says he's praying for "ham" day. 4BMH and XYL, 4GIW, report from La Combe, La., where the OM is maintenance supervisor in charge of the overseas foreign airways communication station. HUK and GEA are also on the job at the station. AUT, secretary of the Delta Radio Club, reports that all the boys are either too busy or dispersed. 4IFE is with FCC Radio Intelligence Division in N. O. CEW, will you please send the SCM all the dope on WERS. WF and WT are busy railroad men. ERV is keeping up on code practice. FJW finds time for Little Theater plays. HMV reports direct from the European theater and says it was swell to see his first *QST* in months. HMV, S/Sgt. J. W. Waller, APO 133, c/o Postmaster, New York, N. Y., has just received the Air Medal for taking part in the invasion. 73, *Gene.*

HUDSON DIVISION

EASTERN NEW YORK — Acting SCM, Ernest E. George, W2HZL — The hidden transmitter hunt, held by Schenectady County WERS on their field day, was won by J. Downie and KLM. BEW writes of his travels from Schenectady since 1927, which include a year in Latin America as a research engineer in charge of airport construction. Your SCM writes that a storm walked off with the chimney on his home at the Naval station. Three more of the gang have joined the Navy: Jack Davidson, ex-FMR, JZK and C. D. Birkhahn (LSPH). William E. Horton (LSPH), 17 years old and a junior in high school, believes he is the youngest ham in Sullivan County. He is in the local WERS, WKPV, and will be in the Navy soon.

MIDWEST DIVISION

IOWA — SCM, Arthur E. Rydberg, W9AED — URK, Des Moines radio aide, says that they have their WERS application for 26 operator licenses on file with the FCC. UFL reports Sioux City WERS getting along nicely. KGIL, Cedar Rapids WERS, reports 40 to 50 attending each meeting. They have a short talk on some phase of electrical and radio theory, and sometimes movies to illustrate technical problems. A door prize is given at each meeting, which JIH complains that he can't ever win. ZQL, the activities chairman, expects a call from his draft board, so Bill Breed, a Navy inspector at Collins Radio, has been elected to fill his place. Bill is planning a WERS demonstration at the local baseball field. ROW is going to be a papa soon. AVH married a girl from Montreal. BCC spent two weeks in the hospital. NTK, in the Army at Portland, Ore., was a recent visitor in Des Moines. OCG is back in the States in a hospital in Springfield, Mo. BBB has a new Army P. O. New York City address. JBY, former radio operator-gunner, is now a c.w. operator for Army Airlines in the So. Pacific. OLY recently acquired an 815. AED expects to hear from you. 73, *Art.*

KANSAS — SCM, Alvin B. Unruh, W9AWP — After completing radio school in Ind. and Md., NHB is stationed at New Orleans. TYV, ART2c, is stationed in barracks near YYW in Hawaii. Wendell Wilson (operator license) has been busy at Sterling, Kans., while waiting to go into the Navy. He has a new home-built superhet. 1st Lt. ZJV, in the Air Corps, is in the States recovering from a skin-graft operation after a landing crash while in a So. Pacific aerial engagement. ZKA is back to work after a prolonged illness. ICV was host at the convention of Mo.-Kans. Chapter of Associated Police Communication Officers, Inc. in Topeka in July. LFB, chief radio engineer at KGPZ, and Bob Hunter (operator license) planned to attend the APCO meetings, only to learn over the air, after the sessions had started, that they were planning the trip a day too late. 73, *Abie.*

MISSOURI — SCM, Mrs. Letha A. Dangerfield, W9OUD — AEJ writes that the Navy decided to make him an instructor so he is out at San Diego undergoing more studying. His rating is aviation radio technician 2nd class, not 1st class as recently reported in this column. GHD says it is quiet in Alaska at his station. A pleasant surprise was a letter from VWN, who we used to work in the old AARS net from Windsor, Mo. Since those days John has been with the Signal Corps as civilian radio technician, with the Air Corps as aircraft electrician and is now with CAA as radio electrician at Cordova, Alaska. Letters from TGN and PYF, from out in the Pacific, arrived around July 4th. TGN did not receive the hoped-for leave; he has not been home since April '41. PYF's younger daughter is in nurses' training. 4HLN, ex-9IGW, the SCM's brother, has been across to Naples and back since the invasion. HGB is able to get around quite well after his broken hip of a couple of months ago; he has stopped in to see BMS and OUD several times. BMS is longing for those clear Ozark streams and the fish(?), and so forth. OUD had a letter from a British ham who would like to correspond with some U. S. hams. I'll be glad to pass the QTH on to any of you who are in the writing market. If he would whistle CQ U.S.A. out of his window he might raise some among the boys stationed over there. 73, and lots of luck to all of you.

NEBRASKA — SCM, Roy E. Olmsted, W9POB — Sgt. GXO is home on leave, awaiting a new assignment, after many months of service as a radio operator in Africa, Sicily and Italy. Carl says that EGM is serving in England after operating at WAR for some months, and that ZUT is now operating at WAR-WLM. Lt. BZV writes from Corsica, where he is serving with a Signal Depot outfit. EAT-KGLZ says their WERS got into service for two days and nights during that Elkhorn River flood. With the help of ROE and permission from the R.I., KGLZ used remote broadcast through KORN and got FB results. The following amateurs held their annual picnic on June 25th at Lincoln: KYD,

ROE. BXJ, LEF, ZNI, FWW and EAT. What's about HYR and Arline on that shindig? FWW has received a medical discharge from the Navy after serving in the Pacific theater and spending several months in a West Coast Naval hospital. KYD is the admiral of a new put-put ship. UHT spent a vacation from Iowa U. teaching duties at Cedar Point Ranch, Ogallala. YOD writes that Merna, the XYL, just returned home from the hospital. Lt. QGE reports from Camp Gordon that he has recently been commissioned in the Engineers and has been assigned to a new submarine bridge outfit. FAM, ex-SCM, will sell one used 852 and a pole transformer. Regards to all. *Pop.*

NEW ENGLAND DIVISION

CONNECTICUT — SCM, Edmund R. Fraser, W1KQY — Capt. KOY, HITCC Communications, Stout Field, Indianapolis, Ind., writes that he is assistant to the colonel in communications. Lt. Col. FOU is command communications officer at the same QTH. DJC is in England with the OWI. MGT is busy with radar, USMC, at N. C. Lt. Comdr. AH, Medical Corps, USN, has returned after a long spell in the Pacific and is stationed at the New Haven Induction Center. NY1AA is a lt. comdr. USN is aboard ship somewhere in the Atlantic. LOP, former Nutmeg Net member, is an aerial navigator in the Air Corps, and is now taking a course in radar. The members of NHARA extend their sympathies to Pete Limoncelli, whose brother, Matthew, was killed in action at Anzio May 30th. LXK and Ernest Mongillo, in the Army, bring the total GB members in the services to 32. KFN/2OCC, who is still at Ft. Monmouth, writes that his XYL is studying for a commercial license. Albert Loos, CRM, USN, and ex-ham, gave an interesting account of his action at Pearl Harbor, Guadalcanal, Tarawa and Rendova. Al has been given a medical discharge for injuries received. NCL and Davidson were recently home on furlough. Charlie Vaughn, USN, recently visited the club while on furlough from a Naval hospital. DDX writes that he is an ACRT and not a CRM, as listed in *QST*. NBY, whose address is M/Sgt. Frank E. Kovalski, APO 709, San Francisco, Calif., is in the Signal Corps in the Pacific area. MVH was paid a visit by his sons, Bill jr. and George, who are both in the services. CTI reports that Norwalk WJQA units operating portable-mobile have been contacting Greenwich control regularly as has WJQA-37, a Westport portable-mobile. Howard Dickerman, Hamden assistant radio aide for WJLH units, and IND, are keeping units operating while Radio Aide JQK is on his vacation. BW, Branford WJLH acting radio aide, and KAT, Guilford radio aide, have increased attendance on Wed. night test periods. Modification has been submitted for WJLH adding 3 units as well as including operation of most units in the 224–230 Mc. band and A-2 as well as A-3 emission. JQD is conducting Sun. test periods using A-2 emission. The Misses Jackson and Hewitt, WJLH-1 operators, have attained a code speed of 10 w.p.m. The former did a nice job of running the WJLH network in the absence of KQY and FMV, district radio aide and deputy, respectively. The inter-district network is functioning very smoothly on Mon. nights. 73, *Ed.*

MAINE — SCM, G. C. Brown, W1AQL — FQ has been promoted to lt. col. NAE writes that he is chief operator on a Victory ship. He has been in the So. Atlantic, Mediterranean and Pacific and is now an ensign. HYH writes that he was active in the AARS about 10 years ago, has been a ham for 11 years and has been in the radio repair game for about 10 years. Our old SCM, IIE, with some 30 other Maine hams, is working at the Bath Iron Works. AKR is in No. Africa, working in a radio station. CBV is back at Dow Field, Bangor. Your SCM recently spent a week at the Presque Isle Air Base and had a long rag-chew with GCB, civilian senior radio technician. DEO recently installed a loud speaker system in the PX at Dow Field. GHY is overseas. The July issue of *Telephone Topics* carries a nice picture of MN in the tube laboratory at Texas A. & M. Roland is RT1c and has been transfered to the Naval Training College, Gulfport, Miss. as instructor. 73, "*Brownie.*"

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, jr., W1ALP — Lindsay Russell, radio aide and EC for Needham, reports that they have added one more station to their WERS. NGG writes from the So. Pacific that he has met a lot of hams that he worked with his old call in Hawaii, K6PDQ. DVC, HME, KLW, 9SFZ and Lt. Comm. IZO are at M.I.T. 5GNQ was in Cambridge for a few days. BLQ is now a married man. IIL got himself engaged. NOX and 3ILR left M.I.T. and have gone into the merchant marine as radio operators. JMY is now in England. Ens. NBQ has been all over the globe. JOJ has moved to Ipswich. NET, who is in the Army, was married recently. The Parkway Radio Club went to Bow Lake, N. H., for its annual outing. IIM, AIZ, IPF, MDV, NPE and their XYLs were present. 2BJO spent two weeks with NPE. CF's XYL is not with WESX now, but is working at G.E. NIT, MHE, LNO, NRX and NRZ are working at Sylvania Elec. Prod. in Salem. FEC, AY, EJT, LAA, LAZ and MUC are working at Aerovox Corp. AOG has a lot of *QSTs* from 1920–29 that he would like to sell. NHN, who is now a WAVE, RM2c, writes from San Francisco that her brother, JLI, is getting married in July. JNX works for Sub Signal. MBS received his wings at N.A.S. at Corpus Christi and is now at San Diego. NHN has met hams from all over the U. S. A. BTL, in the Pacific area, says he has met 4DEN and W2s, W8s and a W1 from Lawrence, Mass. JNV has moved to Milton. Ex-KNZ/3IIL is home from England. NKE graduated from M.I.T. in Feb. and is with R.C.A. Victor in Camden. MBQ's brother-in-law, George Brown, of Pawtucket, R. I., has his Class A, LSPH. KCF, CRM in the Navy, was home on furlough recently. On July 19th an amateur radio get-together was held at the Hotel Bradford in Boston. 9AA, assistant secretary of ARRL, was guest, and spoke on what the League is doing and planning. The following were present: 9ELQ, VQD, TRI, 9FFQ, YZH, 8CLS, IKE, 7CXO, 6OIN, OE, UTT, 5BXW, FPJ and XYL, 5BDB, 4BWN, 3BBO, IIL and XYL, 2JER, OEN, 1CCL, ALP, LZW, EHT, AYG, KTX, LJN, AYI, KBM, BDM and XYL, KJD, CBY, NON, JED, MPP, AKY, IBF, DJ, SZ, KYX, JNV and XYL, NFQ, BVL, WK, JPE, NF, IGO, Robbins, Walworth, Hoffman, B. Tiffany, L. Russell, H. Wright, Chamberlain, Sussman, R. McAlpine, V. Flint. LAD has a new jr. operator. The South Shore Amateur Radio Club held its regular meeting. MMU, 1S, KBS, HHU, KBM, MMH, MD, CT, KXN, FWS, ALP, CCL and EKG were present. KCP, 2nd lt. in the Signal Corps, was home on furlough from Calif. and gave a talk on some of his experiences.

WESTERN MASSACHUSETTS — SCM, William J. Barrett, W1JAH — BNL is working for Crosley in Cincinnati. KDW, after receiving wings and commission in the Air Force, took instructor course at Randolph Field, and is now instructing at the advanced twin engine school at George Field, Ind. LUD and JAH, radio aides for WKHW Pittsfield and WJPG North Adams, respectively, have been conducting tests to find the best combination of high spots to link the two units to each other and to the state-wide network of Mass. WERS stations. NDR advises us of the addition of a new jr. operator.

NEW HAMPSHIRE — SCM, Mrs. Dorothy W. Evans, W1FTJ — IJB is now a tech. sgt. in an Air Force unit in the South Seas. GKE has moved to Manchester and is going into business for himself. KMH is now in London with the OWI. MLO dropped in to see the SCM recently while home on leave from West Point. LBD is at Pearl Harbor. MAS has taken unto himself a YF. ITF has been doing a little redecorating at his house. BFT was in on the Invasion. MUW is now at her old QTH in Manchester with her baby daughter while the OM, JMY, is on duty in England. MMG is changing QTH. AVJ and family are at their summer cottage for the season. HJI was a recent visitor to Manchester and HOV spent a few hours at his home in Concord. KKQ was home on furlough recently but has returned to her position at Miami Beach, Fla.

