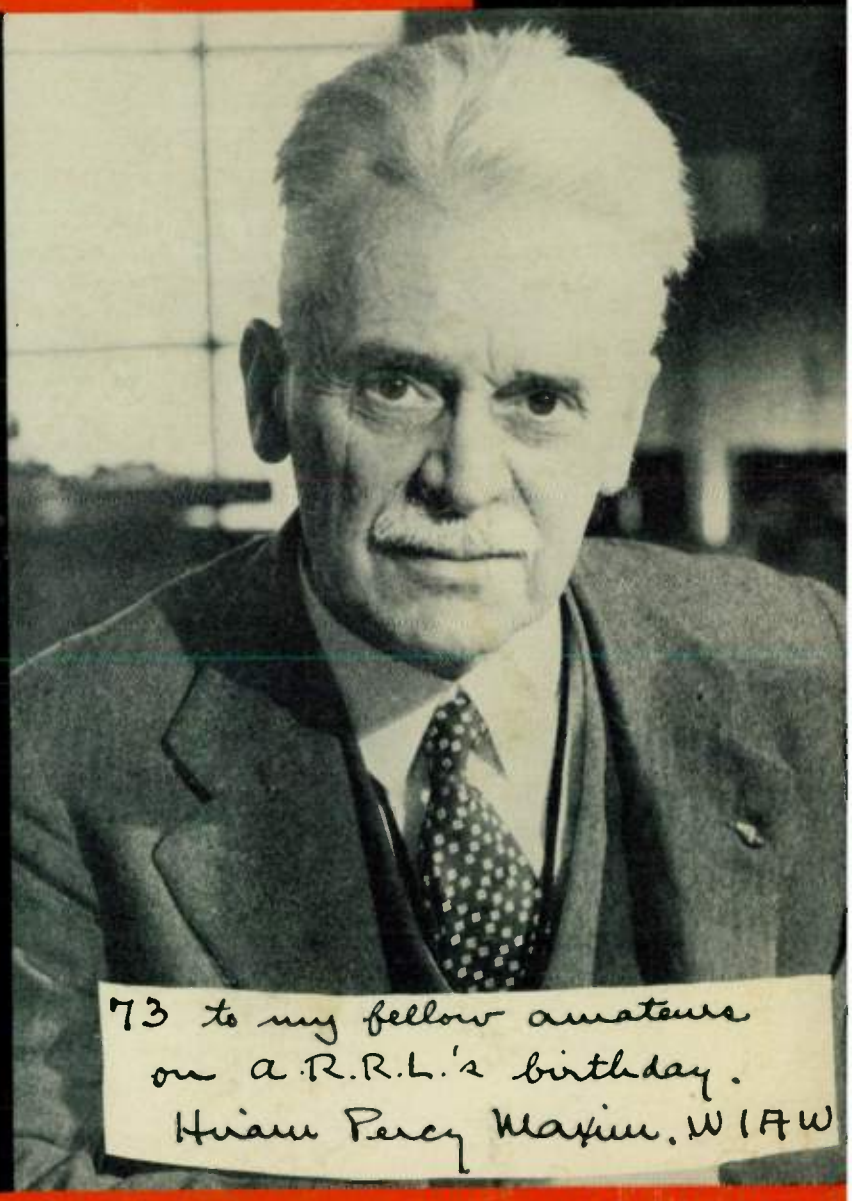
FIFTY YEARS OF A. R. R. L.

$1.00

A REPRINT OF HISTORICAL ARTICLES FROM THE 1964 ISSUES OF QST



73 to my fellow amateurs on A.R.R.L.'s birthday.
Hiram Percy Maxim. W1AW

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FIFTY YEARS OF ARRL

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Foreword

In May, 1914, a small band of radio amateurs led by the late Hiram Percy Maxim, W1AW, of Silencer fame, and Clarence Tuska, started a national organization and named it the American Radio Relay League. Since that time the story of amateur radio has been the history of the League, the chronicle of amateurs working together for the public welfare and for their common good.

In 1964, the Golden Anniversary of the League, its magazine *QST* covered this tale in serial form. At the suggestion of numerous members, this material is now gathered here as a historical reference, supplementing but not replacing the only other comprehensive history, *Two Hundred Meters and Down*, by Clinton B. DeSoto. Through these pages "Old Timers" can relive their own amateur experiences and "Young Squirts" can learn the fascinating tale of amateur radio's early years, and appreciate the heritage of hamdom so painstakingly built up.

—John Huntoon, W1LVQ
General Manager

Newington, Connecticut
May, 1965

50

Years of ARRL

ANNIVERSARY MESSAGE FROM OUR PRESIDENT

To my fellow League members:

The coming new year, 1964, marks a very special event for amateur radio — the 50th anniversary of the founding of the American Radio Relay League. It will be a year in which we can justly take a great pride in our past accomplishments, and yet realize at the same time we have the challenge of many difficult problems still ahead.

In this and succeeding 1964 issues of QST, *the editors plan to tell something of the history and accomplishments of amateur radio during the last 50 years. They will show how it grew originally from a few hundred dedicated enthusiasts in America and Europe to more than 350,000 amateurs now scattered in almost every country of the world. They will recount the story of our technical progress from the early times, when we could work each other for a few hundred miles with spark sets on 200 meters; to the modern era of vacuum tubes and transistors with which we can now talk almost anywhere in the world on s.s.b., a.m., c.w., and RTTY, using the harmonically related bands that are assigned to us throughout the h.f., v.h.f., and u.h.f. spectrum.*

There were the exciting days in the 1920's, for instance, when Reinartz, Schnell, and Deloy turned the accepted theories of long-distance radio communications upside down, and proved for the first time the enormous usefulness of short wave. This spirit of technical progress and scientific adventure has persisted steadily down through the years, and there has yielded many solid contributions to radio communications. Whether large or small each of them has been a step forward — and another feather in the cap of amateur radio. In recent times the achievements of Project Oscar have been a vivid demonstration that this pioneering tradition is still very much alive.

As we delve into past history it also becomes apparent that the founders of the League, particularly Hiram Percy Maxim and Clarence Tuska, realized from the beginning that if Amateur Radio was to persist it had to have a firm foundation of public service. It was undoubtedly for this reason they included the word "relay" in the League's name, for that was the only known way of handling traffic in those early days. They continually stressed the need for operating skill as one of the basic prerequisites for our existence, as they foresaw that nowhere could these skills be better developed and put to constructive use than in handling traffic and emergency communications. We must be everlastingly grateful to those old timers for handing down to us these traditions of public service, technical progress, and operating skill. Without them ham radio would have perished long ago.

In our concern with today's problems we sometimes forget that the old timers had plenty of troubles, too. But they met them with courage and foresight, and they have left us with a great heritage for the future. We owe the founders of the League a great debt of gratitude, for their vision and leadership provided the basis for our growth and have made amateur radio and the League what they are today.

—HERBERT HOOVER, JR. W6ZH
—President, ARRL

A Memorable Meeting

BY C. D. TUSKA *

MY FAMILY moved to Hartford, Connecticut, and entered me in the ninth grade elementary school at a time when Hiram Percy Maxim had already made a name for himself. While he might have rested on the laurels of his distinguished father, Sir Hiram S. Maxim[1] — inventor of the Maxim machine gun — or his equally distinguished uncle, Hudson Maxim — inventor of maximite (a high explosive) he was known for his pioneering in the automotive field[2] and for his invention of the Maxim silencer for firearms. I shall report the first meeting of the schoolboy and the distinguished citizen that preceded the formation of the American Radio Relay League by several years.

About 1909–1910 the rubber-powered model aeroplane craze came into being. While my first love was wireless, I learned how to build dual propeller pushers in which pairs of rubber-band motors were simultaneously wound with converted egg-beaters to provide motive power. Pocket money had to be earned, so I made and consigned model planes to the Harris Parker toy store on Asylum Street, Hartford. When bad flying weather came, wireless took over.

I had arrived in Hartford with an untuned spark coil transmitter and a coherer-decoherer receiver (both with small dipole aerials) that operated across the room. I also possessed a two-slide tuning coil and an E. I. electrolytic detector that did not operate at all well because the Wollaston wire kept burning out. Before long these crude instruments were replaced with a homemade loose coupler, a crystal detector, and a pair of Brandes phones. About that time the sales of model aeroplanes petered out and soon after my supply of pocket money nearly vanished.

In an attempt to replenish the pocketbook I made a wooden box with a hinged lid. The box was big enough to hold a single slide tuner, a crystal detector and a single telephone receiver. Based on the successful sale of model planes, Mr. Parker did not hesitate to take my small wireless set on consignment and to put the outfit in his window.

Harris Parker's store was on my way to high school to which I had been promoted. I usually waited in front of the store for the trolley car that took me out Farmington Avenue. You may be sure that I watched the store window and my set every day. There was great excitement the day the set was not in the window. That afternoon on my way home I went to Mr. Parker to collect. The conversation went about as follows:

"Mr. Parker, I saw the wireless set was gone so I am here to collect."

"Well now, son, I let a customer take it and if it works O.K., he'll be in to pay for it. If it doesn't work to his satisfaction, he'll return it. Drop around in a day or so."

Perhaps two days later, I went to Mr. Parker and there was the set on a rear counter and I was told: "The man who took the set returned it and said it was no good."

Since I had successfully operated the set these were "fighting words". I volunteered: "Probably the man did not know how to operate a wireless set and undoubtedly he failed to adjust either the tuner or the crystal detector."

My words probably went completely over Mr. Parker's head but he gave me a stopper for an answer: "Oh, I think he knew how. You see, this was Mr. Maxim, the inventor, and I am sure he'd know all about wireless sets."

When I arrived home my mother could feel that something was wrong and she finally dragged the story out of me. During most of my youth she had to be both father and mother. This time I got fatherly advice: "You go promptly to see Mr. Maxim and ask him to tell

* 401 Mercer Rd., Princeton, N.J.

Author's Note: Throughout I have tried to use the vocabulary of the earlier years.

[1] Maxim, Hiram Percy *A Genius in the Family*, New York, Harpers & Brothers 1936.

[2] Maxim, Hiram Percy *Horseless Carriage Days*. New York, Harpers & Brothers 1936.

Clarence D. Tuska, ex-1WD, co-founder, ARRL and QST.

you what was wrong!" It took a lot of persuading but finally I agreed; provided my good friend, William Ball, who was my partner for the sale of enameled wire, Brandes phones and custom-built loose couplers, went with me.

Bill and I started for Mr. Maxim's one evening without an appointment. Mr. and Mrs. Maxim and their two children were living on Prospect Avenue, just south of Farmington Avenue. It was quite a long trolley ride from where we lived. Although I did not admit it, my enthusiasm for the confrontation diminished with the distance.

It was after dark when we found the house, rang the doorbell, and waited for the door to open. A man appeared. He was in his early forties, of medium height, his hair (which was beginning to gray) stood straight up,[3] and he was having obvious trouble with one of his garters. When the garter was fixed, we were given a friendly look of inquiry.

I came directly to the point, and give or take a word or two, I can almost remember saying in one breath: "Mr. Maxim I am the boy who made the wireless set you got at Harris Parker's and you returned it saying it was no good and I want to know why!"

This was obviously no trivial matter to be handled at the open door. Either we were to be shut out or invited in. I was never sure what prompted him to ask us in other than he was naturally kindly and always gentlemanly.* He quickly disposed of the "no good" comment about the set by explaining: "I did not tell Mr. Parker that it was no good or did not work. I told him it would not serve my purpose and that I wanted something better — something more professional."

Before we said good night, Ball and Tuska had Mr. Maxim's order for a loose coupler, a variable condenser, a crystal detector and a pair of Brandes Navy Phones. The rig was installed in due course and gave satisfactory service for a number of years. Throughout those years, and for many years thereafter, my friendship with Mr. Maxim grew. Looking back, it was more of a father-foster-son relationship. It was he who urged me to go to college. It was he who took the time to drive me over to Trinity College and to introduce me to dear old Dr. Luther and to Professor Henry Perkins. But I am getting ahead of the story.

Mr. Maxim and his young son, Hamilton, acquired a spark coil transmitter and we communicated by wireless in the days before amateur licenses were required. At that time most of the call letters around Hartford began with SN to which one added any third letter not previously pre-empted. I believe Maxim's was probably SNW and mine was SNT. We became members of the Radio Club of Hartford. The informal

This picture of Mr. Maxim's station was published in *The Hartford Times* on January 17, 1914. Mr. Maxim is at the right—the other operator is not identified. This engraving was made directly from a clipping furnished us by David Moore, first prexy of the Hartford Radio Club and now a winter-time resident of Florida.

call letters soon gave way under the new law to station licenses with assigned call letters. The stations were operated by licensed amateurs.

The power limitations of spark coil transmitters led to power transformers, first with fixed spark gaps and then with numerous styles of rotary gaps. Our signals went well beyond the city boundaries. It was not long before we had intercity and interstate communications. The growing communication range lead me to discuss with Mr. Maxim the possibility that amateur stations' operators with whom we were in communication must also know other amateur operators beyond our range and beyond them still others. Therefore it would be interesting to organize a relay — say from Hartford to Buffalo or even farther.

While I was thinking of a one-shot proposition, Maxim, who had no end of imagination,[4] foresaw an amateur communication network. He dreamed of a network from the East to the West, from the North to the South.[5] I have no doubt that he also saw the lasting advantages that banding the amateurs together would give to our country [6] and to the amateurs. Thus came the first step leading to the founding of the American Radio Relay League.

To Hiram Percy Maxim wireless must have been a romantic thing, a new tool, a great adventure in which thousands and then tens of thousands of amateurs could communicate freely and easily and instantly over greater and greater ranges. It was he who rendered the necessary leadership. QST

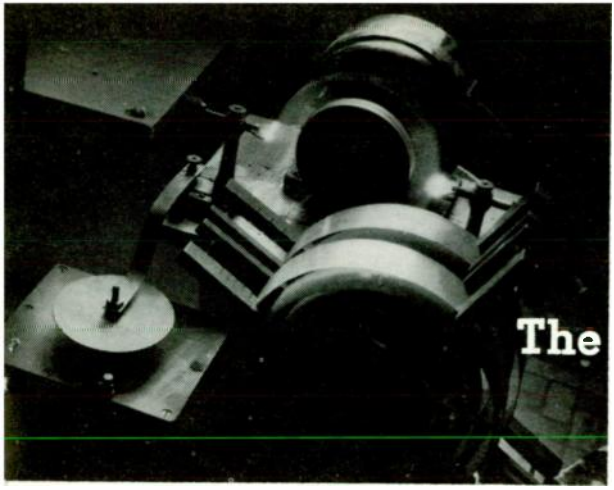
[3] Maxim, Hiram Percy "**Practical Relaying**". *QST*, Vol 1, No. 3, page 19, Feb. 1916.

* About seven years later in a very personal letter he specifically referred to that night and indicated that he "was impressed".

[4] Tuska, Clarence Denton, *Inventors and Inventions* pages 116–117. McGraw-Hill Book Company, New York. 1957.

[5] Maxim, Hiram Percy "Practical Relaying," *QST*, Vol. I, Nos. 3 & 4, pages 19–22 and 45–46. Feb. and March 1916.

[6] "WAR", *QST*, Vol. II, No. 6, pages 3–4. May 1917. "Wanted: By Uncle Sam," *QST*, Vol. II, No. 8, pages 3–5. July 1917.



The Birth of A.R.R.L.

The Background and Formation of Our League

IN THE latter years of the nineteenth century there existed a considerable body of experimenters, of all ages, who made small electromagnets, motors, batteries, static machines, erected neighborhood telegraph lines, and built all the other experimental electrical apparatus within their ken —purely as a hobby, and with no commercial interest whatsoever.

The fascinating new art of radio received many converts from their ranks. Particularly in the case of the neighborhood telegraphists did the possibility of signalling without cumbersome, expensive, deficient wires hold appeal. And in addition to those with an experimental background, there were many of the lay public to whom the romance of wireless called irresistibly; a large proportion, perhaps a majority of the early amateurs came directly from this group.

These enthusiasts read with avid interest of Marconi's early experiments. They thirsted for details of his methods, so that they might duplicate his feats. The articles in the scientific magazines were barren of constructional information, but finally, in July, 1899, the American Electrician *carried the first answer to their prayers—the first actual constructional information on wireless—and it was hailed as a great find by amateurs everywhere. . . .*

In 1901 there came to pass the incident that really brought about the widespread development of amateur radio—and of all other branches of radio, for that matter. On December 6th, Marconi arrived from Europe at St. John's, Newfoundland, with two assistants, and proceeded to erect the most advanced wireless receiving station of the time in the old Barracks of Signal Hill, at the mouth of the harbor. On December 10th he sent up a huge hexagonal kite of bamboo and silk, nine feet long. The wind snapped the trailing wire, and the kite drifted out to sea. The next attempt was a 14-foot hydrogen balloon; this, too, broke away and floated off into the fog. Finally, on December 12th, a kite was successfully sent aloft to four hundred feet and held. Marconi cabled his station at Poldhu, Cornwall, on the southwest tip of England, to begin transmitting. With one assistant present he started listening for the signal—the pre-arranged code letter "S". The transmissions were to begin at 11:30 a.m. Just before noon-time, Marconi heard a repeated trio of buzzes in the head telephones . . . three dots . . . the letter "S"! His assistant verified the reception. Again, twice in the early afternoon, the signal was heard.

Two days later Marconi released the results of the tests to the press. Two thousand miles of space had been bridged—without wires. The press of the world went mad—pages were filled with jubilation, disbelief, triumph. "Wireless" was on everyone's tongue. But most of all it filled the hearts and minds of the hordes of electrical experimenters and other kindred souls throughout this and other countries, and by the hundreds they turned from their backyard telegraph systems, their electric motors and their wet cells, and all their other hobbies—a bunch of tousled, patient, eager-eyed enthusiasts filled with an insatiable curiosity and undaunted by a thousand failures—and, perceiving that here was something a hundredfold more engrossing than all else, they plunged into wireless. . . .

EDITOR'S NOTE: Some portions of this story (in contrasting type) are excerpted from *Two Hundred Meters and Down.*

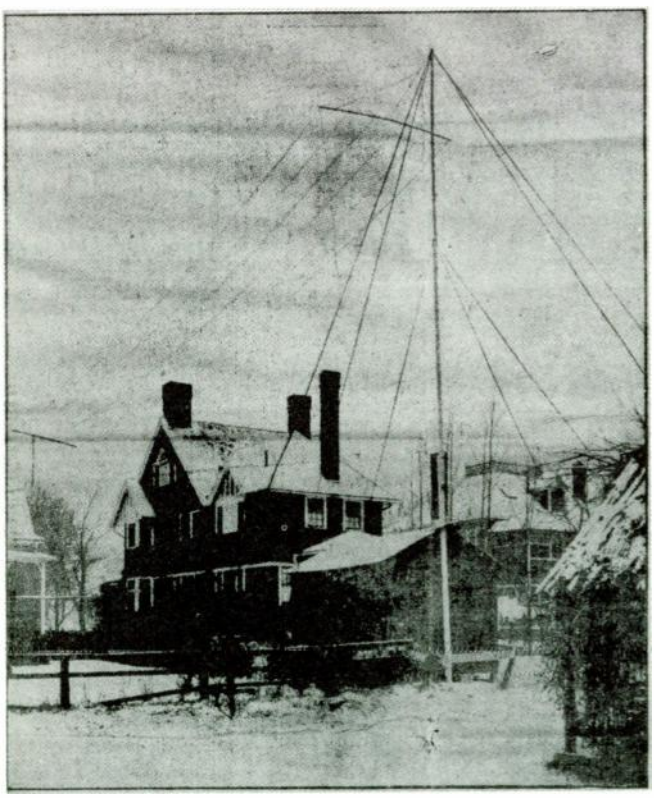
Early Progress

For the first ten years, progress was slow and fraught with difficulties. Technical and constructional material was scarce. Although a number of articles on wireless were published, often in con-

sumer magazines, they were usually for the layman; only occasionally was useful constructional material included. In 1908 Hugo Gernsback, already well known through his Electro-Importing Company catalog and wireless supply house, began the publication of *Modern Electrics*, which as a result of enthusiastic reader acceptance quickly adopted a policy of covering wireless almost exclusively. This, plus lesser treatment in other magazines, and a textbook or two, made generally available to embryo hams the information necessary to assemble a station.

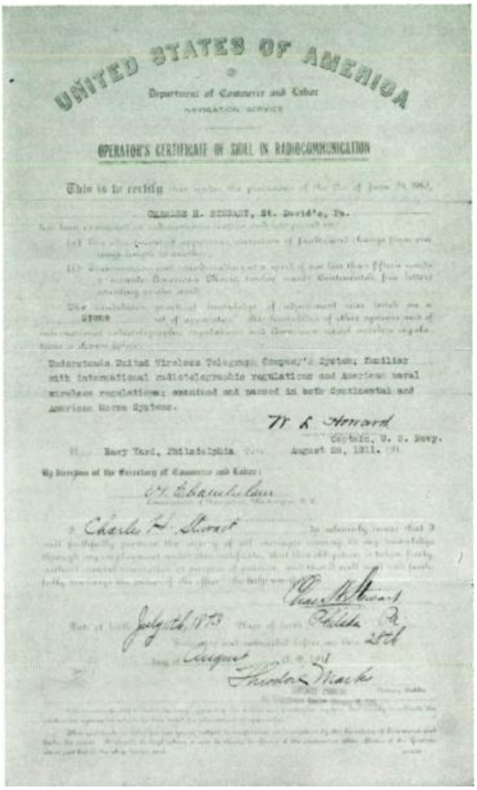
The typical amateur station of those days was an induction coil, a condenser and spark gap for the transmitter, and a simple coherer-decoherer or galena crystal for the receiver/detector, usually into a single head telephone. Better-equipped stations had receiving tuners (most U. S. commercial receiving equipment was untuned, since patents on the loose-coupler system of tuning were held by Marconi, a legal problem which did not bother amateurs). Although the Fleming valve had been invented in 1904, and the deForest audion in 1906, neither found immediate general acceptance in wireless communication — in the case of amateurs, probably because of the high cost compared with only slightly improved results. Distances ranged up to several hundred miles for the larger stations with several kilowatts, but for the most part hams were content with 50 or 100 miles with average gear.