VERMONT — SCM, Burtis W. Dean, W1NLO — BD has been promoted to captain, State Staff, V.S.G. Roy reports that radio operators are being trained at Norwich, White River Jct. and Windsor State Guard Companies. FRT, of Co. H, Montpelier, has his WERS license. Co. E of Barre gave a radio demonstration at Tunbridge July 22nd and 23rd. KJG has been busy rehabilitating his law practice. IQG and family have moved to 116 C. Holden Green, Cambridge 38, Mass. LWN has joined the engineering staff of WCAX. While on their honeymoon, ITY and his XYL visited HPN. JXS is working for G.E. in Schenectady, N. Y. 73, *Burt.*

NORTHWESTERN DIVISION

MONTANA — SC, Rex Roberts, W7CPY — CBY visited with the SCM in Glendive while on vacation. FUQ is with Pan-Am in Seattle. AOD is a captain with Pan-Am. BZA is the Pan-Am chief aircraft radio inspector for the Alaska sector, stationed in Alaska. FUQ gets to see FTX and FGR (OM and XYL) at Kirkland, Wash.

occasionally. FOM is operating at KGVO. AST is now t/sgt. with Alaska Airways and will leave soon for a new station in Alaska. Notes from the Butte Club: 9DVT and Harry Baker are at Great Lakes N.T.C. Ex-CW is leaving for Alaska. The BARC held their annual hamfest at Basin, July 16th. BKM gave a fine oscilloscope demonstration at the June meeting. C. Ault, of the School of Mines, is a new member. CPY will be on vacation next month. 73, *Rex.*

OREGON — SCM, Carl Austin, W7GNJ — HAZ is in the CAA maintenance department at Baker. We incorrectly mentioned SO as being on the staff at Treasure Island. EO is at T.I. We do not know the whereabouts of SO. SY has been transferred to Eugene. FHB sends the following news: AQO changed from Lockheed O.C. to ATC in England. AGZ is Navy radioman in N. Africa; FHM is RT, assigned to sub duty; FBO is radioman in the S. Pacific; HCW, RTlc, had his picture in *Oregonian*, with fellow operators, receiving an award for outstanding service in radio communications; ADA is now chief operator at KORE; HLB is doing radio installing in Po shipyard; HLV is in radio research in San Diego; FHB is still trying to turn out ROs and RTs. ILQ is building a crystal-controlled c.c. rig for 180 kc. HLF says Medford WERS made a movie of a synthetic air raid, showing WERS operation. FRO has gone motor-bike. EXF got a shock — a mere 2000 volts — and lives to tell about it. DYK is in the So. Pacific, and EZR is somewhere in England. IDJ went to Quonset Point for 5 weeks and then to Brunswick, Me., where he is now ARTlc in charge of radio-radar shop. We received a letter from Lt. Col. KV, "Mike," APO 938, Minneapolis, Minn. Mike carries an SX-28 with him for s.w. listening, but admits that he is planning the finishing of the new rig. 73, *Carl.*

WASHINGTON — SCM, O. U. Tatro, W7FWD — News of the death of EPB will be a shock to his many friends. HTH, who was Acting SCM, writes that he has left Camp Crowder and is now at Fort Monmouth. IHK and her daughter, Eleanor, were recent visitors while on vacation from an aircraft plant in L.A. IHK says that her OM, IHJ, is now in Rome. GRQ, on furlough, is home with the XYL. Dick is a t/sgt. in the Marines. HAY is a t/sgt. and has been in the thick of it in the So. Pacific; he is in radio and radar, reports EHQ, who runs a radio supply store in Tacoma. AZR has recently received an m.d. from the Navy. GUN is at Camp Shelby, Miss. FEC is down in Mobile, Ala. HWY is now at Klamath Falls, Ore. 73, *Tate.*

PACIFIC DIVISION

NEVADA — SCM, N. Arthur Sowle, W6CW — Asst. SCM, Carroll Short, jr., W6BVZ. MWF informs us that RFY is in the Marshall Islands. MWF, an instructor in the Signal Corps School, may be addressed S/Sgt. David Davis. Co. X, 800th Signal Training Regiment, Camp Crowder, Mo. Boulder City reports that there are 7 hams left in town: BVZ, GSB, QXH, PZY, TKV, PGD and MRT. RXG, in addition to other duties, is caring for U. S. Grazing Service radio. EEF is civilian radio technician, Reno Army Air Base. ATN is chief radio engineer, McClelland Field, Calif. TNA is RM2c in the Navy, and has returned to the U. S. after an extended period of PT boating in the So. Pacific. TNP's location is unknown. ONU is the biggest, Little City's city attorney now, and just announced twin YLs. QKV recently went into the Army. QAY is trying wired wireless. UIZ is radio operator at KOYA, Region Net Control Grazing Service. BYR is teaching radio at the university. FUO bought a new shack, 'way up high. BWX is with CAA at Humboldt radio, and is active in CAP. PST and TJY are in CAP handling communications. EBP is wing staff communications officer, CAP. PDV is with CAA, Reno radio. TQZ was with FCC, then a GI, and is now discharged and working on police radio in Reno. QJH, XYL of CW, taught some of the boys code before they went into the Air Corps. BIC, your former SCM, is swamped with radio work. GYX is communications man in CAP. RYF, RT2c, Navy, visited QJH and CW en route to active duty assignment. Thanks for voting for me as SCM. 73, *Art.*

SANTA CLARA VALLEY — SCM, Earl F. Sanderson, W6IUZ — A nice V-mail was received from QLO, Lt. James P. West, APO 713, c/o Postmaster, San Francisco. He is officer in charge of the radio intelligence section and company supply officer. OOS, from San Francisco, is his chief radio repair man. He reports QOY's QTH as T/3 Robert Eisen, APO 650, c/o Postmaster, New York, and MZQ's QTH as Lt. W. J. Johnson, jr., 1007 Sig. Co., Sv. Gp., AAF, Lakeland, Fla. NZO is busy with Signal Corps radar. His QTH is John P. Taylor, 1135 W. 87th St., Los Angeles 44. FBW passes on a news clipping of Lt. JAT, who has just completed a year's service as a master instructor in the bomber training group at the AAF Central Instructors School, Randolph Field, Tex. 73, *Sandy.*

EAST BAY — SCM, Horace R. Greer, W6TI — EC, QDE; EC v.h.f., FKQ, Asst. EC v.h.f., OJU; OO v.h.f., ZM. The monthly WERS meeting was held July 20th, according to EE. NZG is at Pearl Harbor. BEZ is at Hunters Point. Complete WERS gear is being installed at the Oakland Chapter of the American Red Cross to take care of any situation that might arise. Another day closer to victory. *TI.*

SAN FRANCISCO — SCM, William A. Ladley, W6RBQ — EC, 6DOT. 1st Lt. HJP writes in from down under. Ens. KB6ILT has been returned to the States from foreign duty because of illness. SWF is radio operator aboard a merchant marine ship and advises that RZC and MJY are also at sea as sparks. The gang would like to hear from SOM, PQW and ORZ. NYQ is now a captain in the Army, somewhere in Italy. SPE is in England. ROO is operating on New Guinea. LLW writes in from Salinas where he is still in the lettuce business. MC may take over a code class at Salinas High School. CLV, in b.c. work, is in Los Angeles. 9EKY is in San Francisco on business for Raytheon. RAH, recently injured in the So. Pacific, is recuperating at his home in Durango, Colo. S. F. WERS is still going strong under the supervision of Radio Aide DOT. 8OWU is a field engineer for Raytheon stationed in S. F. 9FYY, of Denver, visited RBQ as he passed through on his way west for Raytheon. INHN, on leave, is going to visit relatives for the first time in months. Capt. QW has spearheaded three different invasions as communications officer. His address is, APO 133, N. Y. C. He wants to be remembered to BIP, WN, WB and the rest of the gang. AWT is back in S. F. in the radio business and has a television outfit ready to go for postwar amateur activity. CIS writes in from the So. Pacific and wants to be remembered to all the San Francisco section members. Address as follows. W/O K. E. Hughes, c/o FPO, San Francisco, Calif. The following Raytheon engineers gave a farewell dinner at the Bal Tabrin night club to 9EKY as he prepared to leave for Honolulu via clipper: 9EKY, 8OWU, 9VLT, 6TJQ, 9FYY, 1MUO, 6BGH, Ira Hinks, Rags Raglind, Whit Hall, Robert Chikar, Joe G. Wheeler and 6RBQ. PVC tells of entertaining a Naval officer who served with his brother in Europe as a news reporter, only to find during the course of the evening that he is a ham. BUJ has received an advancement in positions at the Southern Pacific. We would appreciate news from Marin Club members monthly for *QST*. 73, *Bill.*

SAN JOAQUIN VALLEY — Acting SCM, Edward H. Noack, W6BXB — BXB is very busy running a steel foundry. His son, BFH, who is acting manager, is anxious to get on the air again. BCR, the superintendent, is also waiting to get back. QUE, OYF and BXB have c.c. rigs operating. The Modesto Amateur Radio Club gets together occasionally. QDT has moved to Sacramento, where he is employed by the state highway patrol in their radio station. MIW, employed by the Pacific Tel. & Tel. Co., has also been transferred to Sacramento. RFO is in the Navy and is somewhere in the So. Pacific. MZD is a radio man with the Army Air Force, and when last heard from was in Alaska. SEA is in the Navy. UGV is a radioman in the Army somewhere in the Eastern U. S. GQT was killed in action. Please send in news each month for this column, gang. *Pop.*

ROANOKE DIVISION

VIRGINIA — SCM, Walter G. Walker, W3AKN — JHC received a letter from JNH, USN, signalman 1st class. JHC also had a card from Jack Boghosian (LSPH) saying that he had met 2MZR in Richmond. 2MZR, from Pleasantville, N. Y. has been servicing radios in Richmond for a year now and is a 40-meter c.w. ham. How about more news, gang. 73.

ROCKY MOUNTAIN DIVISION

COLORADO — SCM, H. F. Hekel, W9VGC — WERS in Denver is on the air as KFND, with BQO as radio aide. The following have stations located at their homes: TRR, QXJ, WYX, VGC, TFP, CAA, QYT, BJN, TLM, ESA, OUI, TDA, PWU, ACD, URH, ODV, YXU, 7GYY, 3JIN, ex-9VTK, Bob Hawley and Don Spalding, ('phone limited) Frank Baird, Paul Kirkpatrick and Mahlon Norton, the last 3 holding commercial tickets. JBI and several others in the armed forces have given their h.f. equipment for use in WERS. Adams County may soon be one of the first to

join forces with Denver in WERS. BQO and CAA report that the county officials are favorably impressed with the demonstration given them. Nine other counties have been contacted and when these counties are under the jurisdiction of KFND the central part of the State will be entirely covered. JKC was home on furlough in June visiting his family and his new baby girl. When he left he was headed for duty in the Pacific as Navy radio technician. BFQ, DZB and QYU were home for a few days in June. EHC is still in Great Bend, Kans., and was out on extended field service (one week). GKW is still one of the married men of the Navy but through the loss of the home of his parents by fire he lost all his ham equipment. MGX submitted the following: The Western Slope Radio Club plans to hold a meeting in July, so all ain't going to be quiet on the Western Front. GDC still stands six feet two in the same pair of socks he had on before Pearl Harbor. MGX carries his QSL cards with him on the run between Grand Junction and Denver and quite often he makes personal contacts with servicemen who hold ham tickets. 7GYY expects to be a proud papa soon. The Radio Widows Club put on a shower for Alice in May. Jacque Hawley came home with a little junior, born June 6th. Here is one for the book: WYX has been going along fine with local and regional officials of the Forestry Service and plans for a radio experimental laboratory on Squaw Mt., elev. 11,475 ft. The site was surveyed and plans of the building made and submitted to the office in Washington, D. C., for approval and authority to build. WYX, having telephone 1st and telegraph 2nd class tickets and working at the game for the City and County of Denver and on call 24 hours a day, received a letter from Washington asking him if he was capable and qualified to do the work as outlined in the application! VIK spent most of his furlough in Denver visiting his family. 73, *by Heck.*

SOUTHEASTERN DIVISION

ALABAMA — SCM, Lawrence J. Smyth, W4GBV — GN, who is with CAA in Henderson, Tenn., would like to hear from KP, APJ, AGS. BCU and BMM. A nice letter was received from IDZ, who is in Santa Anna training for navigation. HYX, ex-8EMW, is located on New Britain Island. GAG has been in the hospital in Calif. and would like to hear from AIH and FTS. His address is: S/Sgt. E. S. Porter, 3180 Qm. Ser. Co., LAPE, Wilmington, Calif. BYW is still in China. ECF sent AUP and EFD a captured Jap crystal (2852) from the Solomons. DGS has trouble with clutch slipping. BCU is a proud papa for the second time. EW and GBV took a flying trip to several of the state police installations recently. A/C C. O. DeLong, former E.E. student of the U. of Texas, qualified recently as a Class C ham and is now stationed at San Marias, Tex. Sgt. PC is teaching radio theory and shop practice at Florence State Teachers College, Florence, Ala. GKU, formerly of Maxwell Field and Courtland Field, Ala., is now stationed at Tyndall Field, Fla. 8JKN, of the pre-flight school here at Maxwell, is on furlough. 9MIC is now pounding brass with AACS here at Maxwell. 73, *Larry.*

EASTERN FLORIDA — SCM, Robert B. Murphy, W4IP — CQZ is holding down the fort at Ft. Myers, being the last of a long line of hams there. QY is in Grove City, Pa., in charge of the radio school. ANJ was one-time sheriff in Ft. Myers and an old National Guard sergeant. BYR visited the SCM on one of his rounds about the State. ES has loaned all his frequency measuring equipment to IP. KK comes through with a 'phone QSO (local). Doc had as visitors, ANI, RM1c, USN, who is doing nicely on his job and CJ, the peanut power DX 'phone man. WERS has a nice set-up here in Miami; QSOs are being carried on cross town. HGO says that GS is with RCA Sound set-up. PEI has moved into Sanford with the ACL. HXM, a corporal in the Signal Corps, got married. Boyle (LSPH) was elected state senator, 37th dist. CPG is in radar here. BWZ, ex-police radio in Sanford, is a Silent Key. CLW is still kicking in Orlando. QW, CNZ, DZH and 9RXK are in Miami. Capt. Hazelton made his rounds about the State and picked up with 8EV at Sarasota. He is an OT from '18 and '21 spark days and winner of trans-Atlantic DX contests from U. S. to Wales and England. HJQ of "Cowwest" fame, late of Admiral Halsey's staff, is doing an excellent job as executive officer and editor of the local paper, *Antenna*, at the Radio School, Bedford Springs, Pa. Red was just made a full lieutenant. M/Sgt. CCR of the Signal Corps is station chief of one of our large radar installations. EYI says: "EWS spent a short visit with his family in St. Pete while away from his duties as CRM of the CG; IGO has gone in for Navy radio; ANH and DBF spent some time in St. Pete. FPC is in Jax; FOD is in training as an ensign, USNR, at one of the large eastern universities; FZW has just returned from a tour of duty in the So. Pacific. EYI spent a well-deserved vacation around Lake Tsala-Apopka." GJI is back at work after a series of illnesses. 6CUG writes that he is getting along nicely in Concord, Calif. Sgt. GEE, AACS, sends a nice letter to hq. with the following news: EYI is CRT on a destroyer. GNS is in a Navy V-12 unit at Villanova, Pa. COV is teletyping at MacDill Field in Signal Section. TZ is an engineer with Raytheon in Boston, Mass. S/Sgt. ERU, AACS, is now in New Guinea. 73, *Merf.*

WESTERN FLORIDA — SCM, Oscar Cederstrom, W4-AXP — MS is now in Philadelphia. 4EAT and 3FZO are in his office. Eddie is planning on building a television receiver while he is stationed at Philadelphia. Joseph F. Holder, an ex-Navy operator and a former member of the radio instructors' gang, passed away at the Navy hospital recently at the ripe old age of 74. HJA's son was killed in action in the Pacific. Jake was a radio operator and a gunner in a Flying Fortress. The Old Maestro is back in a hospital again, this time Pensacola Navy Hospital. FIO, who is operator at WDER at Birmingham, Ala., had quite an experience. The building caught fire, but he stuck to his transmitter until it got too smoky and hot to stay. Channey, ARM1c, from Alameda, was home for a visit and also had a trip over the Pacific. On July 3rd a son was born to Mr. & Mrs. W. W. Shedd. Shedd is one of the radio instructors at the Air Station. Dick Lundbery, at code room 606, drew "Kilocycle Kow Boy," a work of art made up of condensers and resistors and sparks, etc., and sent it to the Old Maestro in the hospital. Bill Green, former SCM from Abilene, Tex., and now a lt. comdr., has been transferred to the Pacific area. 73, *The Old Maestro.*

GEORGIA — SCM, Ernest L. Morgan, W4FDJ — FCW has been taking a course at Washington and his new assignment is unknown. GFF and DIZ were visitors at FDJ. GIA is attending radio school in the Navy. ERS rates ACMM and is now at Pensacola. EGT has been home in Atlanta on furlough after an extended and interesting tour in the Pacific. Evidently the fellows are busy and have no time to send us the dope. Those who do, always ask for more items, so pass along your activities. 73, *Pop.*

SOUTHWESTERN DIVISION

LOS ANGELES — SCM, H. F. Wood, W6QVV — Through the courtesy of the manager of the Temple Theater in Temple City, the thoughtfulness of Harlan Martin, the boss of KGCL, and the hard work of "Red" Champlin, Temple City radio aide, the whole gang of WERS operators were invited to enjoy a preview of *MGM's* "Patrolling the Ether." A meeting for aides and assistants was held after the show and a general meeting at Long Beach was decided upon for the mutual benefit of KGWE, KGIC, KGCL and KGLV, to work out a better plan for monitoring, operating frequencies for all nets, etc. This meeting was held on the 18th of July and tentative frequencies were allo'ted. RO conducted the affair, ably assisted by AM. We had the pleasure of seeing some very fine crystal-controlled jobs that had just been finished, some frequency measuring gear and other equipment that the KGWE fellows are using. A general picnic of all operators in all of the nets was scheduled at Long Beach and Temple City meetings to be held in Griffith Park, arranged by Walt Matney of KGLV. Rudy Jepsen is "signing the roads" so there won't be any excuse for anyone to get lost. Fred Stapp of KGIC writes in that Inglewood is still going strong. They are having trouble in replacing operators lost to the services and so are starting another class. They sure have put a lot through and are developing a mighty fine crew there. They recently held a practice drill in which simulated incidents covering all areas of the city were reported by radio. Dispatching of all emergency equipment and instructions to CDC personnel were handled entirely by the WERS groups and in general the results were very satisfactory. More receivers are being built and they have also just completed new frequency measuring equipment. AM, reporting for KGWE, says they are devoting one-third of their test periods to handling messages, one-third to contacts with other nets and one-third to experimenting. They listen with superhet receivers during the second half of the test period for out-of-town calls and will work out an agreement with any licensee to establish contacts. TKX writes that he has been pounding brass with the Signal Corps for a year and

(Continued on page 88)

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LAST MONTH we discussed the virtues of avoiding QRM by changing the transmitter frequency to a clear spot in the band. Of course, if everybody else gets the same idea too, it won't help much.

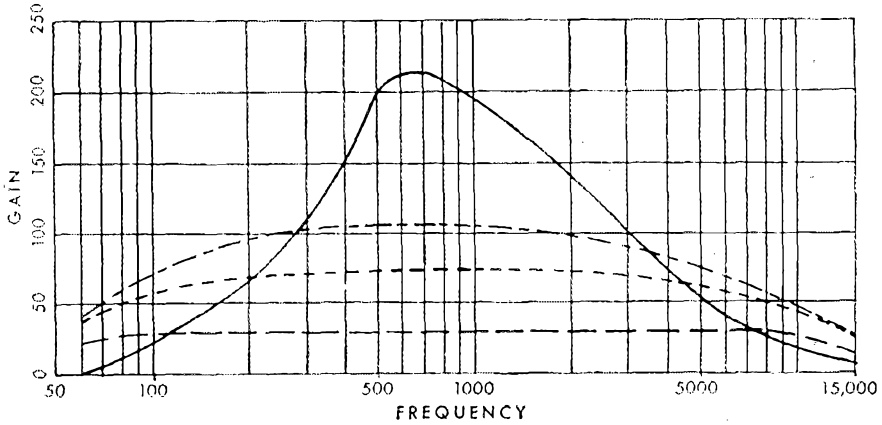
It is still a good idea however. Another good idea is to reduce the amount of the QRM. On phone at least, controlling the frequency characteristics will help a lot. A range from 400 to 2200 cycles is enough for very good intelligibility on speech. The frequencies below 400 cycles account for most of the power in voice signals, and if these are eliminated you can maintain a higher level of effective modulation in the important frequencies. Eliminating frequencies above 2200 cycles will reduce sidebands, and we do not have to tell you how much that will help in reducing QRM.

In *QST* for September, 1939, we described a speech filter circuit which is extremely simple and convenient to use. A standard audio transformer of good quality which is designed to operate from a 10,000 ohm plate will have a response like the solid line in the chart below when operated by a pentode such as a 6J7. Notice that it has very high stage gain — over 200 — and that it corresponds to the response of a telephone receiver. Also notice that the gain is practically zero at 60 cycles, which helps plenty when getting the hum out of a high gain amplifier.

Best of all, the frequency range can be controlled. If you connect a 10,000 ohm resistor across the transformer primary you provide normal matching impedance for the transformer, and it behaves normally. In the transformer we tried, the gain was within 1½ db from 60 to 12,000 cycles. This would be dandy for playing phonograph records. The pickup would not need as much gain as a microphone, so the normal stage gain of 28 would be O.K.

Varying the shunting resistance will vary the response, so a rheostat can be used to provide a tone control. All in all, the circuit is so effective that it seemed worth describing again. If you would like a wiring diagram and more information, send us a post card.

DANA BACON



Amateur Activities

(Continued from page 86)

a half now. He hears from SMC, who is in Italy in the Air Corps. He wants to be remembered to all, especially PDS, RNN and RWF. If you can write to Dick, do so at APO 655, c/o Postmaster, N. Y. C., N. Y. Major UQL would like to hear from the gang. His address: *Major F. A. Wood*, APO 5788, Seattle, Wash. SSU is traveling farther on his hops for Consolidated. MFJ's XYL reports that he is still going strong. ESX has taken up golf again to regain his manly "figger." AEL is planning bigger and better barbecues after this thing is all over. GZZ has a new crystal-controlled rig that is as beautifully built as a Swiss watch. Willy is sure doing a swell job on monitoring and frequency spotting for KGLV. Stan Lambert and Frank Milton, in the West Los Angeles area, are working hard on their net and equipment and are to be commended on their fine efforts. 7IXX, a former Los Angeles resident, is now a t/sgt. He would like the address of 7JCK, STX, 9NYU and 9RQO are in the same company overseas. 9JNW is near them. 73, *Ted.*

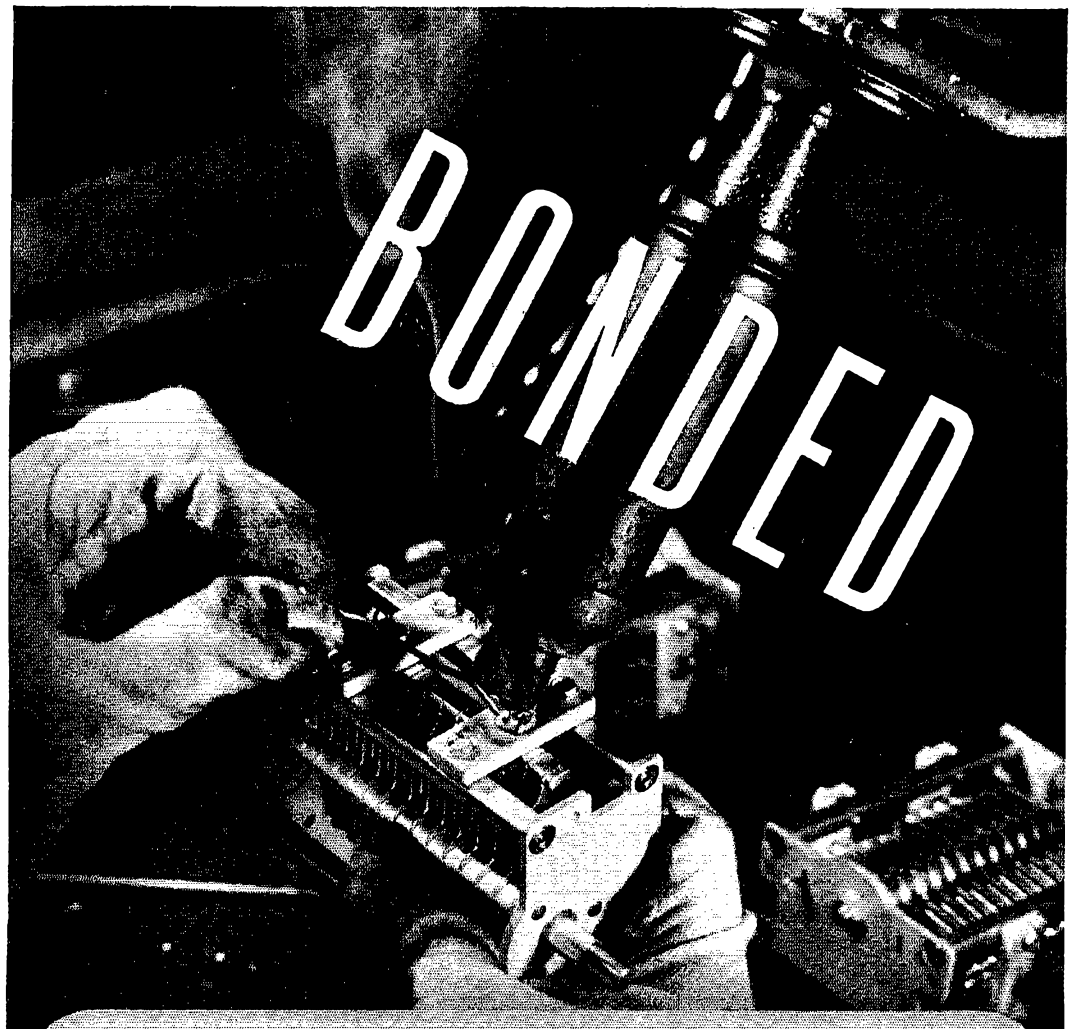
ARIZONA — SCM, Douglas Aitken, W6RWW — Ex-NXO is a t/sgt. at Camp Polk, La., and the papa of a new jr. operator. IZU is with Columbia U, in war research and is engaged in hush-hush work. He has been with the AAF as a civilian at Scott Field, Truax Field and Chanute Field, as an instructor as well as in engineering. Vic Clark, ex-KFC, previous SCM of Ariz., is with the CAA radio engineering section alternately in Washington, D. C., and N. Y. C., and would be delighted to contact any of the gang who are near there. In Washington call Executive 2460 or in N. Y. C. call Market 30527 (Newark, N. J.). He reports that PFL is now in the So. Pacific and that MLC has been promoted to captain in the AACS. REJ is acting as chief operator at a ground station at Bergstrom Field. TBR is busy raising pups. NGJ has his superhet working well in the WERS band and has picked up control station 28 miles distant. All the WERS gang now have their new deputy sheriff cards, issued by Arizona's only lady sheriff. MLL, who has been under the weather again, is designing a new superhet for future use, as well as tinkering with diathermy. TBJ has been on furlough with his folks in Tucson. OZM has been installing new antenna for sheriff's office. The Tucson gang think that IGC, the local ice cream magnate, ought to throw a party for the gang during the summer tropical weather. PCB is in Pittsburgh. I want to thank OAS/TBR, GC, MLL and all the others, without whose help this report would be a sad affair. 73, *Doug.*

SAN DIEGO — SCM, Ralph H. Culbertson, W6CHV — Asst. SCM, Gordon W. Brown, W6APG. Yours truly had a nice visit with 8WEP, who is in the Marine Corps stationed in San Diego. MKW is still with the FCC, is married and says he will return to Calif. in Aug. after three years in Alaska. He reports HWJ, formerly of Imperial is now in Santa Ana fixing ailing b.c.l. boxes and putting in a night a week with the Coast Guard. LD is back in San Diego after a couple of years overseas. He is going back to work in photo laboratory for San Diego police department. LAM joined the Navy. He stopped over at N.A.S. to say hello to the gang. OXQ, 9ALY and 9HNR/K6VJB are civilian employees at N.A.S., San Diego. How about some news? 73, *Ralph.*

WEST GULF DIVISION

OKLAHOMA — Acting SCM, Ed Oldfield, W5AYL — KBA supervises repair of dynamotors for the ASC at OCASC. EON is trouble shooter for O. G. & E. at Oklahoma City. ATL is assistant general foreman radio repair, OCASC. CWZ works at flight testing radio equipment, OCASC. DDH is in charge of all Oklahoma City's fire department communication. Oklahoma City has its share of visiting amateurs who have found it necessary to leave their prewar homes in order to do their part in helping to lick the Axis. They include: 1EAX, 1LKL, 4HO, 5FMY, 5EQF, 5JXC, 5FPH, 5FJP, 5FAB, 5FVT, 9YSY, 9AME, 9JCK, 9OFB, 9TTI, 9OBV. Best regards, *Ed.*

NEW MEXICO — SCM, J. G. Hancock, W5HJF — GXL's new address, from which he hopes to sprout some healthy radiators after the war, is 1015 Lincoln Ave., Las Vegas. HPZ is spending his vacation on the power switchboard. JWA, who thought the going was hot in the Aleutians says it was as cold as the weather there compared to where he is now. HJF's plans for Independence Day were changed a few days in advance when a luggage trailer met his jalopy on very unfriendly terms. Very 73, *Jake.*



Hammarlund engineers developed the technique of soldering variable capacitors as a means of preserving their original characteristics. Where specifications call for vibration-proof components, always specify Hammarlund *solder-bonded* variables.

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MANUFACTURERS OF PRECISION COMMUNICATIONS EQUIPMENT

Prisoners of War

Pvt. Paul Swearingen, W9PJF, who was reported in August *QST* to be missing in action, is now officially declared to be a prisoner of war in Rumania.

Missing in Action

W8IBH, Lt. James H. Pratt, Port Huron, Mich., who won the Distinguished Flying Cross for his work in the South Pacific, is now reported to be missing in action.

Silent Keys

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

W5EDK, T/3 Roy T. Hays, Marshall, Texas
W6GQT, Emil Mundt, Modesto, Calif.
W7EPB, Carl F. Hoffman, Tacoma, Wash.
W8UFO, B. R. Hedrick, Ferndale, Mich.
W9VFS, S/Sgt. Frank F. Liss, Peru, Ill.
Ex-VE5CE, Harold J. Cunningham, Victoria, B. C.
VE5CJ, A. T. Stewart, Victoria, B. C.
LU1DA-LU8AB, Felix Gunther, Buenos Aires, Argentina
William A. Winterbottom, Bayside, L. I., N. Y.

Ernest A. Johnstone, K6KMB, of Honomu, T. H., whose name appeared in Silent Keys in June *QST*, and W. H. D. Nightingale, G5NI, of Norton, Birmingham, England, whose name appeared in Silent Keys in August *QST*, are both reported to be alive and well. We regret these errors and are happy to make this correction.

Signal Corps in Combat

(Continued from page 49)

General Clark's Fifth Army, was an SCR-499 in a 2½-ton truck. At 1000 that morning the small signal staff began erecting an antenna in a field about four miles from the city limits of Rome. A deadline had to be met; this was a broadcasting station, and the broadcasters' daily schedule was to begin in three hours. Allied troops already were at the outskirts of the city, and infantry and tanks kept moving through the field while Capt. Frederic O. Wickham, W9DHF, chief engineer of the mobile unit, oriented the antenna toward North Africa, from where the transmissions would be relayed to New York and London.