Regulation was non-existent; there was no radio law. The Navy did issue "certificates of proficiency," but this was not a requirement for operation. Everyone had an equal right to the air. Operating conflicts between amateurs, military (mostly Navy) and commercials occurred often. The Navy and commercials charged that amateurs were cluttering up the air and interfering with important traffic; the amateurs in turn claimed that if the complainants would use modern (tuned) receivers, they would have no difficulty! Trouble was brewing; many amateurs had better and more powerful stations than those used by the Navy and commercial services, and were often better operators. The opponents of amateur radio took their case to Congress, and in the period 1906-1911 a flurry of bills was introduced. In one way or another, each would have spelled doom for amateur radio; one, urged by the Navy, would have made wireless an exclusive government monopoly (as indeed developed in most foreign countries). None of these succeeded. Although generally unorganized, amateur radio of 1910 had enough small clubs and capable individual representatives to block the bills. Admittedly, this was accomplished with the help of the Marconi company (not necessarily



In 1914, as in 1964, the goal of every amateur was a bigger and better antenna system. This was Hiram Percy Maxim's house on Prospect Avenue in Hartford, and this 80-foot-high antenna was erected by his son Hamilton and himself. (Photo from *Hartford Times*, January 17, 1914.)

through any love for amateurs), who supported the amateur's contention that U. S. commercial gear was inferior (implying, of course, that Marconi's tuning system was much better). The Radio Club of America and the Wireless Association of Pennsylvania (represented by Charles H. Stewart, later to become ARRL vice president) were among those who appeared in opposition


UNITED STATES OF AMERICA

Department of Commerce and Labor

NAVIGATION SERVICE

OPERATOR'S CERTIFICATE OF SKILL IN RADIOCOMMUNICATION

This is to certify

CHARLES H. STEWART, St. David's, Pa.

Understands United Wireless Telegraph Company's System; familiar with international radiotelegraphic regulations and American naval wireless regulations; examined and passed in both Continental and American Morse Systems.

Captain, U. S. Navy.

Navy Yard, Philadelphia August 28, 1911.

This was the Navy Certificate of Proficiency. This one, issued to Charles Stewart, is on permanent exhibit in the ARRL Museum of Amateur Radio.

to the bills which would have spelled the death knell for amateur radio.

The Coming of the Law

But some sort of law was inevitable; uncontrolled, the situation was becoming impossible. What to do with amateurs? Although having no effective national organization, from a political standpoint they were already too numerous and outspoken to be completely relegated to oblivion by a stroke of the regulatory pen. Finally the commercial and government interests hit on a solution. The scientific world at that time believed that long waves were most valuable, and that short waves were pretty much useless. "Ah, that's it — put the amateurs below 200 meters, where they'll never get out of their back yards, and then we can conduct our important business on the long waves without interference."

The Radio Act of 1912 was pushed through Congress and signed by President Taft on August 17. Amateurs could use only wavelengths below 200 meters, and were limited to a kilowatt input. The law required that henceforth all transmitting stations would be licensed, under the jurisdiction of the Secretary of Commerce and Labor. There were sections calling for the use of a pure and sharp wave, one requiring listeners to observe the secrecy of messages, and provision for punishment of violations of the regulations or the transmission of false distress calls. No individual services were defined except the coastal stations and ship stations.

But at least ham radio had not been completely abolished. And it set to work, determined to maintain its existence. Little did amateurs know then that soon they would prove the short-waves the most valuable of the entire spectrum for long-distance communications.

Organization

In January, 1909, the first amateur radio organization had been formed — the Junior Wireless Club, Limited, of New York City, eventually to change its name to the Radio Club of America. Editor Gernsback of *Modern Electrics* in the same year started the Wireless Association of America. With famous names as honorary sponsors, and with no dues and no obligations, it grew rapidly to a claimed total of 10,000 a year later. This figure was indicative of the national interest in wireless, although certainly not of the number of active transmitters, of which there were (not counting small spark coils) about 600.

In January, 1914, the scene of Destiny in amateur radio shifted to Hartford, Connecticut. On January 14th there was held the first meeting of the Radio Club of Hartford, at that time just another of the large group of radio clubs that had been springing up throughout the country for the past four years. In the chair at this first meeting was Hiram Percy Maxim, the brilliant engineer who had already achieved lasting fame through his pioneer work in the development of the auto-

> The Hartford Radio Club formed on January 14, 1914, and I became first president on my 21st birthday (that date). As I recall, the club was formed in hopes of bringing some order out of the unregulated ether. The conflict then was mainly between the hams with tuned signals (albeit unearthly broad) with rotary gaps and helix, and those whose transmitters consisted of Ford coils whose spark simply went to antenna and ground. This was really an "all-wave" sending device which rivalled the later jamming devices of the Russians. In order to attempt a tone tuning effect, so that possibly more than one coil might operate within a five-mile radius, the "rubber band" tension on the vibrator gave character, and with several going at once it produced all the cacaphony of a frog pond in April. . . .
>
> — *David L. Moore*

mobile, and for his invention of the Maxim silencer. He had become interested in amateur radio through the activities of his son in 1907, and soon developed one of the dominant stations of all New England.

Temporary secretary of this first meeting of the Radio Club of Hartford was an eighteen-year old Hartford amateur named Clarence D. Tuska. Before the meeting was over, David L. Moore had been elected president of the club, while Tuska continued as secretary. Bi-monthly meetings were scheduled. A constitution was drawn up and adopted at the next meeting. Twenty-three charter members were on the rolls. By March 9th the attendance had mounted to 35.

Then Destiny encamped. At that time, the demand for vacuum tubes had reached a peak as a result of publication of the wonderful Armstrong regenerative circuit. Production could not keep up with the demand. No longer was it possible to go up to the Metropolitan Tower in New York, leave five dollars with the deForest Radio Telephone Co., and depart with the precious audion. H. P. Maxim was very anxious to secure one of these vacuum tubes, but he had been unsuccessful in his attempts to purchase one. Sometime during the four-week period between March 9th and April 6th, however, he learned that an amateur in Springfield, Mass., had an audion for sale. That night he sat down at his transmitter and attempted to send a message to Springfield opening negotiations for its purchase.

Maxim's one-kilowatt station, 1WH, at that time had a maximum sending range of about 100 miles under favorable conditions. Springfield was only thirty miles north of Hartford. Yet it so happens that from time immemorial right up to the present day some peculiar transmission condition has made direct ground-wave radio communication between Springfield and Hartford difficult if not an impossibility. Maxim could not "raise" Springfield.

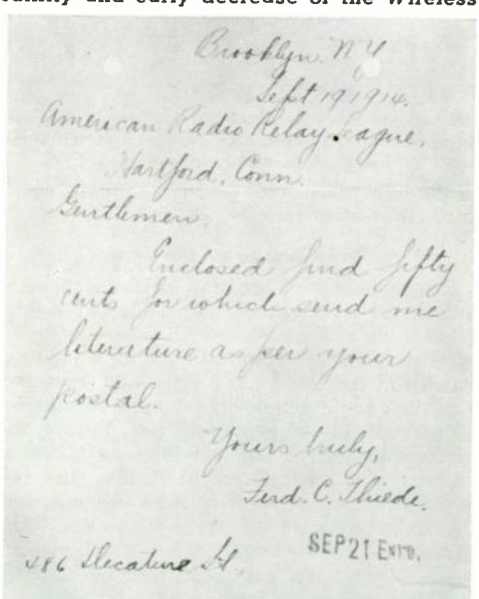
Pondering the problem, with characteristic insight he divined the solution. To one of the early meetings of the Radio Club of Hartford there had come a young lad from Windsor Locks, a small town intermediate between Hartford and Springfield, who said he had a transmitter on the air. The topography of the intervening region was such that he could work both Hartford and Springfield with ease.

Maxim solved his problem by calling this Windsor Locks amateur and asking him to relay the message to Springfield. The feat done, he sat back in his operating chair, puffing his familiar pipe, and pondered more. Driving from his home downtown to his office behind the wheel of his huge automobile the next morning, he continued to think about the incident of the night before, and an inspiration was born.

He has always been careful, since that time, to explain that no significance attached to that particular relay. It was not the first time that relaying had been accomplished. Ships at sea were using the relay principle to get messages from mid-ocean to shore. Amateurs themselves had probably relayed messages beyond the limits of their particular sets before. It is certainly true that the Central Radio Association ("From the Rockies to the Ohio"), which was organized in 1911 and which in 1914 had several hundred members, shortly afterward was relaying messages over hundreds of miles. No, the relay was not especially significant.

The real significance attached to the thoughts that went on in Maxim's mind after the relay had been accomplished, for that next morning there was born the germ of an idea for the long-needed and much-desired truly representative national amateur radio organization. Maxim had for many months felt the need for such an organization, just as he had felt the need for a local club in Hartford. The latter had come to pass. Now the realization of the former was at hand.

The relay idea represented an ideal basis for the needed national organization. Some basic principle, some prime moving force, was essential for the success of such an organization. Americans have always been great "joiners" but if an amateur organization were ever to progress beyond the paper stage, or expand into more than a local club, it must offer more than a gaudy membership certificate and one's name on the rolls. The futility and early decrease of the Wireless


Brooklyn, N.Y.
Sept 19 1914.
American Radio Relay League,
Hartford, Conn.
Gentlemen:
Enclosed find fifty cents for which send me literature as per your postal.
Yours truly,
Fred C. Thiede.
566 Decatur St.
SEP 21 EXPD.

This letter was received at League Headquarters in September, 1914. Apparently Mr. Thiede was sufficiently intrigued by the reply to continue with amateur radio. He is still active, as W2EC.

Association of America had shown this clearly, as did the restricted appeal, limited to the New York metropolitan area, of the Radio Club of America.

At best, ranges in those days were limited. With the power and the equipment and the wavelengths then available, there was little hope for enlargement of the distances covered. After all, the only way radio folk of those days knew how to get greater distance was to increase power, and amateurs were limited to one kilowatt. Even if this were stretched to two or three, as was still occasionally done, the improvement was not appreciable. But an intermediate amateur could relay messages over greater distances with ease and expedition. The only requirement was to achieve some sort of mutual understanding so that each amateur would aid his fellows. Organization was needed—organization that would accomplish the dual purposes of opening relay facilities to all and of bonding together the amateurs of the country into one strong, cohesive, self-reliant body.

March 25th, 1914

David L. Moore, President,
Radio Club of Hartford,
18 Asylum Street,
Hartford, Conn.

My dear Mr. Moore: —

I am enclosing herewith copy of letter which I have sent to *Modern Electrics* and also to *The Electrical World*. As you will see it "opens the ball" on the subject of our Relay Scheme.

Now, what I want to do is to get you and Tuska together some time, within the next day or two, and organize the AMERICAN AMATEUR RADIO LEAGUE. We three can draw up in a few minutes a very simple straight forward statement of the objects of this League. We can then decide who the officers should be and elect them. Then, at the next meeting of the Radio Club of Hartford, we can let the Club decide if it is to become a member of the League. We will then be regularly started and can probably get the Connecticut Valley Radio Club in Springfield to join and it would not be long before we could get others also.

The object of securing the membership of the various Clubs, would be to have those Clubs advise us as to what stations in their locality are the best ones for us to appoint as OFFICIAL RELAY STATIONS. We probably would get wise advice in this manner, because it would be quite a distinction for a station to be appointed to a long distance relay point. It is the only way we will have of getting at the proper stations who could be counted upon to always be in working order and able to read and transmit at decent speeds.

My letter describes the whole matter. I am sending a copy of this letter to Tuska. I wish both of you would give this subject careful thought and be prepared to bring up all possible objections so that we will make no mistakes in the beginning.

Very truly,

HIRAM PERCY MAXIM

Mr. Maxim discussed his idea with the Hartford Club prexy, David Moore, and then wrote him the historic letter reproduced in these pages. At its meeting on April 6, 1914, the Radio Club of Hartford voted to take charge of the development of a relay organization, and a committee to handle the details was appointed.

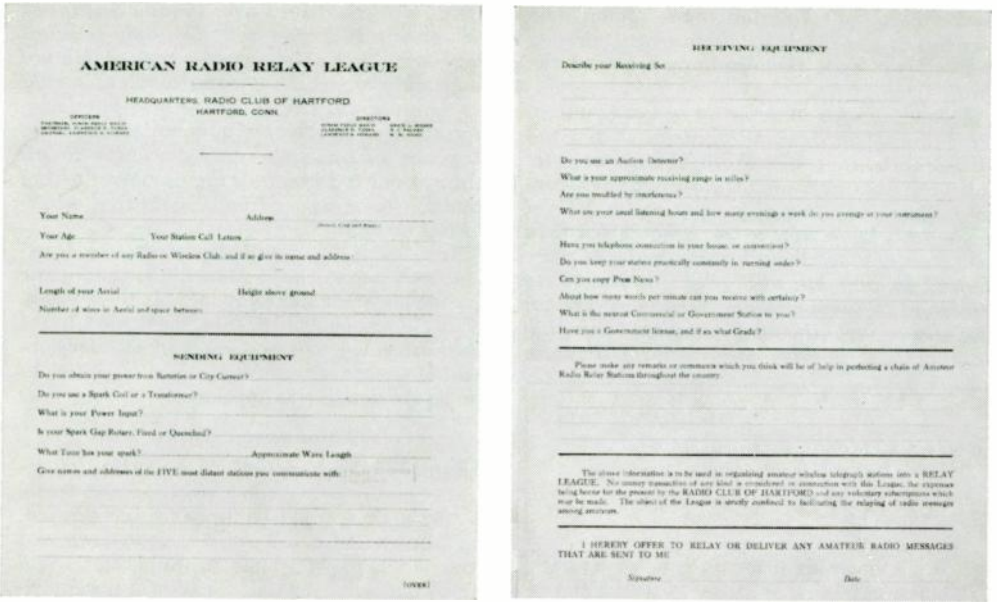
The League Grows

By middle May application blanks bearing detailed questions concerning receiving and transmitting equipment and performance were printed, and Maxim and Secretary Tuska sat down and wrote letters to every amateur station they could think of, announcing the formation of the American Radio Relay League and enclosing one of these blanks. There were no dues; membership was free on application. At the same time, the requirements were set at a high standard and rigidly maintained, so that only qualified amateurs were accepted as relay stations. The response was tremendous. Application blanks came back in every mail. On June 16th the Radio Club of Hartford appropriated the sum of fifty dollars to be spent in further development work. Prior to this time, Maxim and Tuska had paid for the solicitation letters out of their own pocketbooks. The influence of the League was mounting rapidly. It had members in every section of the country . . .

By August, 1914, more than two hundred relay stations had been appointed, from Maine to Minneapolis and from Seattle to Idaho. One of the stations belonged to a man 64 years old; others were owned by youths just entering high school.

In September the League published a map of the United States showing the location of 237 stations in thirty-two states and Canada. In October the League published its first call book, actually a List of Amateur Stations, *a little blue-bound book showing the names, addresses, calls, power, range, receiving speed and operating hours of 400 stations. One-kilowatt stations were surprisingly numerous; they claimed ranges from 50 to 350 miles. The smaller stations, using from 10 to 100 watts, worked from 10 to 20 miles. This call book, the United States map, seven state maps, and a pad of 50 official message blanks were sold for 50 cents.*

In late 1914, Maxim went to Washington and conferred with the Commissioner of Navigation of the Department of Commerce. The object of the conference was to establish the League in official circles, and to secure



AMERICAN RADIO RELAY LEAGUE

HEADQUARTERS, RADIO CLUB OF HARTFORD
HARTFORD, CONN.

Your Name ... Address ...
Your Age ... Your Station Call Letters ...
Are you a member of any Radio or Wireless Club, and if so give its name and address ...
Length of your Aerial ... Height above ground ...
Number of wires in Aerial and space between ...

SENDING EQUIPMENT

Do you obtain your power from Batteries or City Current? ...
Do you use a Spark Coil or a Transformer? ...
What is your Power Input? ...
Is your Spark Gap Rotary, Fixed or Quenched? ...
What Tone has your spark? ... Approximate Wave Length ...
Give names and addresses of the FIVE most distant stations you communicate with: ...

RECEIVING EQUIPMENT

Describe your Receiving Set ...

Do you use an Audion Detector?
What is your approximate receiving range in miles?
Are you troubled by interference?
What are your usual listening hours and how many evenings a week do you average at your instrument?

Have you telephone connection in your house, or connection?
Do you keep your station practically constantly in operating order?
Can you copy Press News?
About how many words per minute can you receive with certainty?
What is the nearest Commercial or Government Station to you?
Have you a Government license, and if so what Grade?

Please make any remarks or comments which you think will be of help in perfecting a chain of Amateur Radio Relay Stations throughout the country.

The above information is to be used in organizing amateur wireless telegraph stations into a RELAY LEAGUE. No money transaction of any kind is considered in connection with this League, the expenses being borne for the present by the RADIO CLUB OF HARTFORD and any voluntary subscriptions which may be made. The object of the League is strictly confined to facilitating the relaying of radio messages among amateurs.

I HEREBY OFFER TO RELAY OR DELIVER ANY AMATEUR RADIO MESSAGES THAT ARE SENT TO ME

Signature ... Date ...

Those who wanted to take an active part in the early activities of the American Radio Relay League filled out one of these applications. The application listed Directors of ARRL as Hiram Percy Maxim, Clarence D. Tuska, Lawrence A. Howard, David L. Moore, R. C. Palmer, and W. W. Howe.

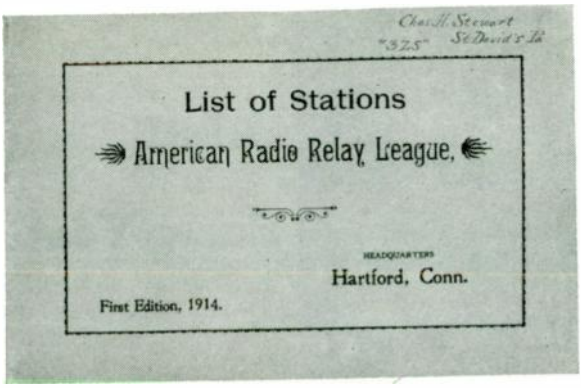
the important concession of permission to operate stations at strategic points along the relay routes of the country under restricted special licenses, enabling them to use the wavelength of 425 meters. These licenses were issued wherever necessary to enable relaying to the next point on the chain, and were granted only to stations sufficiently remote from the sea-coast to avoid interference. The sole restriction was that the 425-meter wavelength was to be used exclusively for the relaying of bona fide *messages, and not for idle conversation.*

The League was actually relaying messages by this time. One station reported handling forty messages in two weeks. Another station owner hired an extra operator, to keep the transmitter constantly on the air and prevent an accumulation of messages. Dozens of other stations were on the air practically continuously, doing nothing but handling traffic. Relay networks had been lined up with fair efficiency over most of Eastern United States.

Local trouble was in the offing, however. Here again one sees the working out of the Destiny that was the League's, courage that was to preserve the working out of an idea of untold eventual national and international importance from the short-sighted hobble of local control. At the January 11, 1915, meeting of the Radio Club of Hartford, friction between some of its members and those of the League began to appear, the source being a disagreement as to whether the League was to be an unfettered and unhampered national organization, or subject to the control of the club. In H. P. Maxim's absence, discussion was postponed until a later meeting. In view of these difficulties, as a result of mutual agreement, Maxim divorced the activities of the League and the club, reimbursing the club from his own pocket for expenditures beyond the original appropriation, the appropriation itself being repaid later. At the February 15th meeting, Maxim and Tuska resigned as members of the club, and David L. Moore resigned as president. From that time on, the two organizations went their respective ways and each fulfilled the purposes for which it was intended. The League was incorporated under the laws of the State of Connecticut, to give it legal status.

Now entirely on its own, the League had to give careful consideration to the question of finances. Selling a 40-page booklet, 8 maps and 50 message blanks for 50 cents left little margin of profit. It was decided to assess each member 50 cents a year for "station dues." This was not a compulsory charge; members could contribute or not, as they wished. There was, however, a gentle hint that non-paid-up members would be so listed in succeeding issues of the call-book.

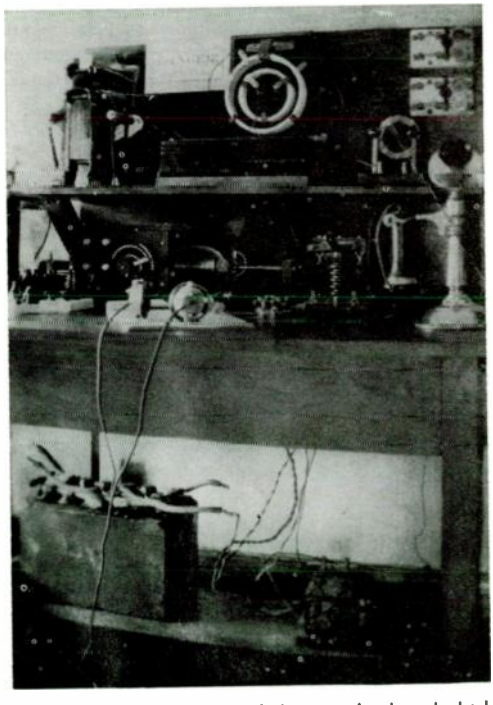
The membership grew steadily. A few stations were deleted from the relay station list for inactivity, for operating standards were kept very high, but the increase more than offset the deletions. In March, the second edition of the List of Stations *was issued. Six hundred members were listed, an increase of 50 per cent in less than six months. Equally significant was the changing character of the listings. Several one-kilowatt stations showed ranges approach-*



This collector's item is the cover of the first *List of Stations*, published by ARRL in 1914

ing one thousand miles. Operating speeds were increasing. The increased proficiency developed by the additional operating practice and the advantages of organization were manifest.

Indeed, by the end of 1915 amateur stations were accomplishing what were in those days unbelievable feats in transmission and reception. With homemade equipment, often not exceeding a hundred dollars in total cost, and in the despised 200-meter region, they were frequently out-performing government and commercial plants representing investments of thousands of dollars. True, amateurs had similarly outperformed these stations prior to 1912—but then they had not been handicapped by power and wavelength limitations. Even if these limitations were not too strictly observed, they still served as a hampering factor, and it was not until three years after the passage of the Radio Act of 1912 that amateurs again achieved superiority in performance. The reason for this regained superiority obviously lay in the improved internal organization, which lent added facilities for increasing both technical and operating ability.

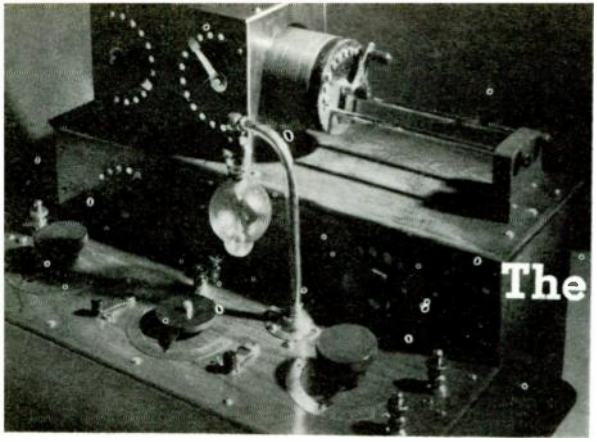


A typical amateur station of those early days looked something like this.

Meanwhile, through radio contacts and correspondence, the building up of the relay routes for which the League had been formed was going on. Considerable success was had, but the difficulty of adequate organization contact, especially with distant states, seemed insurmountable. It was proving a real task to acquaint the growing membership with new plans and schedules by means of correspondence alone. It became increasingly apparent that some kind of general circular or bulletin was necessary. The League, however, had no funds; the nominal optional membership assessment was not remunerative; there was no profit in publications which were sold at cost.