Two hours later the 400-watt transmitter was on the air. As radio correspondents in the theater rushed to get the best dateline thus far in the war, tanks and trucks moving up to the front

(Continued from page 46)

rumbled in the background. In the distance listeners could hear the sound of German artillery.

Late that day it was officially announced that Fifth Army troops had entered Rome. Instantly the news was flashed to the world. Radiophoto and b.c. transmissions continued from the 499 until permanent facilities could be set up in Rome. Then W9DHF and his front-line radio station moved northward to rejoin the Fifth Army.

The story of communications in the Mediterranean theater would not be complete without mention of the "Signal Corps Sallies" — the platoon of 58 Signal Corps WACs attached to General Clark's Fifth Army headquarters in Italy, the only WACs to have worked and lived so close to an actual battle zone. According to correspondent Robert Stead: "They are continually under canvas. They dig — and on occasions jump into — foxholes just the way GIs do in the same region."

In General Clark's words: "They are a great group, and are an inspiration for the way they tear into their jobs. They work long and hard hours without murmur or complaint, and their enthusiasm is a great thing to see."

Alaska

Along the frozen frontier of Alaska the Signal Corps also was on the job. The work of the Alaska Communication System already has been described in *QST*.[3]

On top of their feats in criss-crossing Alaska proper with adequate lines of communication, Signal Corps men participated actively in digging the Japs out of the Aleutians. They saw action first at Dutch Harbor and were in on the landings at Adak, Atka and Amchitka. Accompanying the first landing forces at Attu were ACS task force crews, their assignment the installation of radio stations to supply long-haul command communications. By the time of the Shemya and Kiska landings they were experienced veterans.

These occupations were accomplished under extreme difficulty. Heavy fog and rain transformed the tundra into a soggy quagmire making vehicles useless. The clammy dampness caused corrosion, resulting in open circuits and component failures which tested the ingenuity of the signal repair men to the utmost. It was for outstanding service under such conditions that T/Sgt. Harold L. Sunderland, W9YNO, was awarded the Legion of Merit for technical ingenuity.

Signal Corps officers realized that men like W9YNO were irreplaceable. If they were picked off by the Japs in task-force operations, there would be no one to construct even temporary radio stations ashore. Consequently the signal men were put through rigid courses in marksmanship and other combat techniques — scouting, patroling, camouflage, map reading. They were taught the use of demolition charges and booby traps, and defense against chemical attack.

Radio stations were prime targets for Jap snipers. There were few trees or shrubbery to

[3] Fowler, "Alaska Communications System," *QST*, April, 1944, p. 9.

haste without waste

The electronic engineer has been doing a tremendous job. The increasing importance of advanced electronic equipment in modern warfare has multiplied his task a hundredfold. But, the special training and vitally important knowledge of the electronic engineer enables him to tackle each day's job regardless of its magnitude and get it out of the way.

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Advanced electronic tubes and equipment are playing a role of immeasurable importance in the Allied Nations' drive for Victory. When the war ends, the results of Raytheon's intensive research and manufacturing experience will be utilized to meet advanced electronic tube requirements.

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(Continued from page 92)

hide the radio antennas, and one of the maxims of Aleutian warfare became: "Keep your antenna down!"

Southwest Pacific

In the Southwest Pacific the Signal Corps placed perhaps the heaviest dependency on radio. Hundreds of widely separated islands could be linked in no other way. Yet in the steaming jungle the high humidity played havoc with equipment and operations. The interest in their activities displayed by the Japs didn't help matters, either.

Signal men received their first initiation into Japanese tactics when United Nations troops began driving the Nips out of the redoubtable Owen Stanley Range, backbone of New Guinea. There, in addition to mud and treacherous precipices, they encountered a new obstacle. Instead of barbwire entanglements the Japs made barriers of the lush, tenacious vines native to the region. Pouring mortar shells into the mass served merely to interweave the vines more tightly.

Lt. Col. Erwin Stoll, ex-W9AZT, gives this report on communications in the Southwest Pacific:

"Let me tell you a few of the trials our troops had in the use of radio. When a landing is attempted on an island the only equipment we can take along is what we can carry on our backs. After a beachhead has been established and the situation has become stabilized, we'd make every effort to get an SCR-299 into our headquarters. . . . We'd take the radio set, dismount it from its truck, and set it up in the jungle."

That may sound simple, but Col. Stoll continues: "The Japanese have d/f equipment with which they can find the approximate location of our transmitters. Therefore we use remote control, separating our transmitter from our receiver. . . .

"The jungle insects delight in eating the insulation of the radio sets. It was not unusual to find frogs in our radio transmitters in the morning. Termites, for some reason or other, delight in eating the bases of vacuum tubes."

After experiencing the hardships in the Southwest Pacific, the commander of a signal company earnestly advised that physical training for Signal Corps troops could not be stressed too highly. "Our men are right in the front lines," he said. "They do everything the infantry does and more. Out here we do not walk five miles in fifty minutes with full field equipment, but that would be easy compared to the endurance tests actual combat demands."

He might have been thinking of one company of untried Signal Corps troops which disembarked from LSTs at Lae, just before midnight on October 9, 1943.

The party came ashore in a drenching downpour that had been deepening puddles into small lakes for five days. It was so wet that a private, plodding through the muck and water, turned his steaming face forlornly upward and asked, "Do they know if we've landed yet?"

Although Lae had been retaken from the Japs less than a month before, it was now expanding

(*Continued from page 94*)

faster than QM could keep up with the incoming troops. Exactly six pyramidal tents, each designed to accommodate 8 men, were available for the 6 officers and 256 enlisted men of Company C.

They huddled as tightly as possible in the questionable shelter of the six tents. No one slept that night. The next day the skies cleared, but only to make way for a deadlier rain.

That night Company C went under fire for the first time as Jap planes dropped bombs in the vicinity of their exposed tents. After that, they dug slit trenches and foxholes — a task which, in the absence of sump pumps, might be considered a major engineering feat.

Civilization had not encroached greatly on that primeval valley until the Signal Corps came along. Scattered patrols had wandered here and there but most of the territory had never harbored troops of either side. However, some infiltrating Jap patrols were still in there — as security guards of Company C were to find out.

The route across the kuna grass country wavered from day to day. The heavy kuna grass would mat down and support a half dozen trucks, but then it would rut and the next six trucks would have to make a new track.

The channels of the river — which they either forded or swam across, since there were no bridges — changed as often as every hour. Fifteen minutes after a safe crossing at one point it would become a tearing torrent. In midstream the waters would suddenly rise around the vehicles, turn them over and sweep them away. But somehow the Signal Corps crew went through.

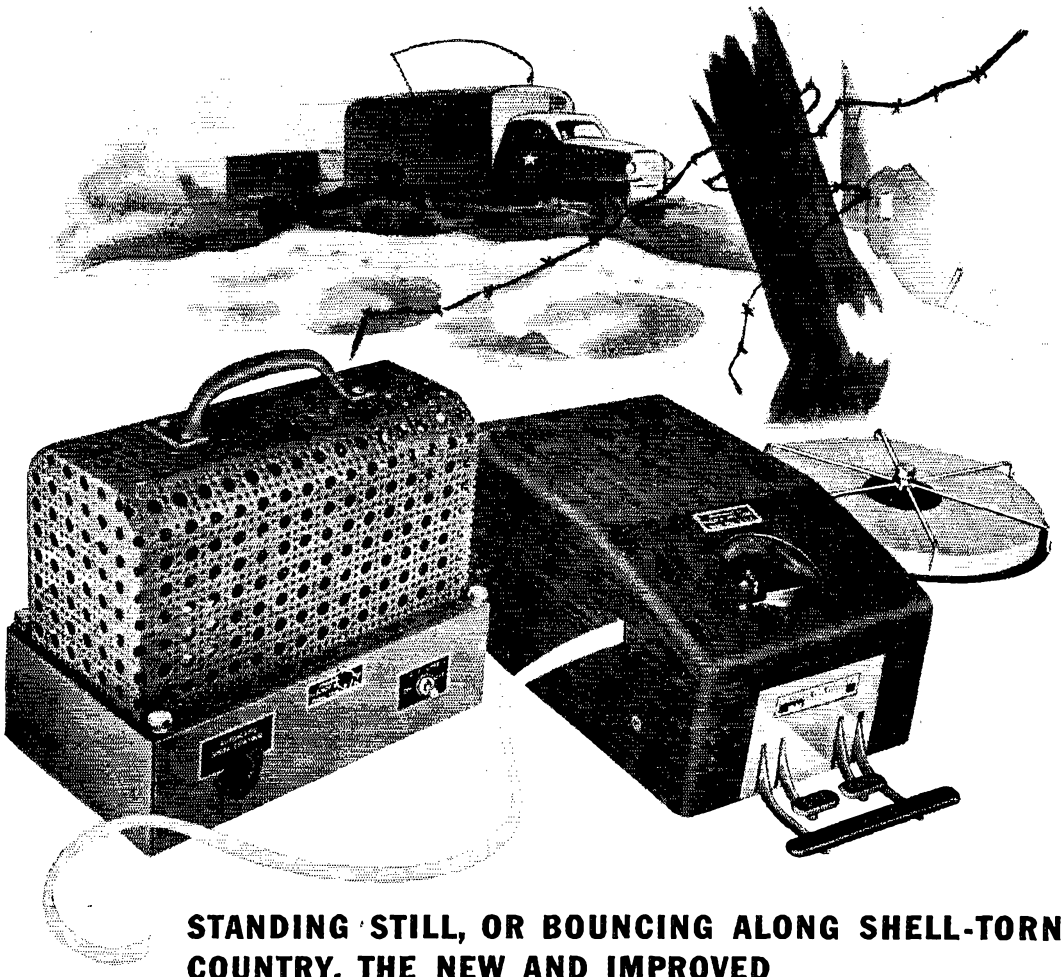
And when they arrived at their destination the message went through, too — as they always do. For that is the tradition of the Signal Corps.

Give 'Em Hell

Signal men in the Pacific have several scores as yet unsettled. The first, of course, is Pearl Harbor. They can't forget that unheeded warning of the Japanese attack from S/Sgt. Joseph L. Lockhard, the Signal Corps radar operator who detected the approaching aircraft while they were still 132 miles from Hawaii.

Another score as yet unsettled is that of a Signal Corps voice which, throughout the winter of 1941–42, sent messages of resolute courage to an anxious America. That voice, the radio transmitter at Fort Mills on the island of Corregidor, is silent now. Yet it, too, got the message through. Using equipment salvaged from Manila and Bataan, signals from this station told the story of "the Rock's" last stand. Even when Jap artillery crushed the antenna atop the shell-scarred rock, Signal Corps men, braving the enemy's malevolent fire, restored it.

And when the end did come there was a Signal Corps operator still at the key, telling the world about it. After the last official report, Sgt. Irving Strobing added this message to his Signal Corps buddies: "We'll be waiting for you guys to help." Then, as the Japs broke through the door, he said: "Give 'em hell for us!"



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Shorn of bulk and complicated construction, the McElroy Model PFR-443-A prepares clean and accurate tapes for transmission at speeds up to 300 words per minute. Extremely simple to operate and requiring no more than ordinary typewriter attention, this unit is solidly constructed to give dependable performance—on land and sea—stationary or rolling.

Two easily carried units comprise the PFR-443-A—the keying device and the electronic drive. Both are compact and self-protected against jolts and jars. In the hands of experienced operators, speeds of between 30 and 40 words a minute can be maintained in all Morse combinations assigned to the Russian, Turkish, Greek, Arabic and Japanese alphabets and languages. We cannot say for sure, but it is almost a certainty that this McElroy development landed with the Armies of Liberation and will continue to help provide high speed transmissions until V-Day. We will be glad to supply additional technical information.

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Signal Corps in the Field

(Continued from page 29)

several days before, impartially sowing demolition bombs mixed with incendiaries over a wide sector so as not to disclose the specific objective.

At precisely 2400 the aerial fireworks are violently supplemented by rumbling concussions from the distant "Long Toms" — the supporting 155-mm. guns. The division artillery — three battalions of three 105-mm. howitzer batteries each and a fourth with three 155-mm. howitzer batteries — sound a refrain for the long-range corps artillery.

Enemy guns promptly reply in kind. They can only strew the general vicinity with aimless fire, but even so only the hardiest Johnny Doughfoots sleep that night. Tautly, silently, they wait.

At 0300 the assault elements leave. Before them stretches an irregular valley leading to a broad, flat oblique plain which is their approach route. As they roll along through the night — black again, now, with the moon's face turned from them — the artillery barrage tapers. To puzzled rookies, knowing old soldiers explain this to be part of this particular variation of the plan — to give them a good "serenade" and then let the preparatory barrage die a while before H-hour. The enemy will expect the attack to come then — or should, anyway — and when it doesn't come their "counterpreparation" should ease off, too, about the time actually scheduled for the attack to begin.

During this time, in parallel with the motorized infantry advance to the respective take-off points, the light tanks move through yet another valley leading to the same flat plain, there deploying behind a covering ridge waiting to exploit the infantry attack.

As the minute hands drift slowly up to 0500 — the take-off hour — the heavy gun crews from the Long Toms to the 4.2-inch chemical mortars are ready to renew the cannonade. On forward hilltops either side of the valley are observation posts — one occupied by an artillery forward observation team and the other by an infantry scout — straining through the lightening gloom to see the enemy camp. Already the bright edges of dawn disclose a neatly arranged disfigurement plainly identifiable as the TOT (simultaneous barrage fire) concentration patterns embroidered by the artillery. Streaming out of the morning sky comes another wave of tactical mediums to give their added tons of HE support. Interceptors come out to meet them. But the bombers bear unswervingly toward their target, resolute in their mission.

The second hand sweeps swiftly upward; wiping away the last minute before zero hour — the hour of assault. At the nick of 0500 the "300" net flashes the code word "Go."

Radio Nets

This is the situation depicted on pages 30–31. Now to examine the communication methods and equipment employed.

Up to the highest echelon units, all radio opera-

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(Continued from page 98)

tion is strictly in nets. There are various kinds of nets — command, liaison, intelligence and control nets, vertical nets and lateral links — each serving a specific purpose, each containing a relatively large number of individual units. Were it otherwise, there wouldn't be enough frequency channels in the entire spectrum to accommodate the need. Within the sector pictured for our hypothetical *n*th division alone, several hundred radio sets are employed — most of them in actual operation during the assault.

First is what is called the "536 net" — the company command net, linking the captain and each of his platoon leaders and, depending on the company organization and the immediate mission, also with the company executive, scouts, patrols, *etc.*

This net uses the hand-carried SCR-536 which has a normal range limited to a mile or so — about the maximum radius for the largest area usually occupied by an infantry battalion, even in delaying actions.

Crystal-controlled, the 536 is designed exclusively for single-frequency net operation. Its performance in that service has been remarkable. The short loaded antenna and low power output (about a quarter of a watt) effectually limit its range, immunizing it against most enemy intercept; and it is unbelievably rugged and serviceable.