The answer, seemingly obvious but surveyed with some reluctance by Maxim and Tuska, was a self-supporting magazine. In December, 1915, each member of the League received in his mail a sixteen-page magazine called QST*—the "December Radio Relay Bulletin." This, it was announced, was being published privately at the expense of Maxim and Tuska. It was to be sold independently of the League, on a subscription basis. The subscription fee was to be $1.00 per year. The stated object of the magazine was to maintain the organization of the American Radio Relay League and to keep the amateur wireless operators of the country in constant touch with each other."*

Having now for the first time a journal devoted solely to the chronicling of its activities, amateur radio rolled up its sleeves girded for accomplishment. The accomplishment was to come, and other things as well.



ARRL The Early Years

How was it to operate an amateur station in 1914? There were few rules, broad spark signals, limited range — but a world of enthusiasm. Once the first crude receiving equipment showed some response, it was quite an occasion to call in the family to hear the new scientific wonder. Equipment was hard to come by, and putting a transmitter together for the first two-, ten-, then thirty-mile contact was a signal accomplishment. But we amateurs were masters of a new art, explorers in a new realm of communications. There was a challenge, as today, to find and work new stations, and the aim was success in contacts just beyond the very limited local horizons.

Until the formation of the League, early amateur operating appears to have been largely without direction. There was some ragchewing, some experimentation, some sending of messages, the inevitable search for DX. But there was no unity of purpose, no useful organization of amateurs beyond the horizons of the local radio club.

At the urging of Hiram Percy Maxim, 1WH, the Radio Club of Hartford voted at its April 6, 1914 meeting to create a "relay committee," the members to be named by the club president, David L. Moore, 1WK. Though the minutes are not specific, this committee likely consisted of Maxim, Clarence D. Tuska, 1WD, William W. Howe, "SNK," and Moore, with R. C. Palmer," "HKW," being added later. Maxim's concept was that of a national association of competent amateur operators, joined together to relay messages beyond individual station range. Accordingly, the original name suggested, "The American Amateur Radio League," was passed over and "The American Radio Relay League" was adopted. The committee set right to work, and at the club meeting of May 18, 1914,[1] passed around application forms for membership in the new organization. These forms were also sent to every amateur in the country of which the committee could obtain knowledge. Response was overwhelming. By August there were two hundred members from all sections of the country, and by October, four hundred.

ARRL was thus born on the relay principle. By August 1914, the earliest successful relay routes were formed — Hartford to Buffalo, and Boston to Denver. Soon they covered much of the eastern United States. The success of these relay routes was in no small measure due to the availability of a special 425-meter wavelength secured from the Department of Commerce by Mr. Maxim on behalf of the League with its use granted under special authority to selected amateur stations. Applications were screened by the League; if the applicant had good apparatus and operating techniques, and appeared to be an asset to the relay system, his request was endorsed and forwarded to the Department.

ARRL Goes Independent

As has been reported, the League and the Hartford club came to a parting of the ways in January 1915, in a dispute pinned to expenditures of funds by the League — but perhaps due more to the fact that the tail was now starting to wag the dog. At the February 1, 1915, meeting of the club, Maxim and Tuska resigned their memberships, and Moore resigned as club president; Maxim announced that he had removed the League from all influence of the Club.

And indeed, he had. On January 29, 1915, the Connecticut Secretary of State recorded the incorporation of the League under the following three articles:

"*Article 1.* The name of said corporation shall be The American Radio Relay League Incorporated.

"*Article 2.* The purposes for which said corporation is formed are the following, to wit: The promotion of amateur radio telegraphy, the organization of amateur radio telegraph stations, the promotion and regulation of amateur radio inter-communication, and of the relaying of messages from station to station, and the printing and publishing of docu-

Portions of this story, in contrasting type, are from "*Two Hundred Meters and Down*" by Clinton B. DeSoto.

[1] This date is considered the official birth date of ARRL.

ments, books and pamphlets necessary or incidental to any of the above purposes.

"*Article 3.* The said corporation is located in the town of Hartford and State of Connecticut."

Incorporators were Maxim, Tuska and an attorney, Lawrence A. Howard.

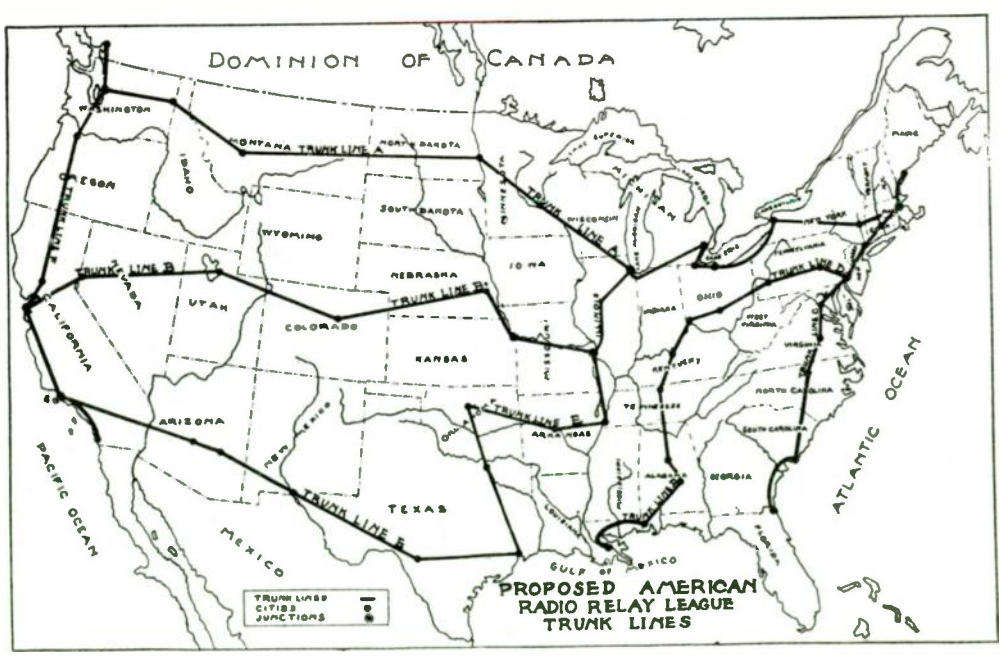
Early records are sketchy, to say the least, but it appears that the original committee, with the addition of Howard, formed a self-perpetuating Board of Directors which managed the League until the adoption of a formal constitution in 1917. True, there was a bulletin to members in early 1915 which proposed the formation of a board of control with one to four representatives from each state (depending on the number of members in each); but no evidence can now be found that this plan ever developed, and later references to decisions of the League always mentioned the "directors at Hartford."

Threats of War

War had begun in Europe in 1914, and the threat of its spreading to the U.S. soon took definite form. Hiram Percy Maxim in late 1915 addressed letters to the Secretaries of War and Navy offering the services of ARRL and its members in the event of emergency. Charles Apgar, 2MN, with an ingenious hookup from his receiving apparatus to a wax cylinder recording device, gathered evidence sufficient to cause our government to shut down the German Telefunken radio station WSL, on Long Island, for violation of the neutrality code. His accomplishment was described as "the most valuable service ever rendered by a radio operator to this country." The League contemplated formation of a Volunteer Radio Corps, along the lines of the ambulance corps in Europe. A modified version, grandly called the

This was the Hartford home of Clarence Tuska in 1914–1915, and it was in the attic of this house that ARRL paperwork was handled and the first issues of *QST* were put together.

ARRL Department of Defense, was adopted in February 1917 (thus anticipating by 30 years our present RACES system). An early forerunner of the Armed Forces Day test occurred in October, 1916, at the instigation of the League. This test was designed to prove to the military, particularly the Navy, that amateurs were capable of good relay work on short notice. The established relay routes proved their mettle; while far from perfect, the tests sufficiently impressed the Navy that a Naval Radio Reserve was announced in April, 1917, with amateurs given special ratings depending on their class of license.




AMERICAN RADIO RELAY LEAGUE

RECEIVED at

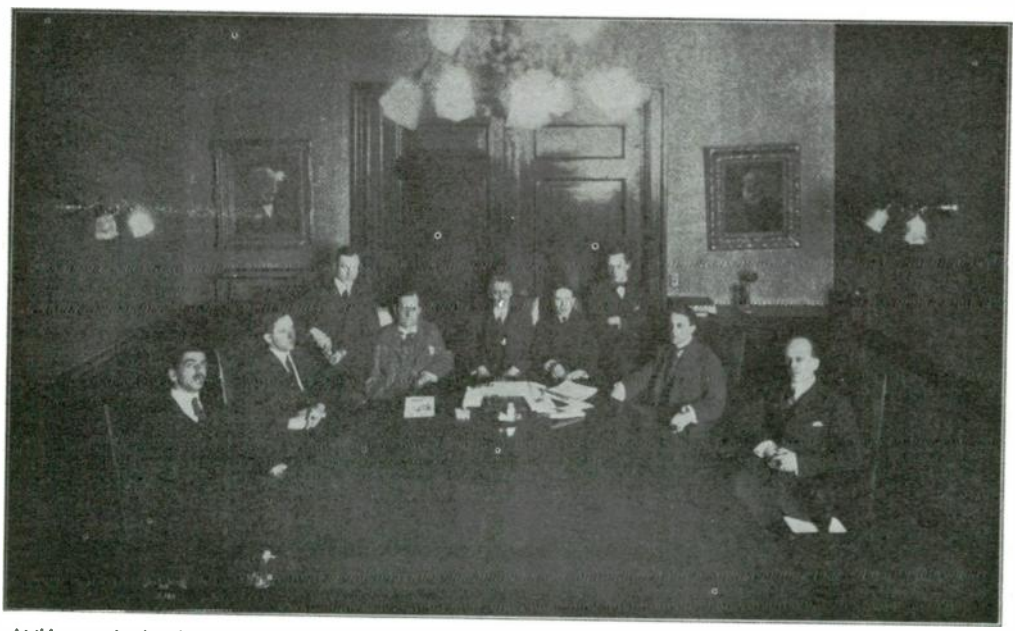
Early ARRL message blanks were designed for pencil copy.

QST first appeared in December, 1915, a private publishing venture by Maxim and Tuska, although it in effect became the voice of the League. It had an immediate beneficial effect: membership jumped sharply, from 635 on December 1 to 961 on January 10, 1916. It also served, more effectively than before, to inform members — and posterity — of what the League was doing.

Trunk Lines

H. P. Maxim had come to two conclusions: first, that the time was ripe for the organization of six trunk lines, to cover the entire United States, three horizontally and three vertically across the map; second, that regular tests in the form of drills should be performed by the stations on these trunk lines to keep them in training. He outlined his plan in the February, 1916, issue of QST. *The practicality of these ideas was evidenced by the success of the first country-wide relay, on Washington's birthday anniversary in 1916.*

On December 31, 1915, Wm. H. Kirwan, 9XE, had originated an emergency QST (general) message with the idea of covering the United States with it in the shortest possible time. The success of this experiment led to the planning and announcement of a gigantic test to be held on Washington's birthday, February 22nd. Under the plan, a message was to be originated by Colonel W. P. Nicholson of the Rock Island, Ill., Arsenal, addressed to the governors of every state in the Union and President Wilson. Selected transmitting stations were appointed all over the country. The cooperation of the ARRL, the National Amateur Wireless Association, and the Radio League of America was secured. When the results were tabulated, it was found that the message—"A democracy requires that a people who govern and educate themselves should be so armed and disciplined that they can protect themselves . . . Colonel Nicholson" —had been delivered in 34 states and the District of Columbia. The Pacific Coast got the message fifty-five minutes after it started at 9XE; the Atlantic Coast, sixty minutes after; New Orleans and Canada each had it in twenty minutes. The success of this test, although not 100 per cent, created wild enthusiasm and led to the prediction in QST



At this organizational meeting of ARRL in 1917 there were present (l. to r.) C. D. Tuska, Secretary; H. L. Stanley; Victor F. Camp; T. E. Gaty; Hiram Percy Maxim, President; A. A. Hebert, Vice-President; C. R. Runyon, Jr., Treasurer; Miller R. Hutchison; and J. O. Smith. Unable to be present for this photo were Directors R. H. G. Mathews, J. C. Cooper, Jr., F. M. Corlett, W. H. Smith, H. C. Seefred, W. T. Fraser, and W. T. Gravely.

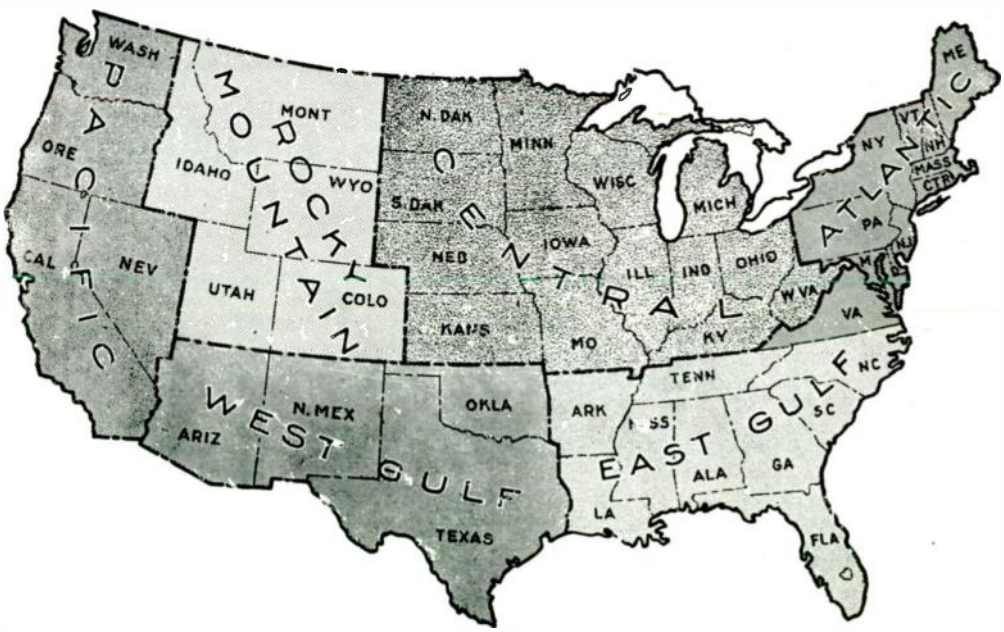
that a transcontinental message would eventually be sent with but two intermediate relays.

In 1916, too, the government began cracking down hard on violations of the radio law, primarily operation without a license. Maxim was called in one such case to testify as an expert witness for the government. In another case, a 16-year-old was arrested for transmitting false SOS signals, and another 17-year-old for interfering with Army communications. (For a time, no amateur licenses were issued or renewed in Texas south of Austin, because of general amateur behavior in respect to War Department stations.) These cases probably helped get the "big boys," those using transformers and spark gaps, in line, but perhaps the most serious problem to amateurs was the QRM from hundreds of "little boys with spark coils," most of whom had no licenses. Several forms of action were tried or suggested. One proposed that the special license stations could report offenders to the Department of Commerce. Another proposed the appointing of Deputy Inspectors, volunteers, from among the better amateur operators. The most practical solution was to get the spark-coil set into the local radio club, and then arrive at a time-sharing arrangement whereby no local work such as ragchewing and testing, was done between 9 P.M. and 7 A.M., so that the serious traffic-handling amateurs could go about their business, troubled only by their number 2 enemy, QRN. The latter was so serious in the spark days that the Central trunk lines closed down during the summer months, the first Transcontinental Relay was washed out in January 1917 because of it, and *QST* seriously asked in June 1916 whether it should suspend publication during the summer (it didn't; as a result of the question, enough subscriptions came in to keep the magazine going). In August 1916, *QST* ran an article, "Summer Working" by S. Kruse, later Technical Editor of *QST*, to encourage some kind of activity during those months.

In March, 1916, ARRL Trunk Line Managers for four of the six routes contemplated under the original Maxim plan were appointed. . . . Test messages were to be sent each Monday night; the objective of each trunkline manager was to see how far these messages could be relayed on each successive drill. . . . By the end of the year more than one hundred and fifty cities were linked by these main trunk lines, with branch lines completing national coverage.

Almost the entire interest of amateur radio at this period seems to have been in the development and improvement of operating practices and technique. Technical interest had fallen largely by the wayside, insofar as the typical amateur was concerned. There were routine arguments about the relative efficacy of high and low spark tones, and some discussion about the proper circuits and operating voltages to be used with audions, but the pervading spirit was one of complete complacency with regard to the technical status of the art.

Everything had a fixed relationship to



A. R. R. L. DIVISIONS

In the early years of ARRL there were six divisions, and the first Division Managers were: Atlantic, J. O. Smith; East Gulf, J. C. Cooper, Jr.; Central, R. H. G. Mathews; West Gulf, Frank M. Corlett; Rocky Mountain, W. H. Smith; and Pacific, H. C. Seefred.

everything else. The small ½-inch spark coil would work five miles. The ¼-kilowatt spark set would work three or four hundred. The advanced amateur would put in a 1-kilowatt transformer, a rotary gap, the highest antenna with the largest number of wires his facilities would permit, a galena or silicon crystal detector (or an audion, or one of E. T. Cunningham's new Audiotrons, regenerative, perhaps, if he were extremely fortunate and wealthy) with a loose coupler, and he did not doubt that he had achieved the ultimate. There was nothing more for him to try for, except to improve his operating proficiency, the number of his contacts, and the number of messages he handled.

The change in the character of amateur radio from the group of eager electrical experimenters of ten years before could not have been more complete. It was not until the war had crumbled all the solid earth from under everyone's feet that this condition ceased to prevail.

This great body of organized hobbyists swept into the year 1917 bent on accomplishing one long-hoped-for objective—the first transcontinental relay. They were all the more hopeful because of two new tools that had been released for their use—complete audion regenerative receivers for amateurs, developed by two different manufacturers, which offered sufficiently increased sensitivity and range to make an actual transcontinental relay feasible.

The first attempt, on January 4, 1917, was broken up by static. But on January 27th the great feat was finally accomplished. . . .

But this accomplishment was quickly overshadowed by a greater one. On February 6th a message was started from the East Coast, relayed to the West Coast, and an answer received in the record time of one hour and twenty minutes! . . . QST dared to predict that the time might be cut to twenty minutes before the summer weather began, for, after all, the relay nets of the country were now so thoroughly organized that there were three possible routes for a transcontinental message.

The month of February 1917 is of historic importance in amateur radio because during it was begun the change which was that year brought about in the governing structure of the ARRL. For nearly three years, Maxim and Tuska, serving as president and secretary respectively, had been the sole officers of the League. By 1917 it had reached such size and importance that a more suitable organization was deemed advisable. Consequently, on February 28, 1917, a group of leading amateurs met at the Engineers' club in New York City to consider the problem. After a succession of meetings they had written and adopted a constitution that outlined the policies of the League, specified the machinery for the election of officers, divided the country into six divisions, elected by vote twelve ARRL directors and four officers, and declared membership open to anyone interested in radiotelegraphy or radiotelephony. . . .

From that time until March, 1919, the administrative office of the League was the business office of the new General Manager, Arthur A. Hebert, at 50 Church St., New York City; and its affairs were handled from his home in Nutley, N. J.

But Destiny again interfered with amateur radio, and it decreed that there were not to be many affairs to handle. In April, 1917, all licensed amateurs received the following letter from the office of the Chief Radio Inspector of the Department of Commerce:

"To all Radio Experimenters,

"Sirs:

"By virtue of the authority given the President of the United States by an Act of Congress, approved August 13, 1912, entitled, 'An Act to Regulate Radio Communication,' and of all other authority vested in him, and in pursuance of an order issued by the President of the United States, I hereby direct the immediate closing of all stations for radio communications, both transmitting and receiving, owned or operated by you. In order fully to carry this order into effect,

Sidelights, 1915-1917

The latest baseball scores were transmitted nightly by ham radio — QST, May 1916 . . . *The end-of-message signal, AR, is nothing but the American Morse letters FN (.—.—.), meaning "Finish", and the sign-off, SK, is simply the landline 30 (...—.—) which meant half-past the hour, and thus, the end of the operator's shift.* — July, 1917 . . . Electrical Experimenter *refused an ad on behalf of* QST, *feeling that* QST *was a competitor, and ARRL was competitive to the Radio League of America, sponsored by them.* — July, 1916 . . . *Postcard acknowledgements, forerunner of the ever-popular QSL, were suggested to be sent when amateurs hear a distant station* — June, 1916 . . . *But amateurs were slow to answer cards received, then as now* — February, 1917 . . . *An amateur worked a military airplane over distances up to 114 miles.* — September 1916 . . . *Car generators were suggested as a source of power for portable spark stations* — October, 1916 . . . *A Cuban amateur was ready to get on the air. Soon amateurs would be enjoying truly international amateur radio QSOs.* — October 1916 . . . *A tube transmitter and receiver were demonstrated to the public by amateurs at the Iowa State Fair.* — October, 1916 . . . *The Wouff Hong, the Rettysnitch and the Uggerumph, all instruments of torture to help insure good operating practices, were revealed to eager amateurs by The Old Man in his fabulous story, "Rotten QRM".* — January, 1917 . . . *A correspondent commented on how long it took amateurs to say goodbye.* — March, 1917 . . . *A League member proposed higher technical standards, harder license examinations and 12 w.p.m. instead of 5 w.p.m.* — March, 1917.

I direct that the antennae and all aerial wires be immediately lowered to the ground, and that all radio apparatus both for transmitting and receiving be disconnected from both the antennae and ground circuits and that it otherwise be rendered inoperative both for transmitting and receiving any radio messages or signals, and that it so remain until this order is revoked. Immediate compliance with this order is insisted upon and will be strictly enforced. Please report on the enclosed blank your compliance with this order: a failure to return such blanks promptly will lead to a rigid investigation.

"Lieutenant, U.S. Navy,
District Communication Superintendent."

Immediately following this crushing blow, amateur radio was called upon to defend itself from a legislative menace. The Padgett Bill, H.R. 2753, introduced in the House on April 9, 1917, proposed that all radio communications in the United States, including amateur, commercial, and extra-Naval governmental stations, were to be turned over to the Navy.

Naturally, all the radio world rose in protest. Individual amateurs generally disapproved the bill in principle, even though none of them dared say when they would actually be allowed to operate stations again. Charles H. Stewart, representing the Wireless Association of Pennsylvania and a number of other clubs, was heard in protest during the House Committee hearings. The N.A.W.A., through The Wireless Age, *fought the measure bitterly. Hiram Percy Maxim, representing the ARRL, went to Washington to confer with the sponsors of the bill, and secured an exception from its provisions for amateur stations, if and when they should be permitted to reopen. The bill was eventually killed in committee but the incident is of historical significance in that it showed that even at this early date the ARRL was accepted as the organization which represented amateur radio. Its membership total of about 4,000 was not as high as that claimed by competitive organizations, but by far the greatest percentage of licensed amateurs was enrolled among its numbers.*

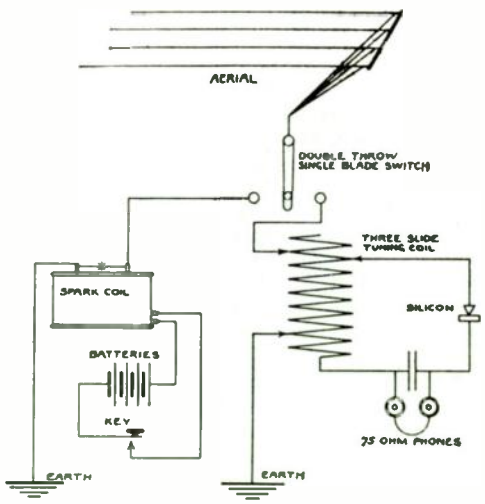
That threat over, amateur radio settled down to its next job, that of helping Uncle Sam to win the war.