At times the range of the 536 is too limited even for company use. Then either of two alternatives may be employed. One is to use 536s in the same net with the staff-mounted SCR-511 guidon sets, which have better sensitivity and output and therefore increased effective range. The other is to change over to an SCR-300 net.

It has been a common belief that all three of these smaller units are of the same breed. That, however, is distinctly not the case.

The SCR-300, normally provided for battalion nets, works on f.m. frequencies; the 536 and the staff-mounted 511, on the other hand, are transreceivers (tubes switched to serve dual functions) using amplitude-modulated transmission on relatively lower frequencies. Thus the 5-pound handie-talkie and the 20-pound guidon set can be used together, but not with the walkie-talkie or other f.m. sets. Several 511s may also be netted, of course, the effective range then being of the order of five miles. Either the 536 or the 511 may also be used with the higher-powered a.m. control stations.

The 511's superior performance results from its longer antenna and greater output, the latter made possible by its two-unit construction — battery supply, modulator and microphone being incorporated in the separate chest pack. Another difference is that the 511 is capable of operation on different frequencies. It is not a band-switching set, however; to change channels, plug-in tuning units similar to an HRO coil assembly are used, each containing a pair of matched crystals and separate transmitting and receiving tank circuits.

In infantry units the 511 has been used until

(Continued from page 100)

recently principally in what is called the battalion command net where it is now being replaced by the SCR-300. This is a radio net supplementing the wire system which enables the battalion commander to maintain contact with his company commanders over the wider battalion area.

The reconnaissance scout, carrying a 536, has penetrated forward of the departure point to his assigned objective — the brow of a high ridge overlooking the city which provides an advantageous viewpoint. Two choices are offered as to the route his reports might take back to battalion CP. He might be able to work direct with his 536 to the 511 at the CP. Since he is a considerable distance forward, however, possibly too far ahead of the CP for direct contact, he may be relaying through another 536 at an intermediate company CP. It is this route which is indicated on the sketch.

Since the battalion is the basic tactical unit, the battalion command post is a key communication center. Included in the ten-man communication detail there will also be one or two "low-speed" c.w. operators. Although their abilities are not required in this operation, when necessary to establish contact with the regimental CP in mountainous terrain or over longer ranges they would probably employ c.w. on their SCR-284 or 694 installed in a jeep.

The 694 replacing the 284 is the set used in the regimental command net. The 694 net may be paralleled or replaced by a 300 net if distances are not too great. In the field a standard-issue 100-watt d.c. hand generator may be used for the power source (as pictured on the cover of this issue). The 284 is considered to be in the lowest category of those units for the operation of which an operator, radio classification 776, is required — this, of course, because it is capable of c.w. operation. All of the sets used on voice alone — the f.m. types and the 511 and 536 — are usable by personnel not specifically trained for radio operation.

The SCR-609 is used by the artillery. In fact, it is a 609 which is seen in use at the forward artillery observation post depicted in the sketch.

The SCR-609 may be described as the field artillery's equivalent of the SCR-300. It has approximately 2 watts output, crystal controlled, with a nominal effective range of five miles.

A separate snap-on battery case facilitates rapid renewal of battery power under field conditions. The 609 also may be remotely controlled, a useful feature when favorable conditions for both radio and observation do not coincide. The similar 509, without remote control, is found chiefly in the armored force for short-range reconnaissance in tank battalions, armored regiments and infantry regiments. They are also used in the cavalry squadron attached to our infantry division.

At regimental headquarters, in addition to the 694 command net to the battalion leaders and a suitable complement of the smaller hand-portable units, there may be one or more medium-range

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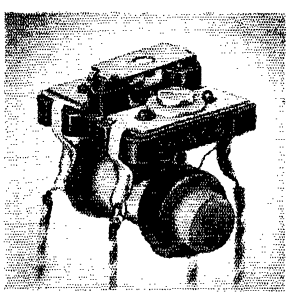
Mighty Unit of America's Might: As far as the camera's eye can reach, it seems, are row upon row of skilled workers engaged in producing vital electronics material for Uncle Sam. This is one unit of the main Meissner plant at Mt. Carmel, Illinois.

Four of a Kind: From miles around Mt. Carmel, entire families have turned to electronics for a place in Meissner's great postwar plans. This group, combining many years of varied experience, is about to report at one of the big gates.



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(*Continued from page 102*)

voice-c.w. mobile units in jeeps or command cars. These units may be built around any of several basic transmitter units, depending on the range required and the function. Among these are two other units, dynamotor powered, of progressively higher output rating — the SCR-245 and the SCR-193.

The SCR-245 is slightly larger than the 284, not considering the external dynamotor, but gives something like half the power output. It is used for air-ground liaison with observation aircraft, as well as other purposes. Comparative power outputs are: SCR-284, 20 watts; SCR-245, 10 watts; SCR-694, 25 watts.

The SCR-193 is the traditional workhorse of the Army — rugged, reliable and versatile. A veteran in point of service, the first service model having been built at least a decade ago, it is undoubtedly the most extensively employed medium-range transmitter in the radio arsenal of the Signal Corps. Mounted in every type of vehicle from jeeps to combat cars, the 193 and its Air Force replacement — the SCR-506 — will deliver 50 to 75 watts or more to any type of antenna at any frequency in the medium- or high-frequency range.

The 193 is also to be found at the division level or higher. It is used at division command posts along with the 299 which is pictured in the sketch. In the division command net it may serve the same purpose as the f.m. and other voice nets described for the lower echelons — personal contact between division commanders and their staff officers and subordinate commanders.

Several other radio sets employing the basic components as the 193 are employed for remotely controlled break-in operation both as a transportable field unit and in permanent installations. Some of these combinations, such as the SCR-177-B, include two receivers at the operating point — one for working and the other for channel-guarding or monitoring.

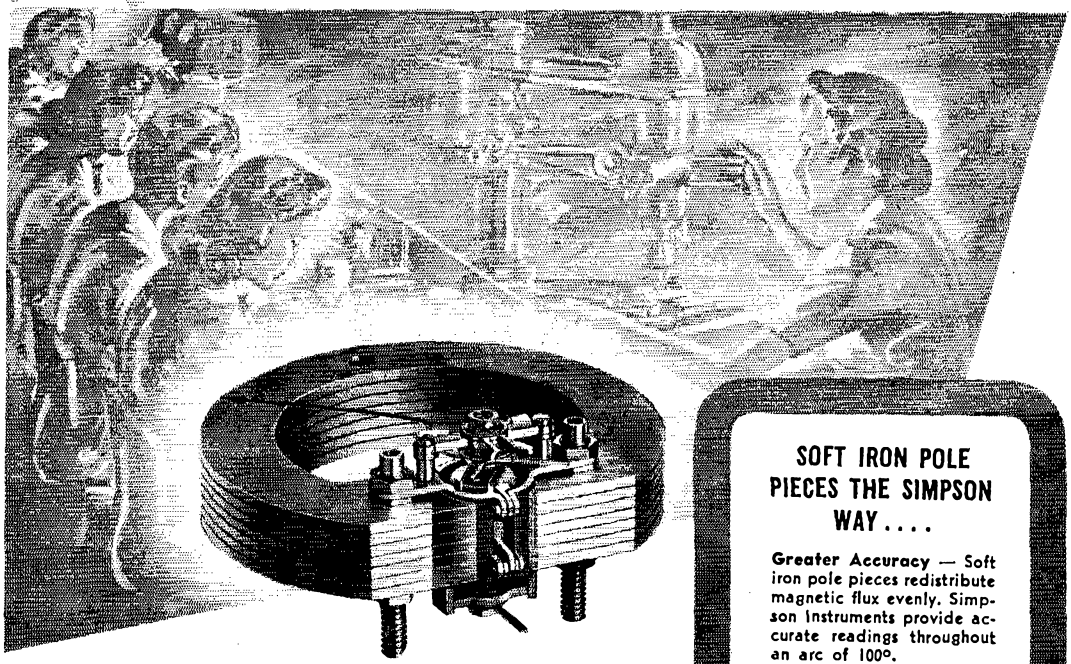
Above the regimental echelon — as the reader certainly should know by now — the Signal Corps takes over operation as well as material. While the equipment thus far described is supplied by the Signal Corps, its operation may be by communication personnel within the combat arms — in this case, the infantry.

Artillery Observation

The forward observation team is the "eyes" of the artillery battery. The sensory system over which it transmits intelligence is the "600" net. This net, as pictured, begins with the two-channel battery-portable SCR-609, previously described.

Over the relatively direct route involved in this particular situation the range of the 609 is adequate. In a situation where additional range is required, either of two alternatives might be employed. The first is the use of an intermediate 609 placed on an intervening ridge or other high point to serve as a relay station.

The 610 is identical with the 609 except that it has provision for operating from a vehicle stor-



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The use of soft iron pole pieces in the patented Simpson movement serves as an example. An admittedly finer type of design, these soft iron pole pieces have been employed by Simpson to provide maximum strength as well as accuracy, and to achieve a simpler assembly that permits faster, more economical manufacture.

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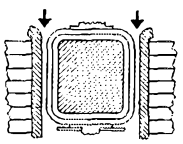

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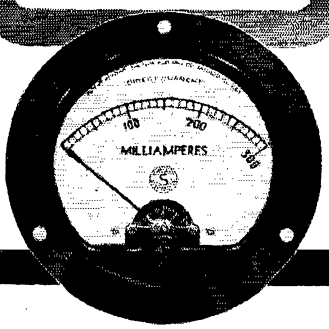

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(*Continued from page 104*)

age battery. The output of both sets is 2 watts and the reliable range is five miles. Along with the combination "A" and "B" dry-battery pack, a vibrator-type plate supply is provided, the required 6-volt primary input and heater voltage being obtained either from the 6-volt pack in the battery compartment or from the vehicular storage battery in mobile use.

At the other end of the net — the artillery executive's command post — there is an SCR-608 in a command car. This is exclusively a vehicular set, being of substantial bulk and weight. The ten-channel push-button transmitter with vibrator power supply produces an output of 35 watts, with a normal range of fifteen miles.

Like the 609 and 610, the 608 may be remotely controlled by means of a special control unit. One respect in which it differs from the armored force's 508 command set is its frequency range. Each set has two separate receivers with duplicate push-button controls incorporated in the unit, permitting almost continuous monitoring of several channels simultaneously. They also have integral interphone controls for providing telephonic communication between the individual crew members in an armored vehicle.

For intra-squadron work armored force units employ vehicular f.m. sets of the "500" type as opposed to the "600" series used primarily by the field artillery and the tank destroyers. The "500s" are also used by engineer, medical, QM and similar armored force components.

The vehicular f.m. set most commonly employed is the SCR-528. This unit, designed for intermediate command use in tanks and vehicles attached to higher-echelon headquarters, closely resembles the basic armored force command set — the 508 — except that it has only one receiver. The same mounting base and integral interphone transmitter are employed, however, permitting interchangeable use of the components of these sets as well as those of the 538, which is also employed by the cavalry. The 538 is another variation of the 508, having no transmitter and a separate interphone amplifier in place of the second receiver to permit use of the interphone system in the vehicle without interrupting radio reception. The same type of universal mounting base and mast base are used.

Interphone amplifiers are a distinct essential in armored vehicles, particularly tanks, where the noise level is so great that even shouted words often are unintelligible. An extension of the interphone system is an external telephone connection in a neat little "box" on the rear of the tank. An infantryman wanting to talk with the commander of a buttoned-up tank, even though just outside the tank or riding atop it, must use either radio or telephone to establish communication.

For long-range liaison and reporting on c.w., the large armored scout cars are provided with standard medium and high-frequency transmitters. In any given vehicle either a 193, a 245 or a 284 may be used, depending on the relative range required.

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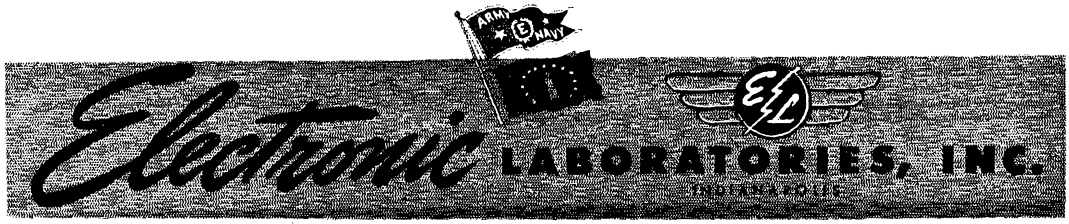
E-L pledges its continued support in supplying Vibrator Power Supplies of increased efficiency, regulated output, multiple inputs and outputs and decreased weight so that the job of the Signal Corps can be simplified, its logistics problems lessened. E-L Vibrator Power Supplies mean fewer units for more applications.



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Signal Corps in Engineering

(Continued from page 41)

A conventional teletypewriter is combined with a radio circuit, the message being simply "typed" out on the standard typewriter-like keyboard which perforates a tape that automatically transmits the desired signals. At the distant point, the message is received again in the form of typed copy and perforated tape which may be used for immediate retransmission or for preparation of page-size copy on a teletypewriter.

There are obvious advantages to this means of transmission. Much of the handling at terminals and relay points is eliminated, saving time and manpower. The same tape may be used for either radio or landline transmission, facilitating relays. A message sent by landline teletypewriter from one of the many signal centers within the United States may be relayed instantly via radio overseas and again by landline to the destination, without the necessity of retyping or manual sending at any intermediate point.

European Sector

For the invasion of Normandy an elaborate communications center, equivalent in size to a small town, was built a hundred feet under the English countryside. From this underground base, the combined signal headquarters of the U. S., British and Canadian forces, the assault on the peninsula was controlled — the convoys directed, the Allied air fleets sent out, the ground forces in the assault areas given their missions.

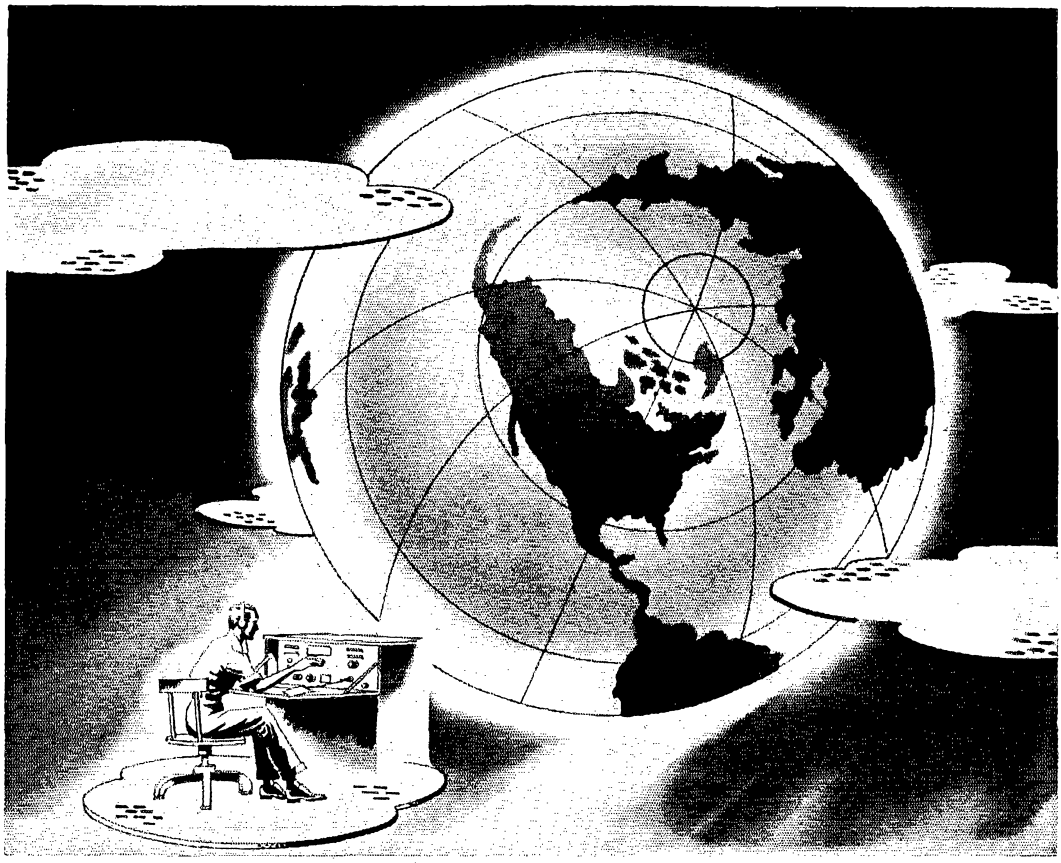
The first use of this great signal center was in the invasion, but its construction had been launched nearly two years before. As early as 1942 it was realized by the high command that an extensive communications system would be vital to the success of the offensive operations which even then were being planned.

For the main command channel a detailed plan prepared far in advance by OCSigO was approved and accepted by SHAEF.

An "all-services" undertaking, the Combined Headquarters Signal Center has scores of teleprinters and a fourteen-position telephone switchboard with 200 lines and 400 extensions operated by WRENS, ATS and WAAFS. A separate radio room, manned by Royal Signal and U. S. Signal Corps operators, provides a special link which, as one of its functions, enables field troops to summon air support from British bases.

Army Communications Service channels from Washington tap directly into the ETOUSA Signal Center in England, which in turn connects with SHAEF, the 21st Army Group, and headquarters of the tactical air force and the strategic air force, in addition to the Combined Headquarters Signal Center — all by tape relay circuits.

This vast system, begun many months ago, was so thoroughly tested and rehearsed that it has functioned with virtual perfection since the offensive was launched. As the troops advanced in France, the system expanded. One installation schedule, anticipating the progress to be made by a certain date, called for 700 miles of eight-wire



THE *Navy Needs* STILL MORE *Hams* TO SERVE AS RAYTHEON FIELD ENGINEERS

Many former hams in the Raytheon Field Engineering group are already serving the Navy in the United States and far afield. They supervise the installation and maintenance of vital radio detection gear, and are gaining experience that will put them on top in the post-war electronic world. And now, to keep up with increased Raytheon production and new Raytheon developments, the Navy has asked us to double this force.

If you have had practical experience in building amateur rigs, let us hear from you.

WRITE TO: Clark C. Rodimon, W1SZ
Raytheon Manufacturing Company
Electronic Equipment Division
Waltham 54, Massachusetts

★ ★ ★ ★

RAYTHEON

Raytheon Manufacturing Company
Waltham 54, Massachusetts

DEVOTED TO RESEARCH AND THE MANUFACTURE OF TUBES AND EQUIPMENT FOR THE NEW ERA OF ELECTRONICS

(Continued from page 108)

line, 1500 miles of special pole line, 30,000 miles of field cable, 400,000 yards of assault cable and fifty special radio installations.

Plant Engineering Agency

The Army Communications Service, through its Plant Engineering Agency, is responsible for the engineering, procurement and shipment of fixed communication equipment for the Army everywhere. Plant does detailed engineering and provides fixed equipment ranging from complete telephone and telegraph offices and long lines of cable and open wire to all types of radio stations for point to point or other communication. It is concerned with voice telephone, telegraph and printing telegraph equipment. It supplies the various and complicated radio aids to aerial navigation and the meteorological equipment used by the AAF. It provides equipment to serve small islands or to cover continents. And it ties those islands and continents together by wire or radio.

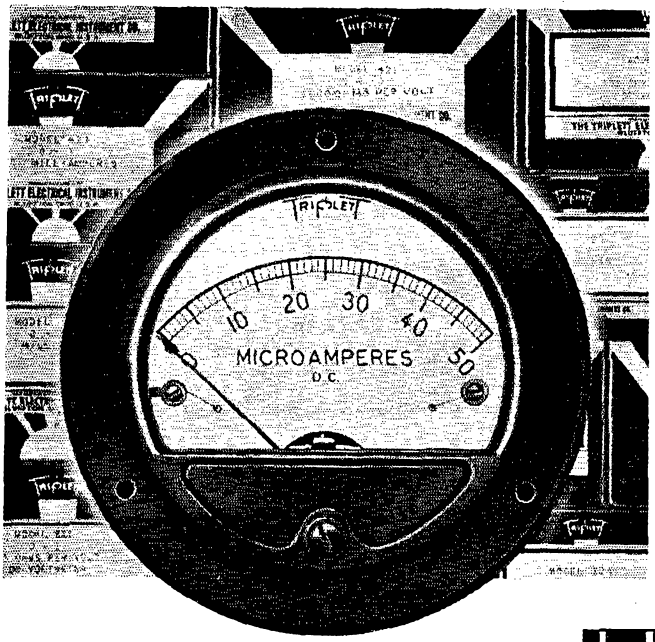
Once a combat area has been occupied — the territory mopped up and under control — the temporary communications facilities of the combat units must be replaced by permanent fixed installations comparable in performance to domestic services. That is the job of the Army Communications Service teams, with Plant Engineering Agency playing an important role.

The Chief, Army Communications Service lays down the broad policies, with his Communications Engineering Branch planning the over-all engineering. Back in Plant's headquarters in the Architects Building in Philadelphia, engineers proceed to draw up plans and specifications. Standard equipment is used throughout; there isn't time to design special units for each job.

Orders are sent out to the various depots. The requisitions are accompanied by shipping instructions. Every part must be selected, crated, and shipped to a certain port before a certain time. There can be no delays, no missing parts. Either would mean a breakdown in the scheduled plan.

Plant's engineers constantly develop short cuts and new or modified methods to save time, personnel or materials. For carrier-type wire cable lines, Plant produced "packaged carriers," combining the best features of many items of equipment into compact units sent into the field along with streamlined instruction manuals for rapid installation by men untrained in the higher technicalities. Similarly, individual engineering of standard radio installations was greatly reduced by the expedient of supplying "kits" containing transmitters, receivers, antennas and all other materials necessary for the particular job.

Occasionally, "pure" engineering must be done in the field to overcome conditions not previously encountered. Violent electrical storms, bitter cold and, in the high northern latitudes, the aurora frequently require ingenious on-the-scene improvisations. As a result, with the aid of operating crews in those regions, Plant frequently revises its equipment and methods. Now the aurora's teeth have been pretty well drawn through the use of



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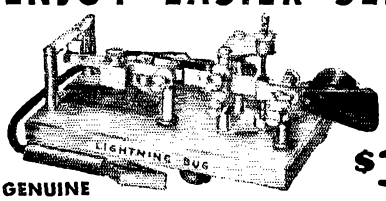

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SEMI-AUTOMATIC RADIO KEY

Here's sending at its easiest and best . . . smooth, effortless, easier than you ever dreamed sending could be. This easy-working Vibroplex is simplicity itself. Anyone can operate it with amazing ease. Responds smoothly and instantly to your touch. Cuts sending effort in half, saves your arm and PEPS up your sending. Striking design. Many exclusive features. Standard black crackle base. Bright machined parts. Precision construction including DIE CUT contacts and main spring. 3/16th contacts. Complete with circuit closer, cord and wedge. *Simply press the lever — Vibroplex does the rest.*

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SALUTE TO THE SIGNAL CORPS

Keep up the fine work, men!

(We'll continue to help all we can!)

HARRISON
RADIO CORPORATION
WOrth 2-6276

Distributors of Electronic Parts Since 1925

SPECIALIZING IN HALLICRAFTERS EQUIPMENT

(Continued from page 110)

selected frequencies and special directional antennas with associated equipment.

AACS Installations

One of Plant's most important functions is the engineering and installation of AACS radio and weather stations — guideposts along the skyways over which military planes of the United Nations carry men and matériel to the fighting fronts.

When a decision is made to extend an ATC route, regional and sector control officers of Plant and AACS collaborate on the plans. One set is sent directly to Plant, to get preliminary work under way without delay. Another is sent to AACS headquarters at Asheville, N. C., thence to Washington and on to the office of the Chief, Army Communications Service, for final revision and approval. Revised plans go to Plant, which engineers the equipment, procures it from commercial manufacturers, ships the apparatus and then provides an installation team of from five to twelve men to place it in operation.

A typical AACS installation requires an airdrome control tower, an operations room, a transmitter and receiver plant, a radio range, a homing transmitter, a meteorological station, and the requisite power units. Specific items of equipment include radio transmitters varying between 25 watts and 40 kilowatts in power; radiosonde and other weather-recording apparatus; high-speed tape radio equipment; direction finders, and radio range beacons. One installation may have as many as five large antenna towers.

The specialists in charge of constructing these stations receive advanced training on the rolling fairways of Philadelphia's Brookline Country Club. Where golfers once sweated away an afternoon foursome in slacks and sport shirts, these signal troops in Army fatigue uniforms now sweat out erecting poles and stringing transmission lines. They construct fancy antenna towers and assemble transmitters, receivers, power plants, radiosondes, recorders — and then tear them down again. They keep on repeating the process until they are qualified to install the complex apparatus of modern military communications under any conditions in any part of the world.

The installation teams, assigned to sectors, customarily fly to the airfield needing equipment, set it up, then fly on to the next spot. Often they move into newly conquered territory while it is still under fire. Invariably working against time, they frequently labor 14 to 18 hours daily in broiling heat or sub-zero cold. Some of the men have been known to work through heavy tropical rainstorms without rest for periods of 36 hours or more. One team in the CBI theater was forced to bail out over mountainous jungle country.

As reported previously in *QST*, over 600,000 circuit miles have been installed for AACS. Even after the equipment has been turned over to the AACS for operation, Plant Engineering still retains responsibility for performing major maintenance.

Another modern miracle of communication engineering and construction accomplished by Army

(*Continued from page 113*)

Communications was driving 2060 miles of line through the roughest wilderness in North America to link the United States and Alaska along the Alaska Military Highway. In addition to the telephone, telegraph and teletype systems, it was necessary to install a radio station at each repeater point as a backstop in case of wire failure.

Yet another demonstration of Army Communications Service's efficiency was the construction of six high-power long-wave radio stations at North Atlantic points in the remarkably short time of twenty-eight days. The long-wave network links the United States with Newfoundland, Labrador, Greenland, Iceland and Great Britain. Free from fading and ionosphere fluctuations, it insures 24-hour radiotelegraph and radioteletype service.

Radiophoto

The Signal Corps has done an equally outstanding engineering job in its supplementary rôle as the photographic agency of the Army. Not only is it providing the most complete pictorial coverage of any war in history, but the combat pictures it makes are being delivered in this country direct from the battlefronts through the coöperative efforts of the Army Pictorial Service and the enterprising Radiophoto Section of the Army Communications Service.

When a Signal Corps photographer of the Army Pictorial Service at a battlefront takes a picture, he sends the negative by fast courier or airplane to the nearest radiophoto station. There the negative is developed, a print made, and the picture sent on its way via radio. Seven minutes later a negative is stripped off a receiving machine in Washington, developed and printed, and the processed picture turned over to the War Department Bureau of Public Relations.

This modern miracle is accomplished, at the transmitting end, by clamping the photograph to a drum, shaped like a dictaphone record, which revolves at 100 r.p.m. A beam of light 1/100th of an inch square scans this drum, moving laterally at a speed of one inch per minute. This beam, reflected to a photoelectric cell by lenses and an oscillating mirror, constitutes an 1800-cycle carrier amplitude-modulated in terms of the relative density of the picture at the point being scanned.

The resulting modulated a.f. current can be applied directly to a telephone line. Before transmission by radio, however, to limit the effects of fading and interference the signal is converted from fixed-frequency amplitude modulation to a constant-amplitude current with a varying frequency, which is fed into a rectifier to get pulsating d.c., and then to a tube which controls the output of a variable-frequency oscillator. The beat frequency resulting when this signal is mixed with that of a fixed-frequency oscillator is detected and filtered.

To receive the picture, the signal must be "inverted" back to amplitude modulation. Following amplification, the signal goes through a push-pull limiter. After filtering the signal is amplified and passed through a full-wave rectifier,

(*Continued from page 114*)

the pulsating d.c. output of which is fed to the plates of a control tube. The 1800-cycle output of a fixed-frequency oscillator, applied to the grid of this tube, supplies the picture-modulation carrier.

The standard telephoto equipment is used both for transmitting and receiving. In receiving, sensitized material, wrapped around the drum, is affected by the same light beam used for transmission. The incoming signal is applied to the modulator, thereby controlling the swing of the mirror and varying the intensity of the light striking the film. As the beam draws lines of light across the film on the revolving drum, the original picture is reproduced in negative form.

Those almost overlapping lines — 100 to the inch — reproduce the picture so faithfully that, after the resulting negative has been developed and printed in the usual manner, it is difficult to detect any difference between the transmitted copy and the original photograph. By another method, even speedier but giving less satisfactory reproduction, direct positives may be made by using a stylus and chemically treated paper.

Operational Research

Dr. W. L. Everitt's Operational Research Branch in the Plans & Operations Division serves as advisor, analyst and consultant to the Chief Signal Officer and to the operating services and divisions of OCSigO on anything of an unusual and special nature. This includes the scientific aspects of equipment, its operation, and the training of personnel.

Operational research has been described as the scientific study of how best to use equipment and men and how, in the guiding of development and procurement programs, to accelerate the application of field experience.

The personnel which makes these studies includes broadcast engineers, consulting engineers, engineers with manufacturing experience, statisticians and psychologists — each selected because of past performance showing that he was expert at solving operational problems and getting the most out of equipment and men.

The Branch has made extensive studies of the literature and procedure applicable to Signal Corps equipment, paying particular attention to the problem of preventive maintenance. It has developed a log system, based on extensive broadcast engineering experience, by which equipment can be checked and corrective measures taken before trouble develops to a point where operation would be interrupted. In this way improved performance can be obtained and the need for spare parts is reduced.

Like the industrial engineer who constantly studies better methods of production, Operational Research studies improvements in the use of equipment. It does not operate equipment, nor does it direct the tactical operational procedures; it leaves that to others. Instead, it studies their operations and operational procedures from a detached engineering point of view and suggests new and improved methods.

(*Continued from page 116*)

Meteorology

The need of the armed forces for accurate and dependable meteorological information is greater in this war than ever before because of the expanding rôle of aviation and the search for greater accuracy in controlling artillery fire. In the past two years meteorological research has been accelerated in data analysis as well as in forecasting techniques. Matching this progress, the Signal Corps has correspondingly improved the tools of the art.