Early Techniques and Equipment

In 1914 radio was in its late teens, ready for bigger things but still on the callow side. Born with Marconi's 1896 demonstrations in the British Isles, it had survived childhood maladies to become a potent force for safety at sea, favorably — although not well — known to the general public through occasional marine disasters such as the sinking of the Titanic some two years earlier.

Possibly it was the attraction of youth for youth that made wireless a young man's game in those days. Certainly a very large proportion of amateurs were little, if any, older than the art itself. Today's teen-agers, brought up with sound and television broadcasting as a home utility, have almost no way of relating the radio they know to the radio of their 50-year-earlier counterparts. What sort of equipment did they have, and what kind of results could they get with it at the time ARRL was formed?

This was a time when amateur radio was exclusively telegraphy, when the miracle of communicating over long distances without visible connection was fresh and exciting, firing the youngster of scientific tastes with the ambition to do it on his own. It was a time, too, when signals had to get through without amplification — an almost inconceivable thought today. DeForest's audion, progenitor of the vacuum tube, was not "commercial" — no two bulbs were alike — and as an amplifier was still almost a laboratory curiosity. The few amateurs who had audions used them as simple detectors, as a more-sensitive replacement for the mineral-crystal and electrolytic detectors then widely used.



This a complete station diagram? Yes, indeed, in the era when the spark coil and crystal detector were supreme. From the *Wireless Age* of June, 1914.

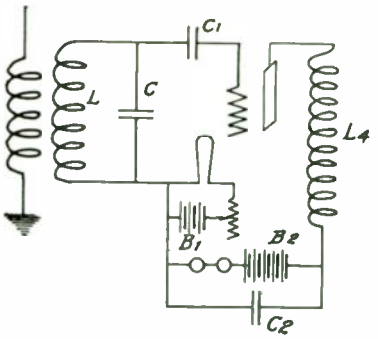


FIGURE 9

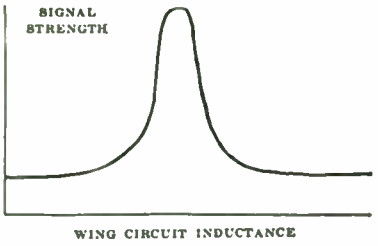


FIGURE 10

Early regenerative audion circuit and a graph showing the amplification achieved by varying the inductance in the plate circuit. This is the original "Armstrong"—tuned-plate, tuned-grid—circuit, taken from the first published paper on regenerative reception (*Proc. I.R.E.*, September, 1915).

Station Equipment

Most receiving equipment had just four major components — a "slide tuner" or, more elaborately, a "loose coupler", a crystal detector, usually galena, silicon or carborundum, a "blocking condenser", and a headset. Plus an antenna or "aerial", of course, and a ground connection — receiving was hopeless without a ground. The amateur of that day spent a large part of his time just listening — mostly to high-power commercial stations on wavelengths above 600 meters, because this was the happy hunting ground of the DXer.

The standard aerial of the time was a "flat top", formed with two or more parallel wires supported at the ends by spreaders. The higher and longer the better; lengths up to a few hundred feet were not uncommon. Single-wire aerials, if long enough, were sometimes conceded to be good enough for receiving, but not for transmitting.

Owning a transmitter was not a prerequisite to being considered an amateur — a receiver was enough to qualify you — but if you did have one, it was a spark set. Depending on the state of your pocketbook and whether your house was wired with a.c., the heart of the transmitter was either an induction coil or transformer. The transformer was the heftier job, and it would work with a rotary spark gap, the type used in the better transmitting stations. The "flivver coil", product of Mr. Ford's factory, was a favorite in the less-affluent circles; it and other induction coils were used with a "straight" or "fixed" gap, where the spark simply jumped between two electrodes of adjustable spacing. The coil, gap, and antenna-ground were enough to get you on the air, but a better signal could be turned out by using a condenser to store up electrical energy between sparks, thus giving each one more punch. As a last refinement, the condenser could be tuned and inductively coupled to the antenna circuit, theoretically putting all of the energy on one wavelength.

DX?

This was the typical station equipment of 1914. With skill, it could be made to reach out on 200 meters, over distances that, for the most part, would cause a present-day v.h.f. Novice with a "gooney-box" to turn up his nose. Although a handful of amateur stations had been heard at ranges up to a few hundred miles, such stations were exceptional indeed. On the average, a kilowatt was good for 20 or 30 miles and most spark-coil operators were glad to be able to reach their pals a couple of city blocks away. A pitiful communication picture by modern standards? Maybe so, but it held all the kicks we get out of our super-sophisticated equipment today. Merely having your signal heard at all was a tremendous satisfaction; distance could come later.

And come it did — almost overnight. Within two years, communication between amateur stations over distances of hundreds of miles was commonplace. By April, 1917, when our entrance into the World War abruptly ended all activity, amateur signals had been heard by ships far out in the Atlantic and the Gulf, and at least one East-Coast station had been heard in California. All this with what, essentially, were the same transmitters — refined somewhat, as technical knowledge among amateurs increased, but still sparks, nominally limited to 200 meters and a kilowatt transformer input.

Such startingly rapid development had to have a more-than-ordinary reason.

Regeneration

That reason was the regenerative audion circuit, certainly the biggest step forward in increasing receiver sensitivity and selectivity up to that time. It is doubtful, in fact, that any receiver development even in subsequent years did, or could, bring about such a revolution in amateur communications.

Consider the status of things before regeneration. With no amplification, the signal heard in

the headset had to come *directly from energy received from the transmitting* station — energy that was microscopic at amateur wavelengths and with amateur power limitations. The signals were broad; spark was essentially a pulse transmission and covered lots of spectrum. With only the selectivity afforded by one or two coupled tuned circuits in the receiver, it was impossible to hear a weaker signal through a strong one, so if a "local" was on the air, you either listened to him or quit.

The regenerative receiver was the almost-incredibly effective answer to the problems of sensitivity and selectivity, by the standards of those days. It was the invention of an amateur, Edwin H. Armstrong, in his undergraduate days at Columbia University. Under development in 1913, it did not reach amateur circles until its public disclosure through the Radio Club of America and the Institute of Radio Engineers in early 1915. A year later there were at least two commercially manufactured regenerative tuners on the market, and innumerable homebuilt versions of the circuit. Combined with gradual improvements in the audion, receiving had reached a peak of effectiveness, for the frequencies and types of signals then in use, that could hardly be exceeded by the equipment we have today. Regeneration continued to be the principal ingredient of amateur reception for at least the following two decades, and has not been discarded even now. What else, for example, is a *Q* multiplier than a regenerative amplifier?

The alacrity of the amateur to adopt new and useful techniques brought him achievements that put to shame most of the commercial and government communication of the era. The same eager interest developed operating skills that were unmatched by the run-of-mill non-amateur commercial operator. The tradition established then has continued undiminished.

What of tube transmitters in those pre-World-War-I days? By 1917 there were some experimental transmitters on the air, and some attempts at radiotelephony. But tubes and equipment, as well as knowledge, were lacking. Spark had not yet felt the challenge of c.w. Wartime developments, during the close-down, solved some of the problems, but amateurs had to wait until 1919 to begin getting acquainted with the vacuum-tube transmitter. That story will be recounted in a subsequent issue.

The secondary coil proper is built in a similar manner but wound with twenty-five turns of No. 26. No taps are taken off and the terminals are connected to two flexible conductors to allow for the coupling which moves on arm E. A wooden disc is fitted into the end of the secondary on which arm E is fastened.

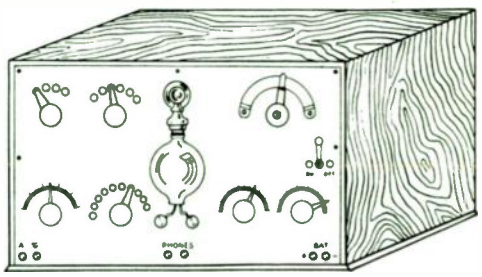


Figure 1

The secondary loading coil F, Fig 2, is placed at right angles to the secondary and primary to avoid undesirable inductive effects. Its size is 4 inches in diameter, 6 inches long, wound with 100 turns of No. 26 double cotton covered wire. Taps are taken out from every ten turns, giving a total of ten taps, the first turn being connected to the secondary proper as shown in the wiring diagram, Fig. 4. A connection is made between the last tap and the switch which acts as a reducer for the dead-end effect since it short-wave circuits the unused turns. One variable condenser is used to get the regenerative effect and this may be any of the small condensers

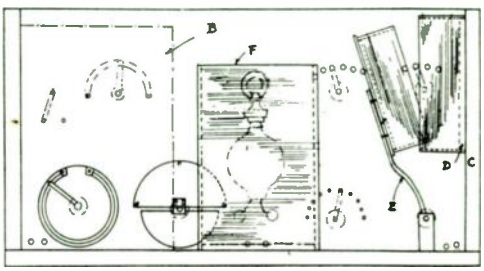


Figure 2

The "QST Regenerative Receiver", copied by hundreds of amateurs of the day, did much to establish QST's reputation as a magazine for the radio enthusiast. It was written up in the December, 1916, issue.

Early Manufactured Gear

A REASONABLY accurate picture of the availability and development of wireless components for amateur receiving and transmitting is given by the advertisements in *QST*. Let's go way back, back to the first issue, December 1915.

At that time equipment that we now call receivers and transmitters did not exist. A few companies mounted pieces of apparatus on a mahogany board to make a wireless station, but nearly always these pieces were sold separately. In this first *QST* the ads were on rotary spark gaps, head sets, crystal detectors, tuners and the Multi-Audi-Phone which came in a black box with admonitions not to break the seal, and looked for a while as if it might rival the audion. (And what was an audion? De Forest's name for the first vacuum tube.) It is interesting to note that early ads on loose couplers and other receiving apparatus stressed ability to hear commercial stations. "I copied KPH press at a distance of 2100 miles". "Receive POZ, KET, OUI, NAA . . ."

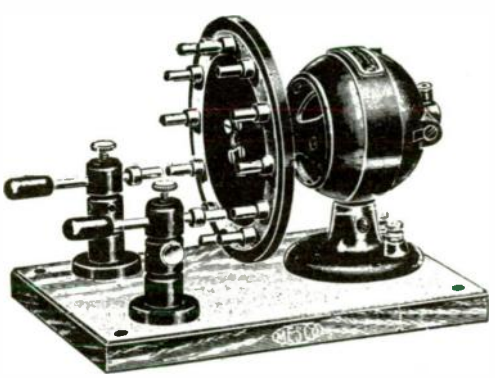
During 1916 and during 1917 through September, the last issue of *QST* before World War I, the same kind of apparatus was shown in the ads, but with vacuum tube advertising substantially increasing. *QST* for February 1916 carried the announcement of a new detector,

the Crystaloi, which the inventor hoped would compete successfully with the audion. DeForest Telephone and Telegraph Company advertised the audion for the first time in March. The March 1916 issue also carried a full page ad for the Wm. B. Duck Company of Toledo, a pioneer wireless mail order firm. Duck's catalog with its pictures and descriptions of shiny, commercially built apparatus was the ultimate. We'd read the pages over and over until some of the copy was learned by heart, dreaming of a miracle that would bring us an Arlington loose coupler or a Boston key with a genuine Italian marble base.

In April 1916, DeForest brought out the Tubular Audion and the Ultraudion "for damped and undamped waves" in June. The Audiotron was advertised in April. Thermo Tron made a bid for its share of the new tube business in July. The Oscilaudion was announced in August. The Audio Tron people reappeared as Pacific Research Labs with The Electron Relay in the same month and in September with the Moorhead tube. In December 1916 Multi-Audi-Fone with new spelling of its name went along with the tide and offered a receiver with audion and amplifier; the amplifier probably used the com-

pany's old device, still sealed.

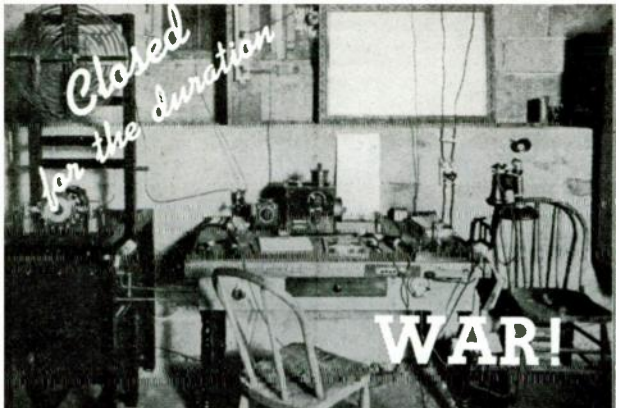
In September the first ad on a short wave regenerative receiver appeared: Grebe. The same unit, evidently, was advertised consistently under both the Grebe and Mesco names. October carried the first ad on the Paragon RA-6, the



famous "amplifying" (regenerative) receiver responsible for Godley's later name of Paragon Paul. Although "receiver" was the word in use, "tuner" would have been a more accurate term. No one offered all the parts in one box. The detector was a separate instrument and so were the tuning condensers. Power for the vacuum tube was from batteries.

The first machine advertised for teaching code at home, the Omnigraph, appeared in *QST* for October 1916. It was used by the Federal Radio Commission — and how we trembled and nearly dropped the pencil when the Radio Inspector wound it up and adjusted the governor for the code test. And the cost of a full page ad in *QST* before World War I? Twenty dollars!

Some of the names as familiar to the hams — wireless operators — of 45 years ago as your favorite manufacturer is to you now:
Loose couplers and tuners: Mignon, A. H. Grebe, Adams-Morgan, Chambers, Clapp-Eastham.
Head sets: Brandes, Murdock, Holtzer-Cabot.
Rotary spark gaps: Klitzen, Mesco, Cos-Radio.
Stores included Bunnell and Mesco in New York City, Radio Distributing in Lombard, Illinois. The Southern Carlifornia Electric Company in Los Angeles advertised "Wireless Expert In Charge".



ARRL Amateurs Serve Their Country

WHEN *the United States went into the War, the military forces were faced with an absolute lack of the great corps of radio officers, instructors, and operators that was needed. That need was great, and it was urgent. There was no time to train men. Probably no more fortuitous circumstance has ever occurred in history than the fact that at the time these thousands of trained radio men were so badly needed, there were over six thousand amateurs in this country who had been training themselves for periods as long as fifteen years in just the sort of activity for which they were required.*

Washington contacted New York. A naval officer at the New York Navy Yard called H. P. Maxim in Hartford and asked him to call at his earliest convenience. Together with General Manager Hebert, he went to the Navy Yard the next day. The officer, Lieutenant McCandlish, explained the situation. Five hundred operators were needed, at once, desperately. Could the League supply them? More than that, there was not sufficient radio equipment available. Could the apparatus of the better amateur stations be converted to military use?

Ten days were allowed. A last broadcast went out over those stations which had not yet been dismantled under the executive order. There was just time; in the next day or two, federal officials placed a government seal on all amateur apparatus. But Destiny again played its part, and within the allotted ten days the Navy had its operators.

The second call was for two thousand volunteers. These were recruited with almost equal dispatch. It is estimated that before the war was over more than a thousand additional amateurs followed in the footsteps of those first volunteers. While the records have never been fully tabulated, it is generally believed that between 3500 and 4000 amateurs saw military service during the period of the war.

This portion of the story is excerpted from *Two Hundred Meters and Down*, by Clinton B. DeSoto.

The Importance of Amateurs

There can be no question of the importance of the part the radio amateur played in the winning of the war. The superiority of Allied, and particularly American, communications was the deciding factor in many moments of close struggle during the fighting on all fronts. The reason for this superiority is well described by Lieutenant Clarence D. Tuska, then secretary of the ARRL, who discontinued publication of QST with the September, 1917, issue, and volunteered. His standing as an amateur caused the military authorities to place him in charge of the organization of radio training in the Air Service with an officer's commission, without an hour's preliminary instruction. Concerning his experiences in training wartime radio operators at Camp McClellan, he has said:

> *The amateurs have come across in the case of the Army. . . . I have turned out a whole lot of operators for the Air Service and have become pretty well acquainted with the type of human it takes to make a first-class radio operator. . . . The very first sort of a student we looked for is an ex-amateur. He seems to have had all the experience and all we have to do is acquaint him with a few special facts and he is ready for his Army job. If we can't get an amateur or a commercial radio operator, then we try to convert a Morse (wire) operator, but it's a pretty hard job. After the Morse man, we take electrical engineers, and from them on, but a man without previous experience is almost hopeless as far as my experience has shown. Of course we can make an operator of him in fifteen or sixteen weeks; whereas, the other way an amateur is fitted in as few as one hundred hours. They've surely done their bit and I am mighty proud I was one.*

At the conclusion of the war, the Secretary of Commerce said:

> *The officers in charge of the wireless operations of our armies in France commend highly the skill, ingenuity and versatility of the licensed amateur radio operators who volunteered in large numbers for military service and served in dangerous and responsible positions.*

The experience of Tuska was not unique. Dozens of the more competent amateurs were taken directly from private life and given commissions on the strength of their amateur proficiency.

Captain (later Major) Edwin H. Armstrong, famous inventor of the Armstrong regenerative circuit which was used by every belligerent in the war, president of the Radio Club of America, was placed in charge of the Signal Corps' Radio Laboratory at Paris, France. There he invented the superheterodyne receiver, now the almost-universal circuit for radio reception.

Altogether, the records show at least fifty amateurs who were placed in positions of responsibility directly as a result of their amateur experience. They formed the nucleus of and largely developed the most efficient wireless signal corps possessed by any of the combatant nations. Self-trained and self-organized, they played a heroically important part in the winning of the war.

Eventually, after one year and seven months, it was all over. November 11, 1918 — Armistice . . . peace. But not for amateur radio.

The Wouff Hong,[1] one of three instruments of torture mentioned by The Old Man in January, 1917, finally showed up in physical form at Headquarters, in time to appear in the first postwar issue of QST, June, 1919. Around it sprang up the Royal Order of the Wouff Hong, honorary "inner circle" of the League, which still conducts its mystical initiations, during League conventions, when the clock strikes midnight.

THE IMPORTANCE OF OUR ARRL

. . . There is no such thing as organization if each one of us starts out to be thoroughly selfish. If all our efforts are to be directed solely for the benefit of self, we are purely individual and able to take about as much form as the individual sands of the sea. We are an incoherent, uncontrolled crowd. On the other hand, if just a little of our efforts is devoted to the common cause, we automatically establish organization and efficiency and protection, and everything else that is elevating, improving and worth the having. . . . When an amateur asks that old-time question, "What do I get out of joining the ARRL?" the answer should be, "Protection." He cannot have it unless somebody joins an organization and does the work. Unless he joins and does his bit, he must not complain when his fellows place him in the list of unenviables who are not willing to do any work themselves. . . .

— Hiram Percy Maxim,
in *QST* for November, 1919.

Regulatory Problems

Concurrently with the signing of the Armistice, Representative Alexander of Missouri, author of numerous prewar radio bills, introduced what was the strongest attempt made up to that time to give the Secretary of the Navy control of all radio in the United States. Hearings were held by the House Committee on Merchant Marine and Fisheries. Amateur radio rushed into the fray. At a meeting at the Engineers' Club in New York City on November 30, 1918, the old Board of Direction of the ARRL authorized Hiram Percy Maxim to attend the hearing on these bills, H.R. 13159 and S.5038. This he did, presenting a detailed and highly effective brief in opposition. A number of local clubs had representatives in attendance as well — Charles H. Stewart, representing the Wireless Association of Pennsylvania and others; Francis Hamilton, of the Hoosier Radio Club; Mr. Densham, of the South Jersey Radio Association; the Baltimore Radio Association; and thirteen-year-old

[1] More complete explanations of the Wouff Hong may be found in the following issues of *QST*, on page 9 in each case: May, 1953; June, 1955; February, 1961.


No.
SERIES A
Certificate of Indebtedness
The American Radio Relay League, Inc.
The American Radio Relay League, Inc.

The money to buy QST from "The QST Publishing Co., Inc." was raised by loans from members, secured by ARRL Bonds. The bonds were issued in any amount from $1 to $200, and were for a one-year period, renewable at ARRL option for another year, and interest was paid at 5%. One hundred seventy-six staunch Leaguemen laid out an average of $17 each, raising $3000. (Four of the bonds went to the Chapman Printing Company, presumably postponing the payment of QST printing costs; these four totaled $1,000.) Incidentally, 10 of the bonds, worth $110, never were redeemed; a couple of these were lost but the other holders apparently valued the bond higher as a memento than they valued it as a cash reserve.

Joseph Heinrich of Washington, who made a fervent plea for the defeat of the bill.

Meanwhile, inspired by a "blue card" appeal sent by the ARRL to "Any member of the family of:" every amateur licensed at the outset of the war, pleading for assistance in this time of emergency, thousands of letters of protest from voters reached congressional sanctums. Where amateurs themselves were still in the service, members of their families wrote letters in their behalf. Many a shaky plea came from mothers whose sons had been killed in the war, asking for other mothers' sons the preservation of that which theirs could never more enjoy. It was the most effective gesture amateur radio had ever undertaken, and a powerful example of the united strength that could be brought to bear by courageous, concerted leadership. Simultaneously, Representatives Greene and Edmonds lent their vocal support on the floor and in the locker rooms; their opposition to military control of radio was staunch. The net result of all this effort was that the bill was not even reported out of committee.

The Board Meets

In February, 1919, the ARRL Board met again and listened to a report by General Manager Hebert on the affairs of the League, which had been held in abeyance since the last prewar meeting, April 21, 1917. This report stated that all memberships had lapsed, and that there was but $33 in the treasury. It ended by recommending that, if the League were reorganized, a paid secretary be employed, and that QST should be purchased and operated by the League.

On the first of March the Board again met, and voted to reorganize the League. It also voted to purchase QST from its owner, Clarence D. Tuska. Since the purchase price of QST, including several months' unpaid printing bills, was about $4700, and the League had only $33 in the treasury, the actual method of purchase seemed a bit obscure. A committee was appointed to devise a financing plan, and the Board adjourned until March 29th. The first action taken at this meeting was to draw up a new constitution. A new slate of officers was then elected, including Hiram Percy Maxim, President; R. H. G. Mathews, Vice-President; C. R. Runyon, Jr., Treasurer; Clarence D. Tuska, Secretary; and J. O. Smith, Traffic Manager. The last-named office was a new one created under the new constitution.

It was immediately decided to advise as many former League members as could be reached of the reorganization plans. Orders were given to the Secretary to print up a miniature four-page issue of QST and send it out. To defray the cost of publication, approximately a hundred dollars, the eleven men present — Victor Camp, H. L. Stanley, J. O. Smith, W. F. Browne, A. A. Hebert, K. B. Warner, R. H. G. Mathews, C. D. Tuska, H. P. Maxim, A. F. Clough, and H. E. Nichols — dug down into their pockets and in a few minutes had made up the fund.