Since Pearl Harbor the Army has established a world-wide military network of weather stations. The Signal Corps immediately embarked on a program of research and procurement to provide the equipment required. The General Development Division of OCSigO provided funds to encourage development by commercial concerns, whose work, in turn, was guided by Signal Corps development laboratories.

An early development project, assigned to the Eatontown Signal Laboratory, was the design of a complete mobile meteorological station installed in a truck. Extensive modification of the more delicate instruments was found necessary to prevent damage in transit. These mobile weather stations have been used successfully under combat conditions. Since mobile warfare has shifted the emphasis from fixed-station surface observation to mobile weather centrals, this truck has been a valuable asset.

To use a military term, the conquest of weather requires continuous reconnaissance. For this duty the most useful and unflagging scout is the radiosonde, a boxed unit containing a miniature weather station and radio transmitter carried aloft to the stratosphere by a hydrogen-filled neoprene balloon, flashing vital signals all the way. As it rises through the atmosphere to altitudes up to 60,000 feet, it transmits meteorological data at recurrent intervals to a receiving station, where the signals are recorded graphically on a continuous-roll recorder. Trained observers decipher the record for the AAF forecasters who, armed with last-second information, can forecast the timing of a mission to take maximum advantage of prospective weather conditions.

For weather forecasts to be of maximum value, the interval between observation and analysis of data must be reduced to a minimum. It was found that transmission of observers' reports by teletype involved appreciable delays in enciphering, deciphering and plotting the data. Facsimile and radiophoto therefore are now being employed for the transmission of meteorological data, synoptic maps, and charts.

Under the impetus of war, the science of long-range weather forecasting has made great strides. Long-range predictions are more accurate than even the most optimistic meteorologist would have believed possible two or three years ago. The new instruments and techniques, particularly those involving radio principles, will be of inestimable value to humanity when peace returns.

Signal Corps Engineering Benefits Amateurs

(Continued from page 32)

devices constitute a new factor in the strategy and tactics of warfare.

Today radio is being used in applications that once could not even have been visualized. These applications include not only the use of radio for the transmission of military information, but also the use of electronic devices for such purposes as security, direction finding, weather reporting, range and height finding, detection and navigation.

While we are reminded that certain of these devices cannot be mentioned, we can at least mention radar, and it would be no real disclosure to call to mind the great achievement of the radio laboratories in their electronic victory over the German submarines which so dangerously menaced our merchant shipping two years ago.

Benefits to the Amateur

"Radio amateurs within the armed forces have had an unusual chance to gain a first-hand knowledge and appreciation of good engineering principles, methods of operation, and maintenance of equipment, and of the last word in advanced thought, which could have been gained in no other way," General Code believes.

Signal Corps courses combine a solid engineering technique with a never-ending search for new and better methods. Students have been given an opportunity to learn the rudiments of fundamental research and of correct procedures for installation, maintenance and operation while being privileged to work with the most advanced equipment, much of which will not be made generally available to radio technicians until the war is over. It is this training that will open many opportunities in the postwar world.

When they joined the Signal Corps many amateurs recognized the crucial importance in war of supplying the right information swiftly, accurately and to the right place at the right time. They realized that without this information the close working coöperation of great military forces would be impossible, control would be lost, command balked. Few, however,

(Continued from page 120)

realized how the war would telescope years into months insofar as radio equipment was concerned. Equipment which in peace might still be only a fragmentary jotting in a laboratory notebook is now on the firing line. The engineering laboratories of the Signal Corps, of government or colleges and of industry, have completed a score of years of ordinary development since Pearl Harbor. These equipments are in the hands of amateurs who have joined the Signal Corps. These equipments, although now focused exclusively on winning of the war, will also have a profound effect on the life of the nation when peace returns, the General predicted. Around the electron tube and electronic devices will open wide and abundant fields.

Peacetime travel safety will be increased; the electronic miracles which today are revolutionizing war, tomorrow will prevent collision of planes, autos, ships and trains, damage from icebergs or wrecks on shore; grade crossings will be made safe, furnaces and lights will be controlled, and smokestacks cease to belch wasteful smoke. Medical science will be enabled to see what is at present invisible. We shall witness the development of the extremely high radio frequencies, in which field today so much is being developed for war purposes. This development will permit plywood to be dried in minutes instead of hours, and is behind the dramatic and efficient ultrahigh-frequency welding; it may revolutionize the baking industry, and even heat our homes.

The amateur in the Signal Corps has seen and handled this new equipment; he has been instructed in making, installing, repairing, servicing and maintaining it. By having used the rugged new equipment, he will be an informed and critical postwar consumer; and thus will help maintain a higher quality standard during the peace years to come, and will insure preparedness of our products in the future.

The application of electronics equipment to industrial, professional, communication, television and home use will permit a carry-over to the postwar world of the lessons learned by the amateur serving his country in the Signal Corps.

★ ★ ★ ★ ★

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

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.

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.

PROMPT Repair Service on Meters and Electronic instruments. Braden Engineering Company, 3317 Kenmore Ave., Dayton 10, Ohio.

HIGHEST prices paid for used receivers, test equipment, bugs, oscillators. What have you? W9ARA, Butler, Mo.

IMMEDIATE SHIPMENT on priority: New NC-200TGs, $174.50; SX-28s, $179.50; SX-25s, $94.50; PM-23s, $15.00. In stock without priority: Trimm No. 65 Dependable heads-sets, $2.28, No. 100 Featherweight $6.00, meter rectifiers, $1.95, coils, transformers, panels, chassis, radio supplies of all sorts. Your inquiries and orders invited. Henry Radio Shop, Butler, Mo.

RADIO TESTS — Pre-examination Tests for Radio Operators. Tests your knowledge before you appear for commercial radio operator license examinations. Avoids failures. Guides your preparation. Saves your time. Worth investigating at once. Also books for home study. Write for free circulars 5Q. Nilson Radio School, 51 E. 42 St., New York 17, N. Y.

PREPARE NOW for tremendous opportunities in new fields of radio after the war. Training for Federal licenses. Write for particulars. Radio code classes, all speeds. American Radio Institute, 44 East 23rd Street, New York 10, N. Y.

WANTED: Radio operators for merchant marine. Commercial license. Must join union. Wages, $310 monthly. Radio Officers Union, 265 West 14th Street, New York City.

WANTED: STANCOR DC3 transmitters. W4COD. J. T. Morgan, Townsend, Ga.

WANT *QST*s, February and July, 1916, and old Government Call Books. F. E. Norwine, 7405 Hiawatha, Richmond Heights 17, Missouri.

HALLICRAFTER SX-24, xtal phones, like new. Best offer. H. M. Barton, 201, E. 10th., Bartlesville, Okla.

SELL: W2JNS having been killed in action, his mother desires dispose gear. Radio City Products Co. tube tester, Model 801 M. Several complete years *QST*. Make offer. Also home-built c.w. phone transmitter, 6L6–6L6–T55 @ 125 watts final input, Cl.B mod. four 46s push-pull-parallel, for 160–80–40–10. Five ft. high, 5 shelves, panels gray flexboard, sides and rear copper screening, simple controls. Crystals and auxiliaries. Reasonable. For appointment to inspect, call or write Mrs. Frieda Haut, 5 Huntington Ter., Newark 8, N. J. Phone WA-3-9107.

TUBES at OPA prices. Abbott, 2101 Grand Concourse, New York City 53.

RADIO telegraph operators wanted for Mississippi river boats. Operate high frequency crystal controlled equipment and do some clerical work. Commercial second grade license required. Deferments available over 26 years of age. Steady employment. Nine days vacation with pay for every thirty days worked. Few women operators accepted if requirements met. Salary *$215.00* per month. Write radio experience, age, education and present employment to F. C. Moore, Federal Barge Lines, 611 Gravier St., New Orleans 12, La.

WANTED: Hallicrafters S-29 Sky Traveler receiver. W4ERT. M. W. Rozar, Box 37, Macon, Georgia.

FOR SALE: Practically new, slightly used Hallicrafter SX-24 with matching speaker, $80 f.o.b. W. J. Hammond, Jr. Box 49, Wenham, Mass.

WANTED to buy: One Rider Model 163-Volt-Ohmyst. Must be in good condition. Will pay cash. E. Crockett, Jr. Box 46, Lees Summit, Mo.

WANTED: FB7 coils. What have you? W1BB.

SELL: Breting 12 Receiver, with speaker; RCA Signal Generator TMV-97 C; Audio Oscillator TMV-34A; Parts for 2500 volt power supply; Hughes Mitchell 10-meter converter; 5-meter superregenerative receiver; misc. transformers, meters, chokes, condensers, etc. Maher, 1001 N. Edinburgh Ave., Hollywood 46, Calif.

WANTED: 20 or 10 meter crystals. Bliley preferred. W9VOY.

WANTED: Relay Rack 77" panel space, UTC-S-48 or Stancor P-8508 or Thordarson T19P63 or Kenyon T-671 transformer. Quote price and condition. H. Kauffman, 15 Garfield, Avon, N. J.

WANTED: Echophone EC-1 or Hallicrafter S-29 receiver. Pvt. T. M. Hahn, Co C 171 Trng Bn, 95 IRT C, Camp Hood, Texas.

FOR SALE: 30 Weston Type 425 Round Bakelite Case Thermogalvanometers. 0 to 115 Milliamperes. Good condition. Price, $10 each. Bliley Electric Co., Erie, Penna.

WANTED: Young, draft-exempt First Class licensee as transmitter operator. Previous commercial experience not necessary. WSAV, Savannah, Georgia.

BEST offer takes slightly used RCA 204A. Allan Smith, W9QNP' Culbertson, Nebraska.

WANTED: Echophone EC-1. Give price and condition. J. W. Lund, EM3/c, USNAS, Bks, 17, Brunswick, Me.

QUICK SALE: National AGSX receiver, $40; Dual-speed Professional Recorder, $75; Bass reflex speaker, $15; Meissner push button remote control, $15; RCA audio amplifier, $15. Write or wire for details. Jay Quinn, Northampton, Mass.

FOR SALE: 150W–300W transmitters, or parts, cabinets transformers, xtals, new and used 811, 812, HY75, HY615, 954, 955, 957 tubes, many others. 2½ meter receivers, transmitters, Howard 450A, Hallicrafter S-21 receivers. Send for list. J. F. Leeder, 3176 So. 13th, Omaha, Nebr.

CRYSTALS: Prompt delivery on those time-proven dependable Eidson crystals in the 100–10,000 kilocycle range. New units available for Aircraft, Police, Marine, Geophysical and other services; also repair and regrinding service. Send for folder L-5, mentioning needs. "Eidson's", Temple, Texas.

TWELFTH Edition Radio Amateur's Handbook (1934) wanted. J. Corbett 206–15 43rd Ave., Bayside, L. I., N. Y.

SALE or Exchange: 1 5BP4, $27.50; 1 5BP1, $24.75; 2 872A, $7.50 all new and in original cartons. Goetz, 321 Broadway, NYC.

WANTED: Hallicrafter or National communication receiver in good condition. C. Horn, 325 East 163rd St., New York, 56.

BUILD a radio, complete kit with tubes, $9.95. Details. RADIO, 911 New York Ave., Brooklyn, N. Y.

WANTED: Hallicrafter receiver SX-28, 26 or other model. Please state price and condition. Cpl. K. Shelton, % A.R.R.L., 38 LaSalle Rd., West Hartford 7, Conn.

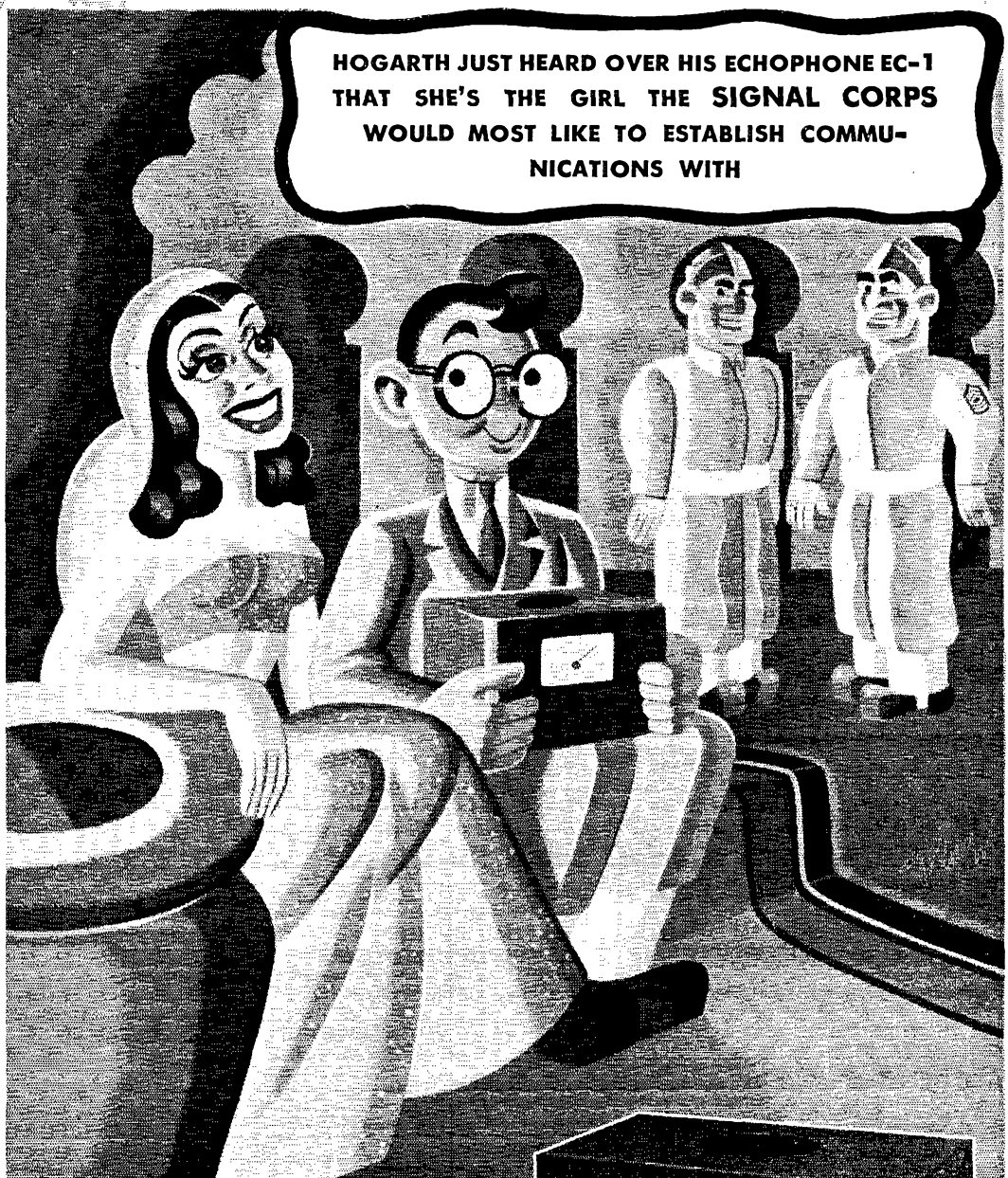
SELL Collins 4-A transmitter, complete, $35, f.o.b. W3QP. URGENTLY need: Mac No. 200 key. G. Esterson, 2922 Norfolk Ave., Baltimore, 15, Md.