When they met again, on the 16th, applications were beginning to come in. It was voted to resume regular publication of QST, and Lieutenant Kenneth B. Warner, formerly 9JT of Cairo, Ill., was elected the paid Secretary of the League, replacing C. D. Tuska, who stated that he would be rendered ineligible by reason of commercial connections, since he was entering the radio manufacturing business.

Meanwhile the amateurs of the country, mostly now released from the service, were straining at the leash, fretting at the five months of enforced inactivity following the Armistice. On April 12, 1919, the Navy Department, in whose hands had been placed the control of all radio communication for the duration of the war emergency, announced

that, effective that day, the ban on amateur receiving would be lifted; but that the restrictions on transmitting would continue in force until the President officially announced that a state of peace existed.

The instant this announcement was made public, thousands of amateurs throughout the nation rushed frantically up to long-deserted attics or down to musty basements where the old apparatus lay, intact under its seals, in cobwebby, dust-covered decay. Hastily it was brushed off; tenderly idolatrous fingers carried the individual units to old resting places; tremblingly, bell wire was stripped of its insulation and connections wired in place. The towering antenna of old, dismantled in 1917, was mourned for a bit, in silence; and then work started on a new network of wiring, to be strung gingerly aloft from tree or roof or mast. Hungering, codesick ears, sad in the nostalgia of two long weary silent years, absorbed in ecstatic reunion the roaring threnody of the commercial and government stations.

ARRL Bonds

There was still other work to be done, however. In early May the ARRL Board again met to consider the plan proposed by the finance committee. Briefly, this plan was to borrow $7500 from former League members, issuing in return certificates of indebtedness payable in two years with interest at 5 per cent per annum. The proposal was approved. The purchase of QST was consummated. Secretary Warner was instructed to lay plans immediately for the first issue of the magazine.

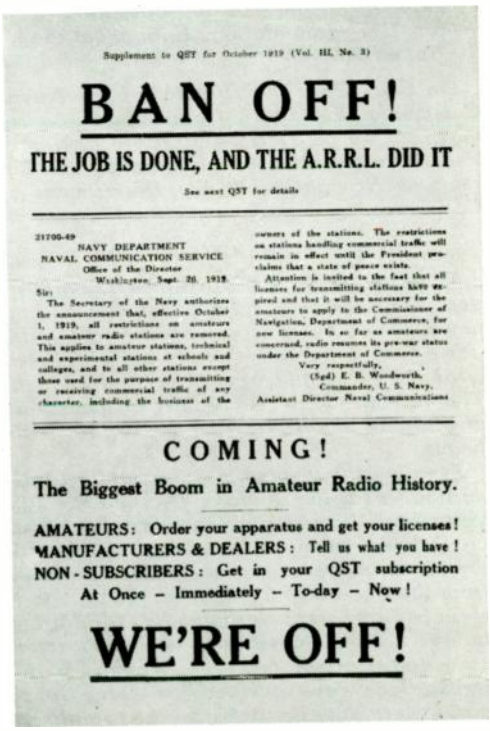
Before the month ended, the first postwar issue of QST — dated June, 1919 — was out, printed with money loaned for the purpose by the printer himself, and the ARRL bond issue was advertised to the members. It was stated that, if the League were to continue, $7500 must be subscribed by the membership. No security could be offered; the League had no assets. Yet there was hardly a man of all the old members of the League who did not do his bit, some with five dollars, some with five hundred, but all in the same true amateur spirit. The bond issue was almost completely subscribed, and the League went on.

Amateur radio without the right to transmit was a sorry body at best. Amateurs fumed, swore, and turned to the building of long-wave receivers for diversion. The Great Lakes Naval Station started the transmission of drill messages, in both coded and plain language, for reception by amateurs. But waiting grew increasingly irksome. The pages of QST were filled with discussions of the fascinating new possibility of vacuum-tube, or continuous-wave, transmission, an outgrowth of war experience. The Thordarson Company was offering a prize to the first ARRL member to transmit 1500 miles on spark.

It was patently the ARRL's first and most important job to get the ban on transmitting lifted. Months had passed since the termination of hostilities but transmitting was still prohibited. The League sent protests, appeals and entreaties to Washington, but month dragged after weary month with no results.

Instead, on July 24th, there appeared another threat. Secretary of the Navy Daniels wrote a long letter to the President of the Senate urging legislation which would give the Department a monopoly of all oceanic and international radio. The Navy still had not given up. As a result the Poindexter Bill, S.4038, was introduced. Concurrently, the Navy attempted to secure the adoption by the United States government of the 1919 Radio Protocol, an attempted revision of the 1912 London Radiotelegraphic Convention. Neither of these matters referred directly to amateur radio, of course; yet their intent was, to say the least, frankly dangerous. They were eventually frustrated by the combined American radio interests.

On August 1st the reopening of amateur transmitting stations was again postponed.



Supplement to QST for October 1919 (Vol. III, No. 3)

BAN OFF!

THE JOB IS DONE, AND THE A.R.R.L. DID IT

See next QST for details

21700-49

NAVY DEPARTMENT
NAVAL COMMUNICATION SERVICE
Office of the Director
Washington, Sept. 20, 1919.

Sir:

The Secretary of the Navy authorizes the announcement that, effective October 1, 1919, all restrictions on amateurs and amateur radio stations are removed. This applies to amateur stations, technical and experimental stations at schools and colleges, and to all other stations except those used for the purpose of transmitting or receiving commercial traffic of any character, including the business of the owners of the stations. The restrictions on stations handling commercial traffic will remain in effect until the President proclaims that a state of peace exists.

Attention is invited to the fact that all licenses for transmitting stations have expired and that it will be necessary for the amateurs to apply to the Commissioner of Navigation, Department of Commerce, for new licenses. In so far as amateurs are concerned, radio resumes its pre-war status under the Department of Commerce.

Very respectfully,
(Sgd) E. B. Wordsworth,
Commander, U. S. Navy,
Assistant Director Naval Communications

COMING!

The Biggest Boom in Amateur Radio History.

AMATEURS: Order your apparatus and get your licenses!
MANUFACTURERS & DEALERS: Tell us what you have!
NON-SUBSCRIBERS: Get in your QST subscription
At Once – Immediately – To-day – Now!

WE'RE OFF!

The circular above is far from modest, but the ban on amateur transmitting was not lifted until Congress, at League request, ordered the Navy to remove the restrictions on the use and operation of amateur radio stations.

Secretary of the Navy Daniels was in Hawaii at the time; the pronouncement was made by Assistant Secretary Franklin D. Roosevelt. Interrogated by League officials and a member of Congress, Mr. Roosevelt stated that he did not know why the reopening had been postponed, but that the ban would be removed as soon as Mr. Daniels permitted, probably coincident with the proclamation of peace by the President.

It was obvious that, if there was to be action, it would have to be forced action. The Hon. Wm. S. Greene introduced a resolution, No. 291, which was referred to the House Committee on Merchant Marine and Fisheries, asking the Navy Department to explain why the transmitting ban had not been lifted. A month passed without result. Representative Greene then introduced H. J. Res. No. 217, which read,

> *"Joint Resolution, to direct the Secretary of the Navy to remove the restrictions on the use and operation of amateur radio stations throughout the United States. Resolved by the Senate and the House of Representatives of the United States of America in Congress assembled, that the Secretary of the Navy be, and he is hereby, directed to remove the restrictions now existing on the use and operation of amateur radio stations throughout the United States."*

On Sept. 26th the Director of the Naval Communication Service announced the removal of all restrictions on radio amateurs and the resumption of authority by the Bureau of Navigation of the Department of Commerce.

Ban Off!

The ban was off! A wave of wild enthusiasm swept the country! A boom such as had never before been experienced in the radio game was under way. Manufacturers were hard put to supply apparatus fast enough. The assembly and reassembly of thousands of stations in all parts of the country was begun.

Even so, the resumption of amateur transmitting was not immediate. Two and one half years had elapsed since the Navy took over control. All amateur licenses had expired. First it was necessary to secure new licenses from the Bureau of Navigation. The Department being short of clerical help, still further delays seemed inevitable. With characteristic cooperation, however, temporary authorizations were provided, on which applicants were supplied with tentative calls in rotation, that permitted temporary operation; the actual licenses followed later when the clerical work could be completed.

Before November, 1919, was over, amateur radio was back on the air.

Sidelights, 1919

K. B. Warner made a strong plea for tube transmitters in amateur radio. "Radio Utopia . . . . would be if all of us used c.w. as I can imagine no more feasible way of minimizing QRM than by having everyone's decrement approach zero." — *QST, June, 1919* . . . . The first clubs were affiliated with ARRL on December 5, 1919; these included the Milwaukee Radio Amateurs Club and the Houston Amateur Radio Club, both very much in business today — *January, 1920* . . . . Navy began nightly transmission of weather, late news and a coded message from Great Lakes NAJ at 25 w.p.m. — *August, 1919* . . . . An Honor Roll of amateurs who died during the war was proposed by the Editor; a list of eleven names was later run in the magazine — *QST. August and December, 1919* . . . . A member proposed that the "government appoint a capable operator in each small district to look after complaints and to see that no willful QRM exists in his locality." — *August, 1919* . . . . In an editorial entitled. "Reforming the Squeak Box," *QST* asks for designs of "really scientific" spark coil sets which would meet the legal decrement and wavelength regulations — *September, 1919* . . . . Canadians, off the air since August 1914, returned to the air on May 1, 1919. Any amateur within five miles of a government or commercial station or waterway was limited to a wavelength of 50 meters; within 25 miles, 100 meters; and within 75 miles, 150 meters. Power input at the transformer terminals was limited to ½ kw. — *September, 1919* . . . . A *QST* reader suggested that amateurs in the small towns could operate "an amateur press service," posting the news in a store, and forwarding the town's news, such as basketball scores, to the city papers. — *October, 1919* . . . . Delays in actual issuance of station licenses were expected upon reopening; Radio Inspectors were therefore authorized to advise applicants what call letters they would eventually receive and permit them to operate using that call. Operators had to hold unexpired commercial license, or take either first- or second-class amateur examinations; 10 w.p.m. was required and the test questions had to be answered in full ("What you fail to say, you don't know.") The second class was available by mail only if you lived at least 50 miles away from the R.I. — *November, 1919* . . . . A *QST* subscription contest was started, the winners to get their choice of gear from the *QST* advertisers. — *November, 1919.*

The Coming of C.W.

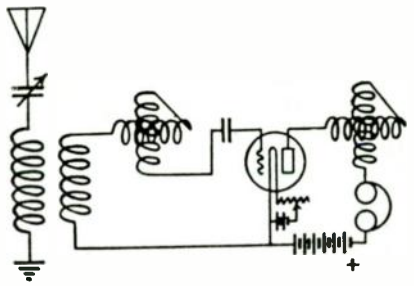
In retrospect, it seems almost incredible that the methods of communication we employ today are based on a few concepts that were established fifty years ago, during those hectic first five years of ARRL's existence — the period from the League's beginning in 1914, through the World War I close-down, and ending with the reopening in 1919.

In the intervening years there have been many advances in technology; nevertheless, our receivers use the superheterodyne principle developed by Armstrong and his associates in France during the war; our phone transmitters operate on modulation principles clearly understood before the 1920s; and single sideband, the most spectacular post-World War II development in amateur communication, not only had been described publicly in 1915 but had been the subject of considerable experimentation by the time of the 1919 reopening. Even short waves had been used by the armies during the war, although mostly in an attempt to circumvent enemy interception. But there was a long road to be traveled before all these things could become a part of everyday amateur radio.

In 1919, amateur radio — and commercial radio, too — was starting from scratch in these new fields. In the main, suitable equipment not only was unavailable, it had not yet been invented. The war had stimulated development of vacuum tubes and, in the four-prong bayonet base, had even introduced an element of standardization. By now the importance of having a good vacuum in amplifier tubes was appreciated; some of the problems of operating amplifier stages in cascade had been overcome, at least partially, and the desirability of amplification at radio frequencies, before detection, was much talked about although nobody knew how to do it effectively. Progressive amateurs were itching to get going, instinct telling them there were great things ahead. But for a while nothing much happened; amateur radio started out, after the reopening, by picking up where it had left off at the close-down.

Little else could have been done at the time. Everything hinged on the vacuum tube, and there were only a couple of types of small receiving tubes to be had. The tube picture was much confused by patent fights and replete with warnings that only this or that manufacturer's type was legally usable by amateurs. Although continuous-wave transmission was urged by all forward-looking amateurs as the solution to DX and QRM problems, there were no power tubes. Nevertheless, there were some c.w. signals on the air very shortly after the reopening, thanks to a few fortunate ones who had their "channels". Mostly these were i.c.w. (interrupted continuous wave) transmitters — what we today call tone-modulated or A2 — because the amateur of that day universally operated his regenerative receiver *below* the oscillating point, where it was most sensitive to spark signals.

But with these few exceptions, transmission immediately after the reopening was by spark. The DX records and the kind of everyday relay work that went on gives the present generation nothing to sniff at, considering the wavelength — 200 to 250 meters — and the power. Rather, it seems hard to believe, now, that such good work could be done with a method of transmission that spread its energy over so wide a spectrum. Nor can today's amateur appreciate what it meant to have one nearby station blot out *all* the spectrum available. Those, indeed, were the good old days!

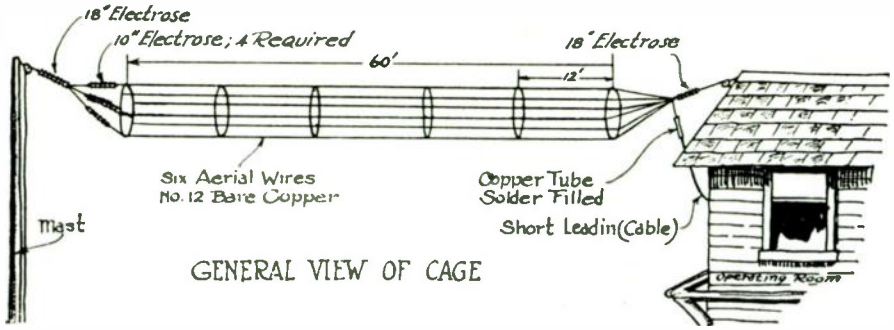


The top receiving circuit of the era immediately following World War I was the "two variometers and variocoupler" shown here. Most versions did not use the antenna series condenser but had a tapped primary on the coupler. Tuning range was approximately 150 to 600 meters. (From January 1920 QST)

C.W. on the Way

As much as anything, the QRM situation spurred interest in tube transmission. Of course, the fact that time and again a 50-watt c.w. set showed that it could do everything that a one-kilowatt spark set could do didn't hurt, either. Nevertheless, c.w. was approached with caution. Aside from the lack of tubes, other problems were visualized. It was seriously doubted that transmitters and receivers ever could be made stable enough at wavelengths as short as 200 meters to permit two-way working with "pure" c.w. Today this may seem funny, but consider the state of the art in 1919:

There were only triode tubes — not very good ones by modern standards, and short-lived at that. Neutralization had not yet been invented, and oscillator-amplifier transmitters were unheard of. Almost nothing was known about stabilizing the frequency of oscillators; the main problem was to keep them oscillating and to get them operating efficiently enough to put some power into the antenna. The principal tank circuit was the antenna system itself — a direct

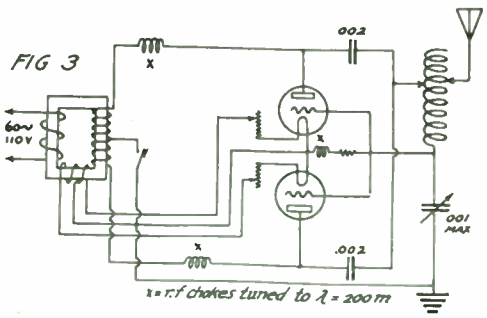


The cage antenna attained prominence in the post-WW I period. This drawing is from an article on the cage by 1AE in the October 1920 issue.

carry-over from spark transmission, where the antenna was the actual oscillating circuit.

Conditions were much the same in the c.w. receiver, which was invariably an oscillating regenerative detector tightly coupled to the antenna. In both the transmitter and receiver, the oscillating frequency was at the mercy of variations in antenna constants. The receiver, too, suffered from "body capacity" effects; having tuned in a pure c.w. signal, one had to become absolutely immobile and cease breathing in order to hold it. Long extensions on the tuning shafts were not uncommon on this account. Operators who didn't have them became adept at detuning the signal in such a way that when the hand was moved away from the receiver the beat note swooped down to audibility.

It was over a year — in December, 1920 — before the first transmitting tube was advertised in *QST*, and that merely a slightly overgrown receiving tube rated at up to 500 volts on the plate and a "capacity" of 12.5 watts. Yet there had been an appreciable swing to c.w. during that year, using such tubes as either were regularly available or could somehow be procured. Other c.w. equipment, such as inductances and power transformers, had made its appearance. Attempts were being made at telephony, accompanied by the inevitable phonograph-record concert. Tube transmission was getting into position to give spark a good run for the money.



Back-to-back self-rectification in the c.w. transmitter. This was developed in a day when plate power supplies were expensive and components hard to get. Tubes oscillated alternately, one on each half of the supply cycle. Recognize the Colpitts circuit? (From December 1920 QST)

A Scientific Experiment

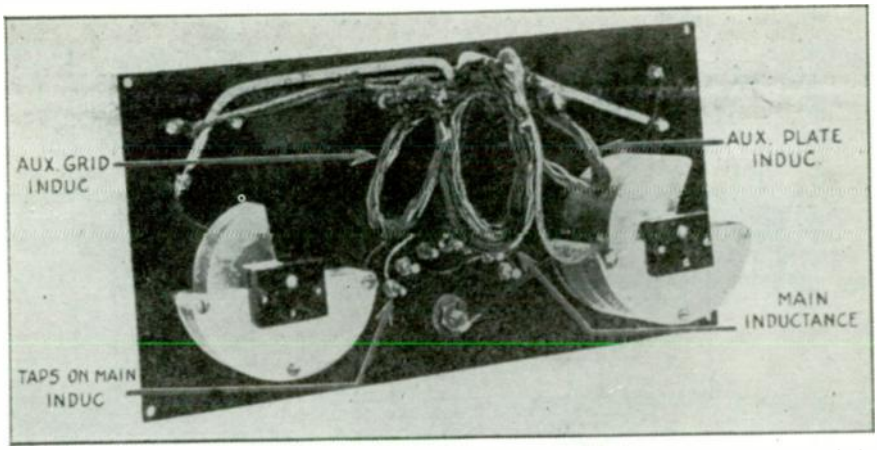
It was in this year, 1920, that the first concerted amateur effort along scientific lines was made — the famous fading tests conducted in a cooperative venture by ARRL and the Bureau of Standards. Sparked by a prominent prewar amateur, R. S. Kruse, at that time at the Bureau and later *QST*'s first technical editor, these tests were announced in June 1920 *QST* as a means, it was hoped, for uncovering some of the reasons for the variations in the signal strength of distant stations. Since the basis of the tests was scheduled transmissions by a few of the better stations while others kept logs of signal strength vagaries, cooperation on the part of the whole amateur body was imperative if the test signals were to be heard at a distance, without destructive QRM.

The fading tests were the forerunner of many such efforts by amateurs of later days, even to the present.

Power Supply

One of the problems of the era was power supply for the vacuum tubes. The indirectly-heated cathode was years away. There were attempts at using a.c. on receiving-tube filaments by connecting an adjustable center-tapped resistance across them, but these were not successful on sensitive detector tubes. Since most receiving tubes took about an ampere of filament current at around 5 volts, the standard heating source was a 6-volt storage battery. The plate supply was invariably a "B" battery, frequently home-assembled by soldering connections between a number of flashlight cells.

The transmitting power supply question was even worse, although here, at least, a.c. could be and was used on the filaments. The motor-generator was acknowledged to be the best for plate supply, but admittedly too expensive for most amateurs. There were a few center-tapped plate transformers, intended for full-wave tube



The inside of the original Reinartz tuner, introduced in June 1921 QST. This was probably the first receiver design made specifically for reception of amateur 200-meter c.w. signals.

rectification, giving voltages up to 350 or 400 per side. But if transmitting tubes were practically non-existent, where were tube rectifiers to come from?

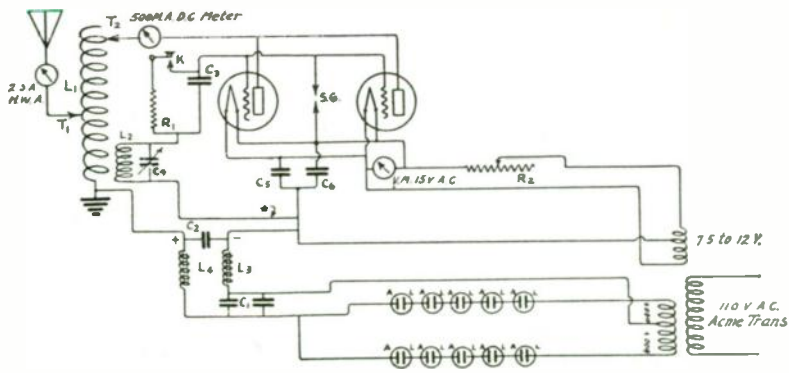
The first solution was to put the raw a.c. on the plate. The 60-cycle modulation could be copied with a non-oscillating detector, which was at least a talking point, but as c.w. the signal didn't have the piercing quality of a real d.c. supply. It soon occurred to someone that *two* oscillator tubes could rectify and oscillate on alternate halves of the cycle, thus doubling the modulating frequency, and with the help of a filter choke the result would have some resemblance to a d.c.-generated signal. These back-to-back or self-rectifying sets were reasonably popular, but still, when phone was attempted, the hum over-rode the voice modulation that could be attained with the crude modulation methods then in use.

It was a happy day when Furlong, 1FF, reported in *QST* successful experiments with electrolytic rectifiers. Simply constructed with lead and aluminum strips in a borax or ammonium solution, the "slop-jar" rectifier almost overnight became the standard method for getting d.c. for the plate supply. The characteristic messiness was taken in stride by a generation used to burning holes in rugs with the acid spray from storage batteries, and the chemical rectifier held a firm place in the amateur transmitting world for several years to come.

Transmitting Tubes at Last

The month of March, 1921, saw the first real power tubes put on the market. The UV-202 and UV-203, and a month or so later the UV-204, were greeted with open arms. Now c.w. was *really* on its way. Endless circuit variations for oscillators were tried, promoted, and often discarded. One described in *QST* by Whittier, 1DH, was among the most successful. Old timers will have no difficulty in recalling the "sure-fire c.w. circuit" — the reversed-feedback or reversed-tickler circuit, so called because the plate circuit was tuned and the tickler coil was connected to the grid, the reverse of the ordinary receiving arrangement.

By the end of 1921 only the most obtuse — or the most stubborn — could fail to see that the



The "sure-fire c.w. circuit," described by 1DH in July 1921 QST, gave impetus to tube transmission in the early Twenties. Strongly recommended by the Editor, tried and liked by numberless amateurs, QSL cards of the day frequently mentioned the "1DH circuit" as the transmitting arrangement in use. Power supply shown here makes use of lead/aluminum rectifiers.

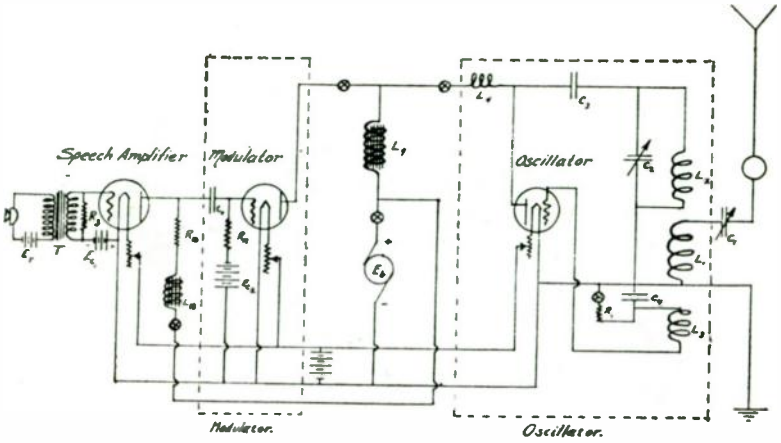


FIG. 14 - 200 Meter Constant Current Transmitter.

This constant-current phone circuit for 200-meter work was shown by the inventor of the modulation system, R.A. Heising, in a paper published in August 1921 *QST*. The oscillator circuit, a modification of the Meissner, is unusual for its time, inductive coupling to the antenna being a rarity in early amateur c.w. transmitters.

days of spark were limited. But spark was far from dead; indeed, this was its heyday. Its supreme achievement was yet to come.

In December of 1921 Paul Godley left for Ardrossan, Scotland where he was to set up a receiving station for the transatlantic test scheduled for the next year. The U. S. had already been spanned; amateur signals were being heard over long distances at sea by ship operators who were also amateurs when on shore. Why shouldn't we get all the way across? — especially if the receiving were done by an American amateur used to our equipment and ways of working.

Although this part of our story ends here, history records that the first American signal Godley heard was a spark. It was not the only one. But the superiority of c.w. showed so overwhelmingly in the tests that spark's greatest moment was also the beginning of its descent to oblivion. The transition period was nearing its end. A new kind of amateur radio was on the verge of taking over.

King Spark: Crescendo and Diminuendo

GENERAL Sherman's well known description of war is tragically accurate. Yet, during the Hell of World War I developments in radio were greatly accelerated. This was to be reflected later in the advertising pages of *QST*, when tube transmitters began to come into their own, although commencing in June 1919, the Reopening Number, the ads were much like those in 1916 and 1917. "We're Off Again" "Open for Business." "All Amateurs will Celebrate Opening Night. Will Your Station be Ready?" were advertising headlines obviously written with the idea of doing business as before.

Through the October issue advertising was for receiving apparatus, but with the announcement in the Liberty Number, November 1919, that the transmitting ban was off, ads on transmitting equipment began to build up slowly. Spark was King and it's doubtful that even the most prophetic foresaw the inevitable abdication. However, a few signs were there. The Marconi Wireless ad on the Marconi V. T. "the only vacuum tube which Amateurs can use" mentioned continuous wave transmission. De Forest's November advertisement featured a Wireless Telephone, probably the first complete tube transmitter advertised for amateur use.

One piece of copy that is intriguing is on the Western Electric VT-1, "sold only for uses other than transmission or reception of messages!" Sounds like "Do not connect wire A to Point B or you may make the tube oscillate" patent-dodging idea of later days.

An indication of the many patent fights to come was advertising copy by RCA/Marconi and Audiotron Sales Co. "A Warning," shouts the former, "The Audiotron . . . not licensed under the Fleming patent. Do not take chances . . ." while Audiotron declares, "The Audio Tron is . . . licensed under De Forest patents."

Immediately after the war not many *QST* advertisers said anything about tube transmission. The handful of amateurs experimenting with c.w. used an a.c. motor-d.c. generator combination for supplying plate voltage to the tube, but a small ad in *QST* for April 1920 announced a new device that was to supplant the m.g. and remain in widespread use to the present day — the high voltage vacuum tube rectifier. This early one was called the Electrodyne.

In 1920 a few companies began to cater to the small group of amateurs struggling with the newer method of transmitting. Tuska inductances were advertised in October. In the same month Chicago Radio predicted that "c.w. transmitters would be adopted by all progressive amateurs during the coming season" and offered an instruction sheet and blue print for a c.w. circuit. Acme boasted in October that the company name was becoming synonymous with c.w. The A-P Transmitting Tube was announced in December. Two manufacturers, Radioland and de Forest, advertised complete Radiophones, de Forest's portable unit being shown in September.

Perhaps the most influential ad in putting amateurs on c.w. was the RCA announcement in December 1920 of the UV 201, which ". . . may be used for Detection and for Radio and Audio Amplification." It didn't take the boys long to find that the UV 201 was a good low power transmitting tube.

Two pieces of equipment that are still with us came out in 1920. The Cootie Key made its entry in June. Under the generic name of Sideswiper it is still popular, especially with French hams, and its sophisticated successor controls many an electronic keyer. Baldy phones appeared in December. John Firth and Company had started to advertise the famous mica diaphragm phones before the war, but the name Baldwin or Baldy had not been used.

There was a "Tremendous Demand for Wireless Operators" as one radio school put it. Many a good ham-to-be served on shipboard. Eastern Radio Institute, Dodge's Institute and Massachusetts Radio and Telegraph School were among the first to use the advertising pages of *QST*. "Positions Guaranteed" declared one. "Wireless Telegraphy Pays Big Money" screamed another school.

At the end of 1920 advertising of Thordarson and Acme spark transformers; Dubilier condensers; Wireless Mfg., Benwood, Bell, Signal, Franklin and Mesco gaps was still going strong. A new decremeter (What was a decremeter, Dad?), the Doolittle, was announced for "Amateur Wavelengths" in September.

Other new manufacturers' names like Burgess, Amrad, Conn. Tel and Electric, Rawson, Jewell and Continental Fibre entered the advertising columns of *QST*. A few of the stores were Atlantic Radio, Tresco Sales, Pacent, Atlantic & Pacific Radio Supplies.

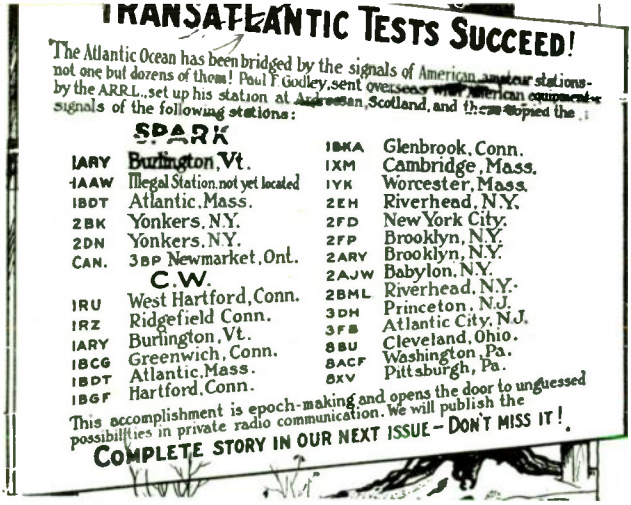
Spark advertising reached its peak in 1921 with names like Benwood, Karlowa, Ray-Di-Co, Wilcox, Radio Supply, Saginaw, Chicago Radio Lab in *QST*. But the vacuum tube had struck the fatal blow to the music of spark. The treble of the 500-cycle rotary syncs, the middle and bass of the 60-cycle rotaries — crescendo, diminuendo, death.

At the end of 1921 Benwood was advertising a complete wireless telephone and Karlowa listed a page of c.w. components and said, "From coast to coast a chain of c.w. stations will ultimately carry the relay work." An early ad, March 1921, by Federal Tel and Tel talked about a "really good microphone." RCA brought out the UV 202, the UV 203 and the UV 204 in April; in May the RCA Kenotron rectifiers UV 216 and UV 217 appeared. A-P's rectifier tube came out in May.

The change to c.w. was now accelerating. Thordarson advised, significantly, in November: "Change over your (Thordarson) spark transformers to high voltage c.w. transformers" and offered to furnish replacement secondary coils.

Amateur receiver and component advertising continued strong. Westinghouse and RCA came out with amateur receivers. Winkler, Standard Assembly and Tuska were among the first kit manufacturers. In September of 1921 Grebe's "Gentlemen, Meet Doctor Mu!" started one of *QST*'s best known receiver advertising campaigns.

Postwar circulation of *QST* was increasing. A page of advertising in 1921 cost $60. QST



TRANSATLANTIC TESTS SUCCEED!

The Atlantic Ocean has been bridged by the signals of American amateur stations—not one but dozens of them! Paul F. Godley, sent overseas with American equipment by the ARRL, set up his station at Ardrossan, Scotland, and there copied the signals of the following stations:

SPARK

1ARY	Burlington, Vt.	1BKA	Glenbrook, Conn.
1AAW	Illegal Station, not yet located	1XM	Cambridge, Mass.
1BDT	Atlantic, Mass.	1YK	Worcester, Mass.
2BK	Yonkers, N.Y.	2EH	Riverhead, N.Y.
2DN	Yonkers, N.Y.	2FD	New York City.
CAN.	3BP Newmarket, Ont.	2FP	Brooklyn, N.Y.
		2ARV	Brooklyn, N.Y.
	C.W.	2AJW	Babylon, N.Y.
1RU	West Hartford, Conn.	2BML	Riverhead, N.Y.
1RZ	Ridgefield Conn.	3DH	Princeton, N.J.
1ARY	Burlington, Vt.	3FB	Atlantic City, N.J.
1BCG	Greenwich, Conn.	8BU	Cleveland, Ohio.
1BDT	Atlantic, Mass.	8ACF	Washington, Pa.
1BGF	Hartford, Conn.	8XV	Pittsburgh, Pa.

This accomplishment is epoch-making and opens the door to unguessed possibilities in private radio communication. We will publish the

COMPLETE STORY IN OUR NEXT ISSUE—DON'T MISS IT!

From the cover of January 1922 *QST*.

ARRL: The Exciting Years

NOVEMBER, 1919. Congress, at the League's request, had directed the Navy to lift the ban on amateur transmitting. The Department of Commerce had slashed red tape, assigning calls and allowing amateurs to resume transmitting without waiting for actual licenses to clear through the overburdened administrative machinery. Finally, after two and one half years of silence, amateur radio was back.

The next five years are extremely fascinating, in every department. Spark transmission reached its height and then faded away: when the legal death of amateur spark finally came in 1927, there was nothing left to bury. One of the factors which speeded up the transition from spark to c.w. is familiar to present-day amateurs: continuous waves caused far less interference to early broadcast receiving than did the spark; thus, with c.w. you might be able to operate even before your neighbors went to bed!

Operating achievements ranged from the spectacular to the impossible. As early as March 1922, the editor of *QST* speculated that the day wasn't far off when amateurs would have to send out expeditions on ships to break any additional records!

The quality, first of spark outfits, then of receivers, then of c.w. and phone transmitters, went up at a rapid pace, led by articles in *QST*, some of them the cream of the crop originally presented to the meetings of IRE and the Radio Club of America.

But among the most fascinating facets of this period was the growth and rapid maturing of ARRL as a cooperative effort by radio amateurs. In the early days on the air, sets of initials were nearly as common as official call letters in *QST* and the League's list of members. Postwar, however, *QST* chided the clod who was too lazy or too ignorant to get a license. Radio clubs had sprung up all over the country, most of them quickly becoming affiliated with the League. These clubs were urged to smoke out the "little boy with the spark coil" and induce him to join the club. Then he could be made to get a license, and to cooperate with his fellow amateurs.

Most clubs soon adopted some form of the "Chicago Plan" [1] whereby the evening was split up by local agreement: local work (most of it by youngsters with spark coils) and testing took place in the early evening, say from seven until ten, and then the long distance traffic men took over for the remainder of the night. In Chicago the plan was drawn up and administered by the Chicago Executive Council, a union of all the neighborhood clubs which had sprung up. The members of the Council policed the plan, and there were fines for violation, not on the violator but on the club within whose territory he resided! Later, the schemes were generally modified to provide for the man with the powerful rig interested in DX but not particularly in traffic. Still, traffic work within ARRL Trunk Lines was considered the most important reason for the existence of the amateur.

Another cause of QRM in those days, in addition to the spark coil operators, was the lack of tuning in spark transmitters. *QST* urged each club to maintain a wavemeter and decremeter for the use of members. There were a number of editorials, T.O.M. stories, cartoons, and letters to the editor stressing the need to get one's decrement down to the legal level. Decrement was approximately a measure of the bandwidth of spark stations. The term went out with spark, since "c.w." (which initially was used to include phone) had a theoretical decrement of zero.

The next major ARRL project was to get everybody down to a wavelength of 200 meters or nearly so. This campaign was perhaps half-hearted at first, since many of the achievements about which amateurs — including those at the ARRL headquarters — wanted to boast took place on longer waves. Undoubtedly, some hams were shocked into legality when one of the top ham stations had its license suspended for a variety of illegal acts, including operation on 800 meters, as reported in *QST* for June 1921. What finally put this wavelength campaign across was the coming of broadcasting which settled first on a wavelength of 360 meters, and then spread out to 200-500 meters. The closer you were to 200

[1] Perhaps it should be called "The Toronto Plan." A cooperative arrangement was in effect there in 1911.

meters the less likely you were to get a squawk from your neighbors. Shortly thereafter the issue became moot, for amateurs discovered the tremendous value of short waves for DX and by then had the tube equipment to operate on the high frequencies.

Cooperation was the theme of the day. For one project after another, the League requested that ragchewing and testing be abandoned on certain nights for certain hours. Transcons, fading tests, Governors-to-President relays, the police chiefs relay, then the transatlantic tests; all were occasions for silence by the majority of stations so that outstanding work could be logged by the top group. Fortunately for the history of amateur radio, this cooperation was forthcoming more often than not.

Then broadcasting came along. Its first noises were made by amateurs, using their radiotelephone equipment over distances of a few miles. Victrola records were added shortly after, and some of these stations had a fair local following. Apparently, serious amateurs — the kind that populated the ARRL in those days — quickly left off this work, for later on there were strong attacks by League staff and members alike about the "radio phone men who have forgotten the code and continually play their squeaky, squawky jazz records." By March 1922, broadcasting by amateurs was "temporarily" prohibited.

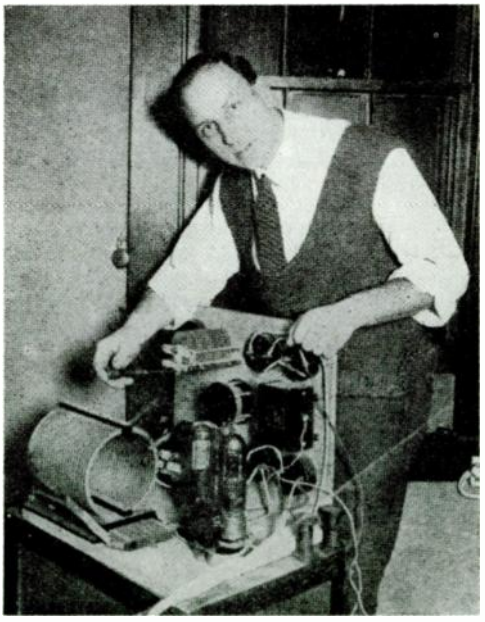
At first, those who listened to radio phone were considered to be amateurs. For about a year, in 1921–1922, *QST* pushed the use of the term "Citizen Radio" rather than amateur, and proclaimed on its cover that it was "Devoted entirely to Citizen Wireless." In December of 1921, *QST* started a column, "With the Radio Phone Folks", later called "With our Radio Phone Listeners." The two groups started drifting apart in early 1922. Many radio magazines which had catered to the transmitting amateur swung away from him, one even so far as to run an editorial attacking the "selfish amateur" for "causing interference", another prophesying the end of amateur radio.

But the ARRL tossed away the quick dollar, and in June 1922 announced that *QST* would not "go popular." The "Citizen" on the cover was quietly changed back to "Amateur", the name of the phone column was changed to "The Junior Operator" and its emphasis shifted accordingly. Phone people became "novices" or "BCLs", and an editorial declared that "novices were *not* amateurs, as the press seems to think."

Nevertheless, the League urged that amateurs extend their voluntary cooperative arrangements to include the listeners, and thus quiet hours were born. This got to be rather one-sided, this cooperation with the BCLs, so as time went on *QST* shifted its advice to an attitude of "Cooperate — but operate!" In July '22, readers were urged to observe reasonable silent hours, but let their neighbors understand that after ten-thirty or so they had work to do and would be on.

Then as now the League was deeply concerned with the long-term protection of amateur privilege. In the first ten years or so after World War I there were something like 45 separate radio bills introduced into Congress, most of them making inadequate provision for amateurs. The criterion was: Were amateurs mentioned in the proposed law itself and guaranteed frequency space? The amateurs had great fear that a bill which put everything into the hands of bureaucrats, especially those of the armed forces, would spell the end of amateur radio. But with the advent of broadcasting, not covered at all by the Wireless Act of 1912, some new legislation was desperately needed. Accordingly, in early 1922, Secretary of Commerce Herbert Hoover (later U. S. President; father of our ARRL President Hoover) called a special radio commission together to write a new bill. The ARRL was on hand representing the amateur. The conference recommended 150 to 275 meters for amateurs, part of it shared with experimental and school stations. It also revived the 1917 ARRL suggestion that there should be Deputy Radio Inspectors elected by their fellows and serving without pay but with all necessary authority to assist the government's R. I.s, of which there have never been enough, then or now. The resultant bill cleared the House, but died at adjournment before being acted upon by the Senate. Nevertheless, the agreements reached by the users of radio in preparing the bill became *de facto* regulations,* the absolute need recognized by all users of radio for agreement being the primary enforcement tool. The next year, and each year

* Except that part which would have set up the Deputy R.I.s; this proposal has never been adopted.



John Reinartz (now K6BJ) and the rig at 1QP-1XAM. Responsible for many pioneering technical developments, John designed the transmitting circuit used by all three stations (1MO, 1XAM, 8AB) in the first two-way short-wave transatlantic contact.

thereafter until a new radio law finally was adopted, there was another Hoover Conference renewing or revising as necessary the arrangements made the previous year. In 1923, the pressure from broadcasting was great enough that the top wavelength was reduced to 220 meters, but the idea of having all amateur wavelengths open to all amateurs (instead of having wavelengths specified in the license, as things had been since 1912) was sold to the Department. The band from 200 to 220 meters was held aside for the new Extra First Class amateur licensees, who had to be licensed for two years, take a test similar to the commercial first of the day, copy twenty per, and have a clean record. Only pure c.w. could be used here.

The lower edge of the broadcast band was only 3 meters away, at 1350 kc., and consequently interference was still a problem. Thus, the Department of Commerce wrote compulsory quiet hours into the rules, from 8 to 10.30 P.M., for all amateurs. *QST* pointed out that those who had failed to observe voluntary quiet hours had brought this restriction into being.

The outstanding achievement of the amateur world in 1923 was the first two-way work across the Atlantic between 1MO and 1XAM in Connecticut and 8AB in France on approximately 100 meters. This led directly to a complete change in amateur radio — and indeed in the art as a whole. There followed a mad scramble for short-wave frequencies by most users of radio. Careful negotiations between ARRL and the Department of Commerce resulted in our getting for the first time a family of bands, harmonically related to each other: 150–200 meters remained, of course, and was the only place where spark and the wilder forms of modulation, such as mechanical chopping of continuous waves, could continue to be used. The new bands were 75 to 80, 40 to 43, 20 to 22 and 4 to 5 meters. The best part of the new regulations, perhaps, was that the compulsory quiet hours adopted a year earlier went by the board for 80 meters and the shorter wavelengths. Henceforth, the quiet hours were to be imposed only when interference could be laid at the feet of the amateur! The bands negotiated with the Department were largely confirmed by the third Hoover Conference, meeting in the fall of 1924, but the 80-meter band was extended to cover 75 to 85.6 meters. Spark was all but outlawed. It was believed that less than 1 per cent of amateurs were still using spark, and both the Department and the League urged their prompt discontinuance.

The internal growth and increasing maturity of the League paralleled its external activity. Almost immediately after reopening, the League, at the request of Canadian operators, expanded its operations to include Canada. Four operating divisions were created, and soon after a fifth was added. A Canadian was named to the Board of Directors.

In 1922, a new Board of Directors was elected.

Mr. Fred H. Schnell
c/o American Radio Relay League
My dear Fred,

Forty years ago! . . .

In a few days forty years will have passed since we established the first short-waves transatlantic contact!

How time flies!

I remember those exciting experiments as if they had taken place yesterday.

I suppose you do, too.

That cable you sent saying "copied solid congratulations." How happy it made me!

And two days later, when you had tuned your transmitter on 100 meters, our two-way contact! It lasted until daybreak in Nice.

That was the great demonstration of what short waves could do.

How widely they have been used since then!

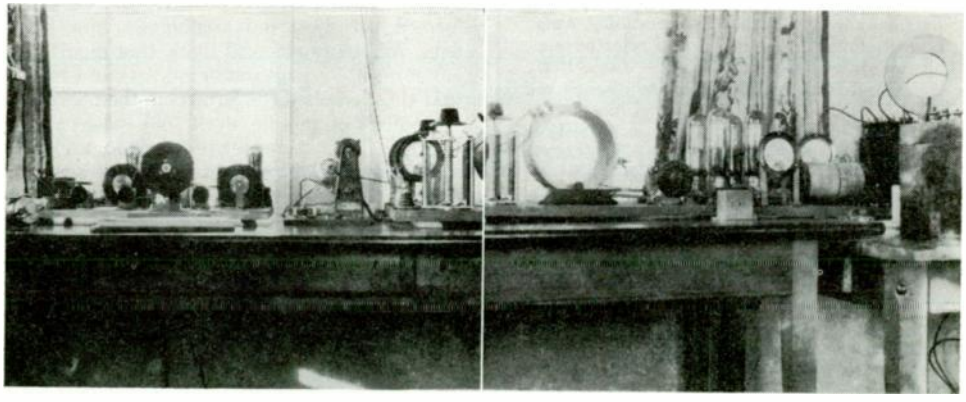
My dear Fred, I hope you are well. I did not want to let this fortieth anniversary pass without sending you a word of greetings.

As far as I am concerned, my health remains good in spite of the fact that I will be 70 shortly. It seems incredible!

Best 73, my dear friend, and hope we celebrate the fiftieth anniversary in 1973!