WANTED: Rider Chanalyst, Hickok 188X signal generator, or equivalents. River Service Manuals. Morris, 718 Crescent pky. Westfield, N. J.

WANTED: A 200 to 1800 watt transmitter. Wm. R. Garnett, Box 211, Newport, Rhode Island.

WANTED: National 1–10; Abbott TR-4 and DK-3; Mims Deluxe Rotator. Albert Webb, Bullard Ave., Holyoke, Mass.

IRE "Proceedings" wanted for March, April, 1943; June, July, August, September, 1942; November, 1938; January, June, 1937; 1936 and earlier years. T. M. Ferrill, Jr., 29 Fairview Blvd., Hempstead, N. Y.



ECHOPHONE MODEL EC-1

(Illustrated) a compact communications receiver with every necessary feature for good reception. Covers from 550 kc. to 30 mc. on 3 bands. Electrical bandspread on all bands. Six tubes. Self-contained speaker. 115-125 volts AC or DC.

ECHOPHONE RADIO CO., 540 NORTH MICHIGAN AVE., CHICAGO 11, ILLINOIS

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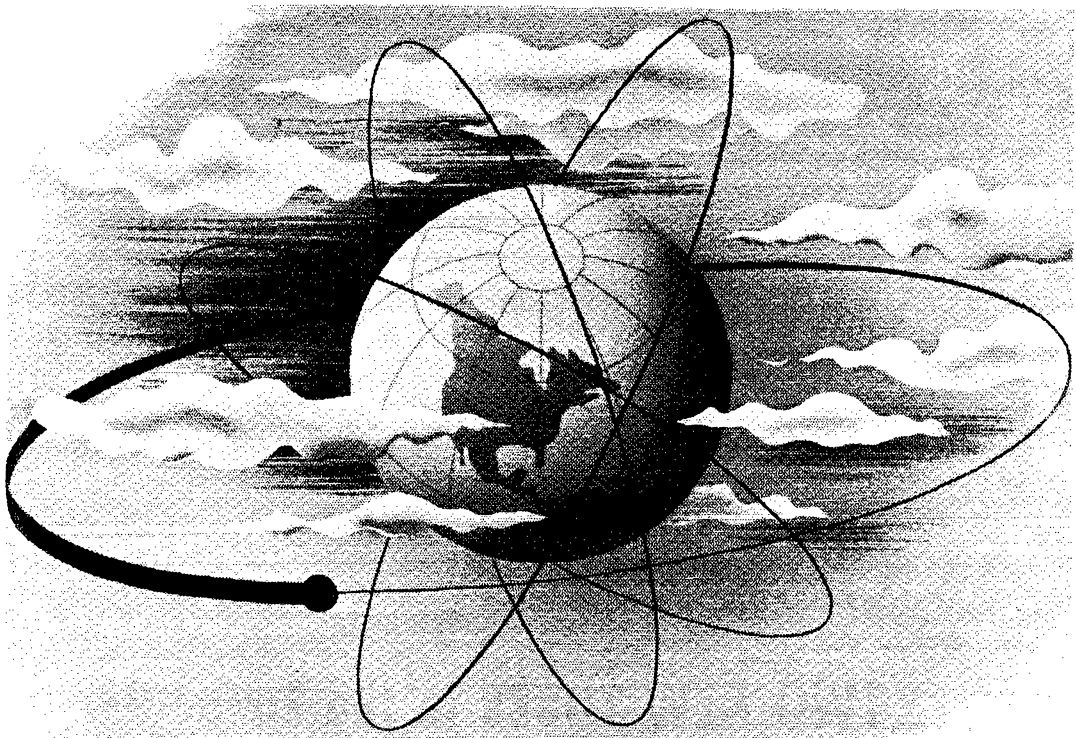
All of the above advertisers are coöperating with the A.R.R.L. to permit publication of an editorially adequate *QST* during this period of war rationing of paper. Using less advertising space but at higher rates, they continue their customary support of *QST*. Some are using smaller space in each issue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



Delco Radio Products Mean Uniform Quality

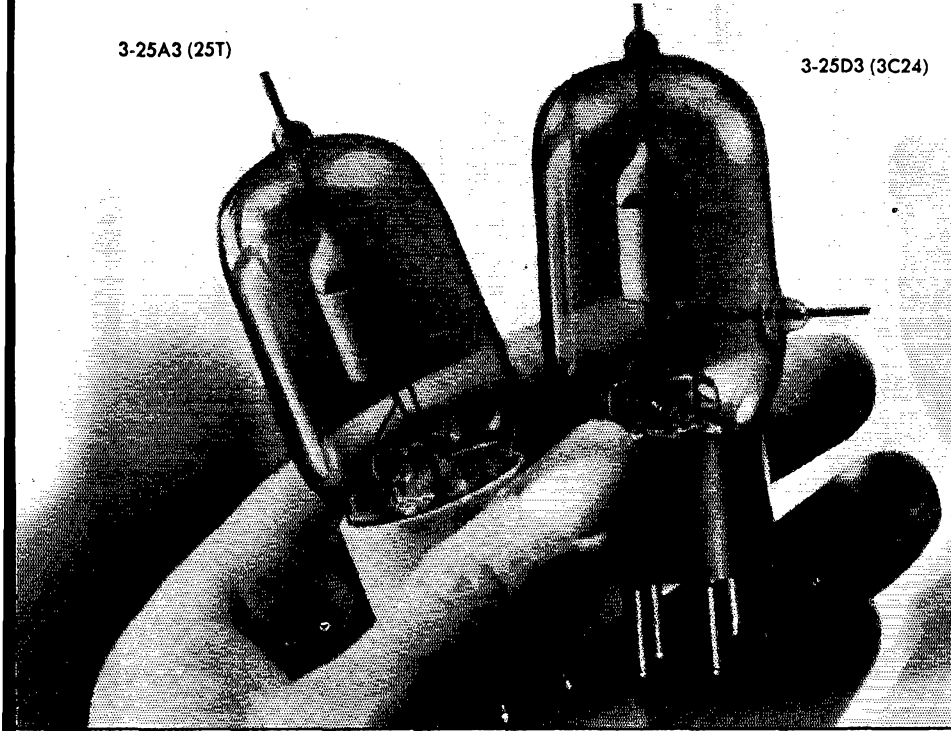
Delco Radio products—wherever in use—are of uniformly fine quality. For two reasons . . . First, capable engineering by Delco Radio's laboratories . . . Second, advanced techniques in mass production. It is through this combination of engineering vision and manufacturing precision that Delco Radio meets the demands of war, the needs of peace.

Put Your Dollars In Action
BUY MORE WAR BONDS

Delco Radio
DIVISION OF
GENERAL MOTORS

3-25A3 (25T)

3-25D3 (3C24)



Here are TWO NEW TUBES in the Eimac line

	3-25A3 (25T)	3-25D3 (3C24)
Plate Dissipation (watts)	25	25
Amplification Factor	30	30
Filament Volts	7.5	7.5
Filament Current (amps)	1.25	1.25
Interelectrode Capacity		
Grid to Plate	3.5 mmfd	3.5 mmfd
Grid to Filament	3.5 mmfd	3.5 mmfd
Plate to Filament	0.2 mmfd	0.2 mmfd
Maximum Ratings (Class C amplifier)		
Plate Voltage	600 volts	600 volts
Plate Current	75 mils	75 mils
Grid Current (max.)	25 mils	25 mils
Maximum Plate Dissipation (watts)	25	25

Smaller brothers of the Eimac 35T and 35TG, these two triodes are filling a need in high-frequency equipment of relatively low-powered class. They attain a high order of efficiency on frequency in the VHF range and perform equally well at lower frequencies.

In every way these two are worthy additions to the Eimac family . . . embodying all the Eimac features including complete freedom from premature emission failures due to gas released internally.

Complete data is available without obligation. Write for it today. Also ask for your complimentary copy of *Electronic Telesis*, a sixty-four page booklet which gives the fundamentals of Electronics and many of its applications. Written in layman's language, this booklet will assist engineers in explaining the art to novices.

Follow the leaders to

Eimac REG. U. S. PAT. OFF. TUBES

EITEL-McCULLOUGH, INC., 893 San Mateo Avenue, San Bruno, California

Plants located at: San Bruno, California and Salt Lake City, Utah

Export Agents: FRAZAR & HANSEN, 301 Clay Street, San Francisco 11, Calif., U.S.A.

PRINTED IN U. S. A.
RUMFORD PRESS
CONCORD, N. H.

THANKS FOR THE PLUG, ROMMEL

...early in 1941 I was transferred to Tunis where I have remained until the present. During all these times your receiver gave me the best of service and enabled me to follow broadcasts from the United States as well as Europe.

Unfortunately, during the German occupation of Tunisia after our landing in North Africa, my house in Tunis was occupied by the German Commander-in-Chief who apparently found your receiver as much to his liking as I had. In any event, upon my return to Tunis after the recapture of that city, I found it missing together with the greater part of my furniture and household effects.

It would be appreciated if you would again provide me with the present equivalent of the set which I possessed.

(Excerpt from a letter we received from a member of the State Department)

NATIONAL COMPANY, INC.

MALDEN MASS, U. S. A.

TIONAL RECEIVERS ARE IN SERVICE THROUGHOUT THE WORLD

NOW A Miniature Thyratron with a Man-Size Rating

RCA-2D21—For Control Jobs Where Lightness and Small Size Count

STURDY construction—stable operation—high control ratio—yet this new RCA thyratron, the 2D21—is a true miniature. It weighs but ½ ounce; stands just 2⅛ inches high. And it will handle 100 milliamperes average; 500 milliamperes peak. The 2D21 is a gas-type tetrode electrically similar to the well-known RCA-2050.

In addition to its small size, RCA-2D21 has many application advantages—for example:

Low Internal Drop: Only 8 volts!

Any-position Mounting: The 2D21 is xenon-filled; no mercury to limit mounting position, or to restrict motion while in operation.

Wide Temperature Range: —55 to +90°C, with little change in operating characteristics over the entire range.

Quick Heating: Anode voltage may be applied not less than 10 seconds after application of heater voltage.

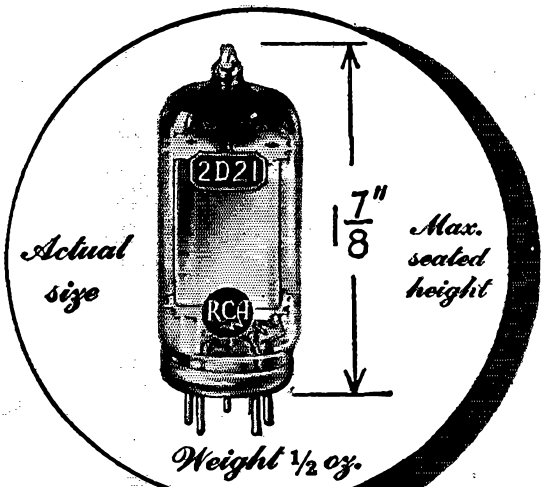
Stable Operation: The inherent stability of this type of gas-filled thyratron makes greater control-circuit sensitivity possible. Low grid-anode capacitance makes the 2D21 insensitive to line-voltage surges.

Versatility of Control: You can control the operation of the 2D21 by means of both the shield grid and the control grid. This makes for flexibility of control where needed.

Low Preconduction Current: Electrode structure provides low preconduction current up to start of conduction.

High Sensitivity: Grid current is very low; hence, a high resistance can be used in the grid circuit, providing high sensitivity. A high-vacuum phototube can be coupled to a 2D21 without intervening amplifier.

Need further information? Write to Commercial Engineering Section, Radio Corporation of America, Harrison, N. J.



TECHNICAL DATA

RCA-2D21 $3.75

Heater Volts (A. C. or D. C.)	6.3
Heater Amperes	0.6
Tube Drop (Approx.)	8 volts
Max. Overall Length	2⅛ in.
Max. Seated Height	1⅞ in.
Bulb	T-5½
Base	Miniature Button 7-pin
Ambient Temp. Range	-55° to +90° C.

MAXIMUM RATINGS

Peak Forward Anode Volts	650
Peak Inverse Anode Volts	1300
Shield-grid Volts	-100
Control-grid Volts	-100
Peak Cathode Milliamperes	500
Average Cathode Milliamperes	100
Max. Control-grid Circuit Resistance	10 Megohms

Typical A-C operation: RMS Anode Volts, 400; Shield-grid Volts, 0; RMS Control-grid Bias Volts, 5; Control-grid Signal Volts (Peak), 5; Control-grid Circuit Resistance, 1 megohm; Anode Circuit Resistance, 2000 ohms.

BUY MORE WAR BONDS

★ The Magic Brain of all electronic equipment is a Tube . . . and the fountain-head of modern Tube development is RCA

RADIO CORPORATION OF AMERICA

RCA VICTOR DIVISION • CAMDEN, N. J.

62-6431-8

IN THE SERVICES

— but it *will* help us to accumulate the complete record of amateur radio's wartime service we so badly need and want. Don't forget — it's for your own good as an amateur, too.

Dear ITS Gang:

Have I heard from you recently telling me all the latest on what you've been doing? Most important of all, have you sent in the AWSR form reproduced in each issue of *QST*?

If not—if you've been too busy or if you haven't wanted to cut your copies of *QST*—how about filling out one of the convenient postcard forms below and sending it in? No free samples promised in return for the coupon — hi!

What do you say, OM?

You in the Signal Corps, and all of you others in other branches of the armed forces and in war work — will you write me?

Yours "In the Services,"

Ethel L. Burnham

Please give this card to a ham friend.

AMATEUR WAR SERVICE RECORD

Name

Present mailing address

Rank or rating

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

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

SERVICE

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

Your Amateur War Service Record—What It Means

As every *QST* reader, regular or otherwise, should know by now, we are endeavoring to compile at ARRL Headquarters a record of the service of every radio amateur serving in this war. If you are, or ever have been, a licensed amateur (holder of either an amateur station or an amateur operator license) and are engaged in military service or in any aspect of communications work where radio know-how counts, we ask you to register with us by filling out the postcard form below and mailing it to us (marked "free," of course, if you're in the armed forces). We need this record whether your service is in uniform in the armed forces, or in the Civil Service, or in any other branch of government work of a nature essential to the war effort, or in those portions of the radio manufacturing industry which are 100 per cent devoted to war work. It will take you only a minute to fill out the form and it will be a big help to amateur radio. We would also appreciate similar data on your co-workers of amateur background. A second card is provided for your convenience in this connection. If you've already sent in your own AWSR, please try to get both cards into the hands of other hams who have not done so.

Don't dismiss this request as trivial and don't minimize the importance of the record we are establishing. It may well be of vital importance to the future security of amateur radio — not only when the time comes to obtain our post-war restoration to the air, but in the even more distant future when active recollection on the part of government authorities of the service we have rendered will have dimmed. The performance of radio amateurs in World War I has always been one of our strongest arguments, but it would have been far stronger had a fully detailed record of that performance been maintained. The same mistake must not be repeated. The amateur's record in this war must be preserved in full. You do your part and we'll do ours.

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