As ever,

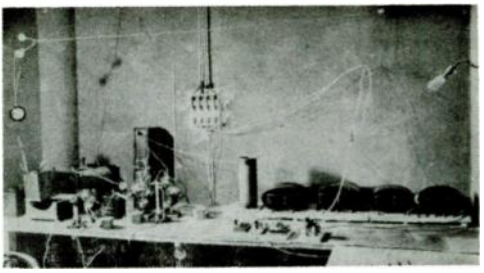
Leon Deloy, Ex-F8AB



Schnell's 1923 station, 1MO, pictured shortly after the historic transatlantic QSO. Now W4CF, Fred recently received from Leon DeLoy, ex-F8AB, the letter reprinted in the box on this page.

Sidelights, 1920–1922

The editor invited artistic members to sharpen up their pencils and get to work on a League emblem. Six months later, the emblem we all know so well was adopted, no one man getting credit for the design. — *QST, January and July, 1920.* . . . The League advocated reducing power and using a wavelength shorter than 200 meters for local work. — *February, 1920.* . . Membership and subscription to *QST* henceforth would be inseparable. Consolidated dues were set at $2.00, with newsstand copies at 20¢. — *March, 1920.* . . . 1AW, 1TS and 1FQ teamed up for "diversity" reception of DX stations being worked by 1AW. — *April, 1920.* . . . *QST* articles were regarded as a contribution by one member to his fellow members; there was no pay for these articles (a policy still in effect in 1964). — *July, 1920.* . . . Ford coils used for modulation transformers — *October, 1920.* . . . Radio very important part of the Scouting program in San Diego. — *November, 1920.* . . . A 17-year-old named Haddaway had built his entire station from absolute scratch, including the making of his own vacuum tubes! — *February, 1921.* . . . A crippled ham had a rig at his bedside — *February, 1921.* . . . 1FBF relays ship's SOS to Boston Navy Yard. — *February, 1921.* . . . CQ Party, everybody within a call area to transmit at the same time, on April 1! Purpose was to get CQing out of the system. — *March, 1921.* . . . QRR chosen by Detroit clubs to mean "Cut out the rag chewing". — *March, 1921.* . . . The little pussycat used to illustrate "Strays" appeared. — *April, 1921.* . . . Radio fraternity *Alpha Delta Alpha* started at Coe College. — *July, 1921.* . . . Robert Garcia, of Los Angeles, passed amateur exam with grade of 92% at age 7. — *September, 1921.* . . . Lively discussion in the Letters section on a graded license scheme (much like today's discussions on incentive licensing). — *November, 1921, January and March, 1922.* . . . Use low power for local work. — *November, 1921.* . . . A Westinghouse engineer stated flatly that aurora doesn't affect radio waves. — *April, 1922.* . . . Possibility of phone work from moving trains was explored. — *June, 1922.* . . . New department in *QST* called International Amateur Radio. The ARRL Board rejected idea of foreign branches of ARRL. — *June, 1922.* . . . Mail arrived addressed to "Q Street Magazine". — *June, 1922.* . . . Chicago city fathers tried to put over a license inspection and fee for amateur stations. — *July, 1922.* . . . GMT should be used for amateur work, a reader said, — *September, 1922.* . . . And transatlantic schedules were announced in GMT. — *December, 1922.* . . . Why not use aluminum panels in receivers? — *October, 1922.* . . . Phonetic alphabets for French and English. — *December, 1922.* . . . How we grew — there were five employees at headquarters (January, 1921); then there were 13, enjoying a dinner together (July, 1922) and then 19 posed for a "wiring diagram" of headquarters (January, 1924).



French 8AB, Nice, used by Leon Deloy to span the Atlantic in 1923. Deloy jubilantly reported during that first QSO that 1MO was "QRK, very QSA a foot from the phones!" Imagine the excitement of that contact, Young Squirt!

Like its predecessors since 1917, this election was held "at large", with all members voting for 17 of the 22 on the ballot. This 1922 Board goes down in history as the one to put itself out of business, for during their term, the directors drew up a new democratic constitution, under which each of twelve U. S. divisions chose a director to represent it on the board. Any ten members could nominate a member not engaged in commercial radio as a candidate. The then-new constitution, differing only in detail from the League's present Articles of Association, was adopted in December 1923, and the new directors were elected in 1924.

Not only was the League as a corporate body going through a period of great achievement and growth, but so also its individual members. We have already talked about the dawn of co-operation as a governing force in amateur radio. Members were pushing out on all fronts. Several emergencies were reported in *QST*, in which amateurs had carried on when the wire lines were torn out or rendered inoperative. Amateurs investigated fading and other propagation phenomena. Skip was observed and reported upon, though full understanding was to come later. Power factor and other points of theory were hotly debated both at conventions and in the correspondence section of *QST*. Portable work was going on; the marvelous shack of portable 3OI which could be carried around on a truck formed the most outstanding example of this field. Amateurs received marketing reports from government agricultural broadcasts and saw to it that these reached the farmers in their areas. The beginnings of mobile work took place as early as 1921. Break-in operation came under discussion in *QST*, as a real boon to the c.w. traffic hound. In the better traffic stations, message totals often exceeded 500 per month.

Individual achievement was spurred on by a variety of contests and prizes. The outstanding one perhaps was the Hoover Cup, launched by the Secretary of Commerce to recognize amateur technical achievement. During Hoover's administration of the Department it was granted each year to the amateur having the best station principally built by himself. Louis Falconi, 5ZA, took the Cup for 1921. In 1922 the winner

was F. B. Ostman, 2OM. Donald C. Wallace, 9ZT-9XAX (not unheard of today as W6AM!), won the award in 1923. The Hartford *Courant* offered a Smith Cup in 1921; the League used it to encourage summer work from July to November. It was presented to the Chicago Executive Council for its development of the Chicago Plan. There were also contests, with cash or equipment prizes, for the best relay spark station, for the best ham superregenerative receiver, for the highest number of subscriptions garnered for *QST*, and several other noble aims.

This was also the period when tubes *versus* spark and code *versus* phone always could raise an argument. Such arguments, and the achievements mentioned earlier, needed a forum: it was found in the local club banquet, the state, call-area, division and national radio conventions which had sprung up like crocuses in the spring during this era. The lectures and discussions went on the evening as well as the daytime at these affairs, and the amateur who did not fill up his notebook during a convention simply wasted his money. Social aims certainly were served by these conventions, but largely in the Owl-Boiling hours; civilized hours were devoted to learning about the radio art from the experts, most of whom were still classifiable as amateurs.

More than any other perhaps, this was the period during which amateur radio as we know it today assumed its basic shape. Yes, it was a great period to be an amateur. Serious problems and challenges abounded, but so did excitement, learning and accomplishment.

Operating Achievements

WITH AMATEURS BACK ON THE AIR after a 2½-year hiatus, activity increased by leaps and bounds. We began an era in which there were, besides the routines of traffic handling, such projects as fading tests, transcontinental relays, transatlantics, and communications with expeditions.

ARRL membership was required for trunk-line appointments, and such posts were quickly filled. The Operating Department of those days had Division Managers, Assistant Division Managers, District Superintendents, and City Managers. A member's traffic report had quite a chain of command to climb before it reached *QST* for publication. Relaying techniques and station ranges were improved, and by November, 1922, the monthly message count had climbed to 50,000. Before long Official Relay Stations had to certify that they would deliver or mail every message within 24 hours.

Fading Tests

The summer of 1920 found the amateur world agog over the ARRL-Bureau of Standards fading or "QSS" tests. Starting on June 1, a selected group of six transmitting stations sent signals at intervals on a specially assigned wavelength of 250 meters which were to be regularly recorded in terms of signal strength levels by observing stations throughout the country. The resultant data were correlated by the Bureau with weather, magnetic and other effects, with the intention of establishing whatever relationships might be found to exist between radio and other natural phenomena. As a result of this investigation, a comprehensive theory on propagation and fading effects on the 250-meter wavelength was evolved and presented as a Bureau of Standards report.

Transcons

The League continued to grow and with the addition of Fred Schnell, 1MO, as a full-time traffic manager, the staff was up to five. The rivalry between spark and c.w. continued apace, but the majority of traffic was still handled by spark stations.

*In middle January, 1921, the first official postwar transcontinental relay tests were held, following three months of careful planning and organization. Test messages were sent for four nights. On the final night five messages were transmitted. The third—Message "C"—made a record that established amateur radio as the fastest cross-country channel of public communication—*six and one-half minutes round-trip elapsed time!

Centrally located stations succeeded in hearing stations on both coasts, and there was speculation that stations on the two coasts would someday be able to communicate directly without relays.

Transatlantics

The idea of transmitting American amateur signals across the Atlantic ocean was not a new one when 1921 rolled around. Hiram Percy Maxim had dared to envision the possibility a short time after the founding of the ARRL. Just before the war, Louis Pacent presented a project for such transmissions to the Board of Directors of the Radio Club of America. In 1919, M. B. Sleeper, editor of Everyday Engineering, *originated an elaborate plan in this connection. The year 1920 found* Everyday Engineering *faced with the necessity for suspending publication, however, so Sleeper turned the plan over to the ARRL with the request that they carry on.*

In consequence, some two dozen American amateurs transmitted prearranged signals on February 1, 3, and 5, 1921

Portions of this story, in contrasting type, are from "*Two Hundred Meters and Down*" by Clinton B. DeSoto.

which were listened for by about two hundred and fifty British experimenters with prizes offered by manufacturers on both sides to the amateurs turning in the best performances. The results were negative. So large was the number of English listeners on the 200-meter wavelength, all using regenerative or self-radiating receivers, that they jammed each other by emanations from their own receivers! Added to this difficulty was the interference from commercial station harmonics, high local electrical noise levels, and some uncertainty as to frequency calibration. All in all, there were plenty of reasons for the failure of these tests—reasons which it was hoped would be obliterated by the next series of tests, to be run late in 1921.

At a meeting of the ARRL Board of Direction during the first national convention that year, Traffic Manager Fred H. Schnell presented a plan to ensure that any possible deficiencies in British receiving technique would not imperil the possibility of amateur signals being heard across the Atlantic on these tests. He proposed that a qualified American amateur be sent overseas with the best available amateur receiving gear to supplement the efforts of the British listeners. Not that the ability of the British was doubted, but—well, they had not succeeded before, and every possible chance of success should be provided.

Paul F. Godley, 2XE, probably the foremost receiving expert in America at that time, one of the ARRL's Advisory Technical Committee, members of the Institute of Radio Engineers and the Radio Club of America was selected for the job. On November 15th he sailed on the Aquitania, *following a testimonial banquet in his honor at New York, attended by what the editor of* QST *termed "a hamfest of oldtimers, most of whom had known Godley for years", all expressing utmost confidence in the famous designer of the Paragon receiver. Major Edwin H. Armstrong said, "I'll stake my scientific reputation on Paul Godley," and was echoed by so many others that Major J. Andrew White finally commented, "Paul, it looks like a cinch!"*

A month, lacking only a few days, went by. Paul Godley had reached England, was royally feted in London, set up his apparatus for preliminary tests, travelled to Scotland; and there, at the very edge of the sea, on bleak Androssan moor, amid fog and wet, a tent was erected in which the transatlantic receiving station was located. By midnight of December 7 the installation had been completed, and long-wave stations were coming in. "At 1:33 A.M.," reads Godley's log, "picked up a 60-cycle synchronous spark at about 270 meters, chewing rag. Adjusted for him, and was able to hear him say 'CUL' and sign off what we took to be '1AEP'; but atmospherics made sign doubtful; . . . That this was an American ham there was no doubt! . . . His signal had doubled in strength, and he was booming through the heavy static and signed off clearly 1AAW, at 1:42 A.M.! . . ."

After that? Well—

"Oh, Mr. Printer, how many exclamation points have you got? Trot 'em all out, as we're going to need them badly, because WE GOT ACROSS!!!!!!" ran the lead in QST.

Records Galore

The next three years were to see the most concentrated activity and achievement of amateur radio's entire period of existence. New records, new accomplishments, new additions to amateur radio's Hall of Fame were constantly being made. The Governors–President Relay of 1922 was the first of these new accomplishments. Upon the first anniversary of the inauguration of President Harding, messages of congratulation and fealty were started from the governors of forty-three states. Five refused to participate; there were still a few staunch Democrats. Unusually bad conditions made operating difficult, but by March 8 forty messages had been handed to the President, a highly capable performance and one most opportune in the face of the existing legislative situation. . . .

On April 13th the first transpacific two-way amateur communication was established between 6ZAC, Maui, and 6ZQ and 6ZAF, in California. On that night and on the night following reliable communication was maintained for long periods of time and a quantity of message traffic was handled.

The "Trans-Atlantic Derby" won by ARRL Secretary K. B. Warner, who bet "a new spring hat" that American signals would be heard in Europe by Godley in 1921. British hatmakers didn't know what a derby was (it's called a "bowler" there), so sent this topper, traditional headwear at the Derby races.

On the same days, Atlantic Coast amateurs were successful in copying Pacific Coast amateurs direct for the first time. The coincidence of these dates indicates the important part that atmospheric conditions played in the results obtained during these early days when great distances were first being spanned. . . .

The general character of amateur radio began to experience a subtle change in 1922. It commenced to lose its insularity. It slowly but steadily approached the cosmolitan international characteristics that were to achieve dominance before two years had elapsed. The most apparent outward manifestation of this was the department on international amateur radio, begun in the June, 1922, issue of QST. *. . .*

It was in an atmosphere of expectation that big things were due to break in international amateur radio, then, that the amateur world turned to the transatlantic tests of 1922. Unparalleled enthusiasm prevailed. Practically every amateur in the United States, even in the far West was brimming over with eagerness. During the preliminary tests, in which amateurs were required to demonstrate their ability to cover 1200 miles in order to qualify, some 91 calls were logged in England!

The keen edge of surprise at the actual results was therefore somewhat dulled, but even so they were staggering enough. When the outcome was finally tabulated it was learned that 316 American stations had been heard in Europe! *The British, organized by the Radio Society of Great Britain under the leadership of Philip R. Coursey, heard a total of 161 stations. The French, the members of several societies having been formed into a joint Transatlantic Test Committee by Dr. Pierre Côrret, together with the Swiss, heard a total of 239 American calls, while 85 stations were heard on both the British Isles and the continent.*

Perhaps the most significant result of the 1922 tests was the fact that every United States district got across the Atlantic. The summary showed 78 first district stations reported, 81 second, 53 third, 11 fourth, 7 fifth, 8 sixth, 1 seventh, 63 eighth, 12 ninth, and 1 Canadian (probably there were more Canadians which could not be distinguished from U. S. stations). These stations actually covered almost the entire country.

The really startling news, however, was about the "westbound" tests. A total of about 20 different American amateurs heard European amateur signals, principally from French 8AB and British 5WS and 2FZ! The first signal across was from 5WS, a special station erected by the Radio Society of Great Britain, at Wandsworth. This was indeed news. Two-way communication with Europe now loomed as a definite possibility.

Two-Way Across the Atlantic

To tell the story of the first contact across the Atlantic ocean, let us set the scene by recalling the second transatlantics. Then, it will be remembered, one of the three European stations reliably reported heard in the United States was French 8AB, at Nice, France. In January, 1923, a preliminary attempt at two-way transatlantic communication failed. The European station on that occasion was also French 8AB.

*The owner of 8AB was Leon Deloy. During the summer of 1923 Deloy visited the United States to study American amateur methods, with the avowed determination to be the first to span the Atlantic. He went to the ARRL's national convention in Chicago; he bought American radio gear; he consulted with John L. Reinartz, 1QP-1XAM, concerning his new station. He lived, thought, acted and worked with one objective—*to work across the Atlantic. *Returning home to France in early autumn, he applied all the information he had received, completed his new station and tested with British 2OD in October, and in November cabled ARRL Traffic Manager Schnell that he would transmit on 100 meters from 9 to 10 P.M., starting November 25th.*

Over the traffic routes of the ARRL flashed the electrifying news. Many a station commenced listening. From the very first, 8AB and the identifying cypher group "GSITP" were audible in Hartford. The next night, the 26th, Deloy transmitted again and, having been advised by cable that he was being heard, sent two messages, which were copied not only by Schnell and K. B. Warner at 1MO, but also by Reinartz at 1XAM. One was a message of greetings from French to American amateur radio; the other made a schedule for an attempt at two-way work the following night.

The night of November 27, 1923. Both Schnell and Reinartz were on the air. Schnell had secured special permission from the Supervisor of Radio at Boston to use the 100-meter wavelength, and everything was in readiness. At the stroke of 9:30 the strangely-stirring 25-cycle gargle from 8AB came on the air. For an hour he called America, then sent two more messages. At 10:30 he signed off, asking for an acknowledgment. Long calls from 1MO and 1XAM and then . . . there he was, asking Reinartz to stand by, and saying to Schnell, "R R QRK UR SIGS QSA VY ONE FOOT FROM PHONES ON GREBE FB OM HEARTY CONGRATULATIONS THIS IS FINE DAY MIM PSE QSL NR 12" . . . American and European amateurs were working for the first time, with strong signals, and to Deloy, after a year's constant and unremitting effort, it was a fine day!

He then called Reinartz, 1XAM, whose

transmitting circuit was in use at all three stations, and they also worked with similar ease. A message was sent via 1MO to the renowned General Ferrié, France's grand old man of radio. Further schedules were arranged. Signals were coming through on loudspeakers. A key and buzzer, actuated by the neighbor lad next door, would have been no louder; yet a mighty ocean, four thousand miles of trackless distance, separated these pleasantly chatting friends, separating innumerable friends to chat in countless days to come.

It was indeed a fine day.

Expedition Work

It was also in 1923 that amateur cooperation with international exploring began. ARRL member Don Mix, 1TS (now an assistant technical editor of *QST*), accompanied Donald B. MacMillan to the Arctic with amateur equipment aboard the schooner *Bowdoin*. WNP (Wireless North Pole) brought an end to the lonely isolation which had haunted MacMillan on each of his previous eight trips to the arctic. Operating on 200 meters, the station provided fairly reliable contact all through the winter of 1923–24, leading MacMillan to predict that no polar expedition would ever go north again without radio.

And Now Another New Era

But when Mix returned from the Arctic in the fall of 1924, he found an entirely new world of amateur radio, for by then the short waves had been discovered and transoceanic work was commonplace. The short waves had been discovered, 200 meters was obsolete.

In 1924 amateur radio stood at the gateway to its greatest achievement—traveling the road downward from 200 meters.

Early Emergency Communications

THE HISTORY of emergency communication by amateurs begins in 1913, when amateurs at the University of Michigan and Ohio State University, in conjunction with numerous individual amateurs in and around the region, successfully bridged the communications gap surrounding a large isolated area left by a severe windstorm in the Midwest. In these early days, such emergency work was spontaneous and without previous organization of any kind. The need existed, the amateurs were available, so they went to work with whatever they had. This included very little in the way of what was then modern equipment, but a great deal in skill, ingenuity and enthusiasm. These latter attributes carried us through a "proving" period. Amateurs gradually, without realizing it, attained a reputation for being able to supply communications, somehow, even under the most difficult circumstances

Undoubtedly, there are any number of incidents which were never reported or publicized. Early issues of *QST* contained only brief occasional mentions of this kind of work by amateurs. Following the above-mentioned midwest storm there is no further chronicle until 1919, when a tropical storm disrupted communications in the Port Aransas, Texas, area, and one Clifford W. Vick of Houston handled newspaper dispatches and other general communications, despite the fact that the wartime transmitting ban had not yet been lifted. Subsequently, amateurs were reported as having served in 1921, when 1AW handled news dispatches during an auroral disturbance; in February, 1922, when a snow and ice storm isolated Minneapolis-St. Paul (9XI, 9ZT and 9AJP); in November, 1922, when heavy snow blanketed Wyoming and Colorado, stalling two trains in the mountains (7ZO).

In 1923, more reports were received. In March, 9ZN, 9APW, 9AZA, 9BHD and 9ALG organized a net to relay communications into and out of a part of the upper Mississippi Valley isolated by a storm. That summer the Arkansas River flooded in Oklahoma; 5XBF, 5GJ, 5GA, 5SG and 5WX operated three days and nights. In November, 1ARY and c2CG (Canadian) provided contact between Burlington, Vt. and Montreal when a snowstorm took down railroad telegraph lines. In December, a storm in Neah Bay, Wash., isolated some canneries; relief was brought by 7IP and 7GI.

Among the earliest users of amateur services in emergencies were the nation's railroads. Consequently, in 1923 the first signs of amateur emergency organization were manifested as ARRL considered plans for a railroad emergency committee, under the supervision of one A. L. Budlong. The plan was completed in 1924 and tests over the Pennsylvania Railroad proved eminently successful. During the two or three ensuing years this organization acted with good effect in numerous emergencies.

The earliest really widespread emergency situation in which amateurs participated was in February, 1924, when a raging blizzard swept the northern half of the U.S., paralyzing wire communication in the Middle West and isolating many large cities. Hundreds of amateur stations were active, handling messages for the railroads, press, officials and individuals, saving innumerable lives and much valuable property. Says *QST* of this operation: "It may be seen that many stations did fine work. There were many failures, however, and we are in no position to pat ourselves on the back insofar as the net results were concerned. Not enough stations were on the job. . . ." Today, with our comparatively high state of organization, we can *still* use more stations on the job.

Also during the early months of 1924, 8WR operated 8XAP during a Western Penna. sleet

storm that tore down wire lines, and 9DOW supplied communications service for ice-locked lake steamers near Duluth, Minn. In April, Canadian amateurs 1BQ and 1DD transmitted a request for press information from England on behalf of a Nova Scotia receiving station supplying several large American newspapers.

During the year, as a result of the work of amateurs in this field, the Commissioner of Navigation announced that thenceforth amateur stations would be permitted to use their own discretion during times of emergency regarding strict observance of the regulations — the beginning of our present understanding to do what is necessary in an emergency, worry about the regulations afterward.

From these early stirrings, emergency communication became one of the most important functions of amateur radio in years to follow, as we shall see in subsequent issues.

Technical Achievements

AMATEUR RADIO contributed its share — maybe more than its share — to the din of the Roaring Twenties. The launching of a major phenomenon of the era, radio broadcasting, was facilitated by the fact that amateur radio was in being, offering a ready-made audience able and willing to spread the word of the new scientific marvel. And thanks to amateur radio, there were technically-knowledgeable men in every major community — men who could do the jobs that had to be done to put broadcast stations on the air and keep them running; men who could handle the problems of receiver installation and maintenance.

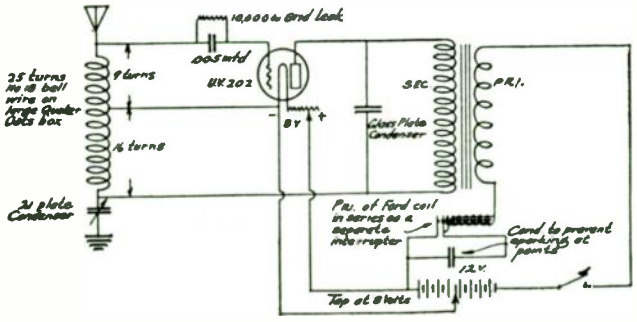
Broadcasting later was to assume the proportions of a menace. An activity of such tremendous interest to the public could not help but have an effect on radio communication at large. The amateur, being in the front line, so to speak, was among the first to feel it. But in 1921 this was a year or so in the future. Meantime, exciting things were happening.

Change was swift. Starting, in 1915, from a thirty-mile radius as the reliable range of a kilowatt transmitter, amateur radio had worked up such steam that signals had been heard coast to coast before the war. Now, in November 1921, everything was set to try to get 200-meter signals across the Atlantic — with the serious expectation of success. A first effort, in December 1920, had been a failure. But this was not so much a disappointment as a challenge. To meet it, Paul Godley was on his way to the British Isles to set up a receiving station for the transatlantic tests to be held the following month.

1921 Transatlantics

Godley took with him two receivers, one a standard variometer regenerative set with two steps of audio amplification, the other a 10-tube superheterodyne built especially for the tests. A superhet would occasion no comment today on a similar expedition — except for the small number of tubes — but in 1921 the circuit was an extreme novelty in amateur work; so far as the record shows, Godley's was the first to be so used. It would be highly interesting to listen in on it today, if it were still in existence, because from the brief details available it seems likely that it would have been capable of rather good single-signal reception of c.w. signals. There was no r.f. amplification, the antenna being coupled to a regenerative first detector, with a separate oscillator whose frequency was adjusted to heterodyne the signal to 100 kc. The intermediate-frequency amplifier had five stages, resistance coupled, the final one coupled to the detector through a transformer tuned to 100 kc. Godley's description of the set says that feedback from the plate of the last i.f. stage to an earlier one made the amplifier regenerative. A separate beat-frequency oscillator was used for c.w. reception, tuned about 1000 cycles off 100 kc. A single stage of a.f. amplification followed the second detector.

With this receiver and a Beverage wave antenna Godley heard seven spark and nineteen c.w. signals from North America during the test period in December 1921. Fittingly, perhaps, in view of its past accomplishments, spark was the first to get across; less fittingly, the honor went to a station to this day unknown. But spark's minority share of the total glory only emphasized the superiority of c.w., especially since nearly all of those c.w. signals had been generated by transmitters running much less than a kilowatt. In the very act of reacing the summit, spark was slipping over the precipice.



The spark-to-c.w. transition was helped along by using parts of the obsolescent spark equipment in c.w. hookups. This is a c.w. transmitting circuit using a spark coil to furnish plate power, described by 9DDY in March 1922 QST. It gave a modulated signal that could be copied on non-oscillating detectors.

Struggles With C.W.

Developments during 1922 only served to ram the c.w.-vs.-spark lesson home more unmistakably. With clocklike regularity — but with nothing monotonous about it to the amateurs of the time — c.w. was hanging up new records for distance and power. The superiority of c.w. performance, a growing conviction that spark operation was selfish in its use of the crowded spectrum, the impossibility of living with one's BCL neighbors with a spark transmitter in the shack, and the beginnings of an interest in waves still shorter than 200 meters — all these combined to hasten the day when spark would disappear from the amateur air.

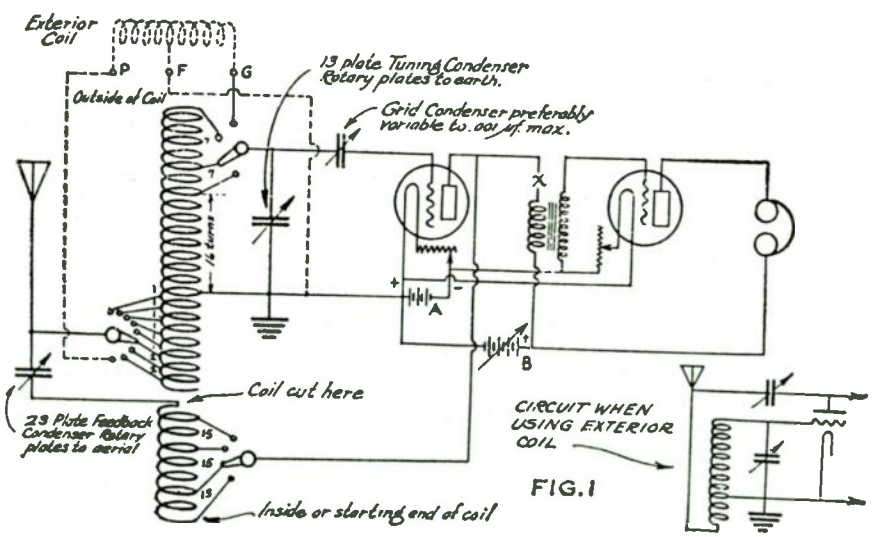
Not that c.w. was free from problems! Nearly all transmitting circuits used the antenna-ground system as the frequency-determining element in what today we would call the oscillator tank circuit. The effort on frequency stability, especially in windy weather, is not hard to imagine. Superficially, it might seem strange that a generation used to spark techniques, where great emphasis was placed on the necessity for using loose inductive coupling to the antenna, should have given almost no consideration to using the same type of coupling with c.w. To the amateur of the time there was no anomaly. In spark, the antenna system *was* the oscillating circuit; the primary circuit was there just to deliver a large chunk of energy in a hurry and then get out of the way, letting the oscillations be set up by the antenna. With c.w. there was no such sudden bang, since the tubes supplied energy continuously, but it was merely logical to continue to look on the antenna as the oscillator.

The necessity for better transmitter stability was of course recognized. The outstanding c.w. station of the December 1921 tests, 1BCG, had attained a steady signal by using a master oscillator-power amplifier circuit, an arrangement that was conceded to have the necessary attributes, but which was seldom found in the general run of amateur stations. Successful operation depended on using just as big a tube in the oscillator circuit as in the amplifier — and what amateur would willingly sacrifice the extra punch he could get from making *all* of his precious tubes pump power into the antenna? Stability wasn't that important — yet. Another reason was that while the theory was fine, the practice was something else again. There were only triode tubes, and "amplifier" circuits were little more than tuned-grid tuned-plate oscillators. If amplification was achieved at all it must have been in the form of an oscillation locked in frequency by the master oscillator, rather than straight amplification as we now know it. Whatever the reason, the m.o.p.a. did not catch on to any extent.

But in spite of shortcomings, c.w. was getting out. A repeat of the transatlantic tests was held in December 1922, this time with only European amateurs doing the receiving. Over 300 c.w. stations in Canada and all U. S. districts were logged — but no sparks. There were hardly any sparks left; the lessons of the previous year had been well learned. And now, for the first time, European amateur signals were heard in America — two British, one French. A meagre performance, but enough to show that it could be done. Preparations were begun for yet another series of tests, this time with the determination to work two-way across the pond. But here the whole course of amateur radio took a swerve toward a wholly new road.

The Short Waves

Ever since the reopening there had been rumblings about waves below 200 meters. It was known that work had been done in the lower regions during the war, and short-wave experi-



The second version of the Reinartz tuner used this circuit, reprinted from March 1922 QST. Many an old timer will recognize it as one he used in the early c.w. days.

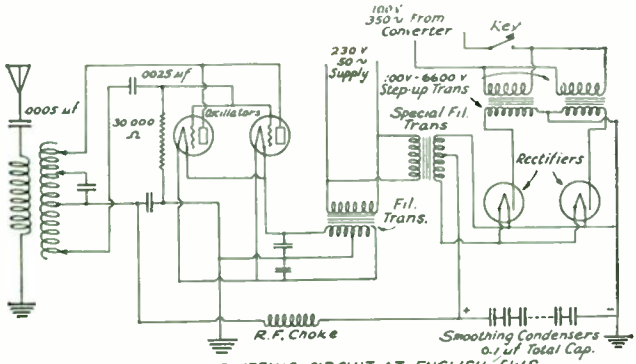


FIG. 3 FINAL TRANSMITTING CIRCUIT AT *ENGLISH 5WS*

British 5WS, a star station of the 1922 transatlantic tests, used the inductively coupled Hartley circuit shown above. Inductive coupling was rather rare on this side of the water at the time.

menting was continuing, particularly in France. A handful of amateurs on this side were plugging away in the vicinity of 150 meters, finding communication more reliable than at 200 and above, largely because of lack of QRM. But it was difficult. Receiving equipment then available didn't go that low, so contacts were few. The situation was summed up in a letter by S. Kruse of Bustands-ARRL Fading Tests fame, published in January 1922 *QST:* "Is there not some manufacturer (*sic*) who will produce a tuner . . . whose normal range is from 100 to 200 meters . . . ? Certain stations to our knowledge have done excellent work on waves as low as 150 meters . . . but . . . all these stations have abandoned the short wave . . . because no one else could tune down to them. . . . No one within their range had been able to buy a tuner that was made for amateur wavelengths."

Broadcasting and the success of the 1921 transatlantics had temporarily diverted attention from the shorter waves, except for a few persistent experimenters who wanted to get down below the mob where they could work in comfort. To their surprise, and in contradiction of accepted theory, they found that the transmitting range was not lessened at the shorter wavelength, even after allowing for the lack of QRM. Thus encouraged, a small group centered in Washington, Chicago and New England, determined to go still farther down. Eventually they reached 100 meters, finding things still better as they went. As reported by Kruse in March 1923 *QST*, in every test better signals were heard at some wavelength *below 170 meters* than at 200.

Making equipment function at 100 meters was no simple feat at the time, and Kruse's report was accompanied by a short article by Boyd Phelps on making receivers work at that wavelength. A description of three transmitting circuits followed in April *QST*, the one used by Reinartz, 1QP, being particularly interesting because it seems to be the first time that a counterpoise was used as the other half of a balanced antenna system, rather than as a capacity ground. A feature of this circuit was the establishment of a nodal point, or point of zero r.f. potential, at the filament tap on the oscillating circuit. The method of adjusting the circuit to accomplish this was described by Reinartz in a later issue. Getting the nodal point to come where it should subsequently became an important part of the technique of transmitter tuning.

While this was going on, Deloy of French 8AB had been involved in some short-wave tests with the government communication authorities in France. In a letter to *QST*, published in the October 1923 issue, he reported enthusiastically that strong signals were received at his station, 435 miles from the transmitter, on 45 meters *day and night*. Such performance was unheard of at 200 meters. With the evidence of superiority now piling up, there was only one thing to do — put the short waves to the acid test of transatlantic two-way work. Arrangements were made with Reinartz and Schnell, and the rest is history; November 1923 saw the first two-way intercontinental amateur contact, and the wavelength was 100, not 200, meters. The previously scheduled December tests, although highly successful, were anticlimax; from now on, international amateur communication would grow to be about as routine as interstate work had been on spark a scant two years earlier.

Receiving Developments

Manufacturers naturally like to cultivate the fields promising the most profit, and in 1922 broadcasting was beginning to be just such a field. Professional designers were concentrating on broadcast reception (and would continue to do so for at least another decade), leaving the amateur pretty much on his own. Although no longer a prime market of radio manufacturers, the amateur did benefit by the shower of components aimed at the BCL. And developments in broadcast reception were of technical interest, occasionally even proving useful in amateur communication. But for the most part the increasing importance of broadcasting to manufacturers forced the amateur into constructing his own apparatus, as developments in 200-meter communication made the older factory-built equipment less and less satisfactory.

Thus in March 1922 *QST* we find a remodeled Reinartz tuner described, incorporating improvements that gave it a still greater edge over the variometer set for c.w. reception. It featured an untuned inductively coupled antenna circuit and a fixed tickler coil with capacitive control of regeneration, making for ease of tuning and, comparatively, freedom from tuning effects on the part of the regeneration control. Easy to build, the tuner became even more popular than the original model had been.

But while developments of this sort moved in the direction of greater simplicity, there was no lack of interest in more complicated methods, even if there was no great disposition to put them into practice. It was generally admitted that the ideal thing would be r.f. amplification, increasing the signal strength *before* detection, since detectors were square-law devices favoring strong signals at the expense of the weaker ones. But the problems of r.f. amplification at 200 meters seemed almost insurmountable.

The villain here was the capacity between elements of the triode tube. Although the input and output capacities could be circumvented by absorbing them into tuned circuits, this merely gave the grid-plate capacity the opportunity to get in its dirty work and set the amplifier into oscillation. The only stabilizing method known to the amateur world at the time was the simple one of loading the circuit by putting a positive bias on the grid. This could kill off self-oscillation, but it killed off the amplification, too. Consequently, attempts were made at various types of untuned interstage coupling. There is no evidence that anything but indifferent success attended these efforts.

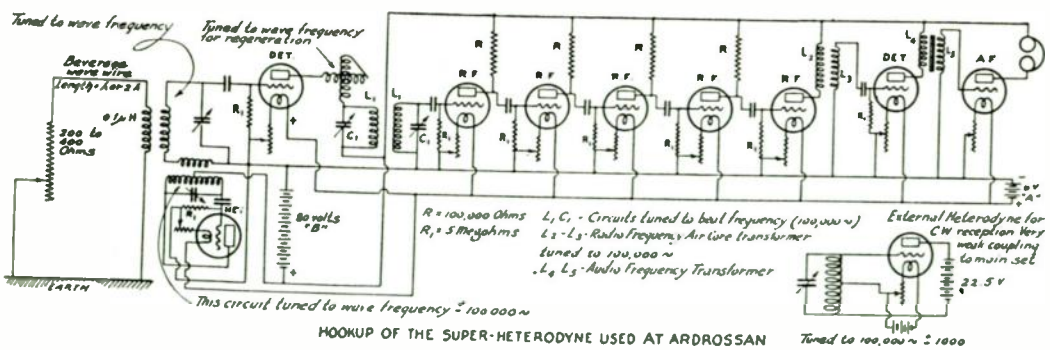
Superregeneration, announced in mid-1922, started a mild furor. After six months or so any further references to it disappeared from the pages of *QST*; it had shown no advantages over the plain regenerator for 200-meter work.

The superhet had a small share of attention, but it too was passed by for amateur work — too complicated, perhaps, for the ordinary amateur, and too hoggish when it came to A and B power consumption. (Remember that batteries had to be used for filament and plate supply in this era. With a heavy drain, B batteries went dead in a hurry, and A batteries likewise.)

But possibly the most potent factor of all in discouraging the use of these more complicated receiving methods was Ballantine's "Radiotelephony for Amateurs," the amateur's Bible of the period. Ballantine showed that to get sensitivity equal to that of an ordinary regenerative detector at least two r.f. stages would be needed at 200 meters. Furthermore, he also showed that the square-law assumption for detectors was untrue in the case of an oscillating detector. The oscillating detector was just as kind to weak signals as to strong ones, a simple fact that negated the most powerful argument for r.f. amplification. At the same time, it was a powerful argument *for* c.w., the reception of which required that the detector be oscillating. Even the introduction of Hazeltine's neutrodyne, which overcame the principal disadvantage of the r.f. amplifier, failed to make an impression in amateur ranks. However, the neutrodyne quickly became the rage in broadcast reception where the detector was *not* oscillating.

At this period, then, amateur receiving methods are notable chiefly for the way in which they clung to the fundamentals that had proved most effective for *amateur* work, rejecting those superficially attractive schemes that may have had their place in broadcast reception. The exigencies of c.w. reception demanded, and got, simplicity in circuits and simplicity in operation. It was fortunate, probably, that the manufacturer left the amateur to work out his own destiny at this juncture.

There has probably never been a time in the history of amateur radio when so much of technical interest happened as during the period from, roughly, late 1921 to early 1924. In the few pages available here it has been possible to touch only on some of the high spots; some will have to go over until next month. Even so, and even if



HOOKUP OF THE SUPER-HETERODYNE USED AT ARDROSSAN

The receiver circuit used by Godley in the successful transatlantic tests of December 1921. With a regenerative first detector and a regenerative i.f. amplifier, this could have been the first amateur receiver to approach single-signal c.w. performance. The detector tubes were UV-200s; the others, A-P amplifiers of the "hard" variety.

unlimited space could be allotted, it is doubtful that any chronicler could recapture the spirit of adventure that pervaded the amateur ranks at the time, the exciting conviction that ever-greater achievements were just around the corner, the wealth of techniques that were tried and laid away to be revived years later — often under new names — when the need become more apparent. Truly, those were great days.

Advertising:

The Broadcast Boom

THE SUCCESS OF 1BCG and other c.w. stations in the December 1921 transatlantic tests further stimulated c.w. operation. "Duplicate the set heard across the Atlantic," said RCA in February, 1922. In the same month Pacent Electric advertised Dubilier condensers as a vital part of 1BCG. Esco in March said it had a part in the station's triumph.

But now the rapid growth of broadcasting began to be reflected in the advertising columns of *QST*. Equipment for broadcast reception was advertised in quantity. Westinghouse, Burgess, Willard, Prest-O-Lite, and Eveready batteries were active and so was G. E. with its Tungar charger. Magnavox, Dictograph, Telmecophone and Western Electric were among those looking for speaker business, and let's not forget Doolittle's Audimax — the same Doolittle that had advertised the Decremeter. (Well, Dad, did you explain?) There were at least twenty-five headset manufacturers ranging from names like Everett, Monarch and Leich to more familiar present-day firms such as Federal, Kellogg, Stromberg-Carlson, Briggs & Stratton.

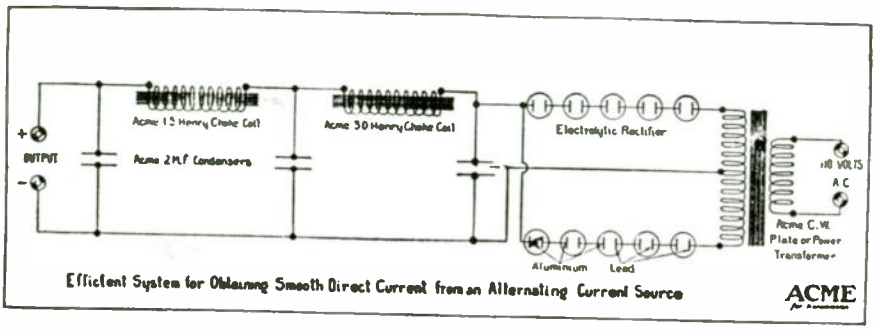
Well known among those who liked to drill their own panels were Radion, Bakelite, Celoron, Formica, Eisemann.

At that time there was no sharp dividing line between amateurs and BCLs. Many amateurs listened to music, amateur phone and c.w. on the same receiver. Advertising was addressed to either or to both. Esco in March 1923 showed a charger for "charging batteries used in wireless operation" but in December Exide asked, "Will your battery stay for the concert?" Grebe in June 1923 said the CR-6 "increases the tone qualities of music and increases the range of c.w. reception." Battery charging advertising became common in 1923 with names like Signal, Radio-Q, Valley, Westinghouse, in *QST*.

The shift from amateur to BCL advertising which began in 1922 and continued through the first part of 1929 followed a pattern that was to be repeated some years later when certain com-

Don't annoy your neighbor

How to avoid interfering with the broadcast listener



Follow this diagram and you can make an efficient filter for your set

panies deserted ham radio for television, and new companies sprang up. Receivers, mostly for broadcast reception, included Day-Fan, Kennedy, Radiodyne, Mu-Rad. These were complete receivers, not just tuners. Even Grebe in September 1924 went heavily into the broadcast receiver business. Zenith, Paragon, Crosley, tied in their receivers with MacMillan's WNP North Pole expedition.

Names like Grimes Inverse Duplex, Neutrodyne, Deresnadyne, Islodyne, in the advertising indicated the circuits employed in certain receivers to avoid infringing upon the Armstrong patent which controlled the use of the superheterodyne circuit.

Component advertising, also mostly for BCLs, remained heavy through 1925, especially on tubes and variable condensers. Cunningham, Myers, Sodion, Radiotron, Amrad, were among the tube advertisers; a few of the fifteen or more companies manufacturing condensers were Cardwell, Acme, Allen-Bradley, General Radio. National's first ad in *QST*, March 1924, was on a condenser — the type DX Vernier. Exactly one year later Hammarlund's initial ad, also on a variable condenser, showed the Model C.

In line with the use of *frequency* instead of *wavelength* in 1925, several manufacturers advertised their newly designed variable condensers. Pacent, Amsco, Duplex, U.S. Tool, talked about straight-line frequency. The advantages of their own engineering, neither straight-line frequency nor straight-line wavelength, were extolled by Precise and Karas.

Weston, Jewell, Roller-Smith, Westinghouse, were advertising meters in 1924, 1925. Hoyt started in January 1926 and Sterling in August 1927.

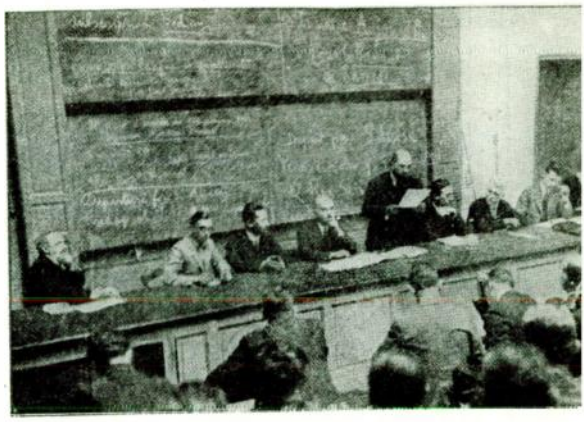
However, in 1924 and 1925 a few companies advertised to amateurs only: Ott Radio's receiver, Whittlesey and Hull masts, Wade transmitting condensers, and Pyrex insulators, for example. In August 1924 Acme stated ". . . we haven't forgotten the amateurs . . . while it seems that many others have ceased to do so, Acme still makes transmitting apparatus." In May 1925 Jenkins Labs made "available to American Radio Experimenters . . . machines which will both send and receive pictures, sketches, drawings . . . etc." Advised E. F. Johnson in November 1924, the first ad: "Ask for our new ham catalog."

The first *QST* Vibroplex ad appeared in April 1925, the Gold Bug in March 1926, the Ultimate key in February of the following year, the Electro Bug in July 1928.

Esco's "Filter Facts," the first monthly series in *QST* of engineering-explanatory ads, started in December of 1924. QST

ARRL

and



International Amateur Radio

AMATEUR radio regulation in 1925 was a singularly uncomplicated affair, with the regs occupying less than a page in *QST*. These regulations had been rewritten each year in accordance with the Hoover conferences held by the Department of Commerce, a practice which had begun in 1922 and which was to continue until 1926. "Frequencies" were almost unheard of — everyone operated on wavelengths. The amateur bands included 150 to 200 meters, 75 to 85.7, 37.5 to 42.8, 18.7 to 21.4, and 4.69 to 5.35 meters. Converted to our present-day frequencies, these were the bands of approximately 1500–2000, 3500–4000, 7000–8000, 14,000–16,000, and 56,000–64,000 kc. Quiet hours from 8:00 P.M. until 10:30 P.M. were mandatory if you operated on the 150–200 meter band or if your plate supply did not provide a pure continuous wave. The special sub-band of 170–180 meters was allocated to those who wished to use phone, spark, or i.c.w.

But the amateur and the broadcast listener and the Department of Commerce were having their troubles. Despite the quiet hours imposed everyone operating on the 150–200 meter band, interference to broadcast reception was rife, and amateurs were threatened with quiet hours even on the wavelengths below 85 meters. *QST* published a series of editorials on the subject, the Department of Commerce sent out warning letters, and about a hundred licenses were suspended in the spring of 1925.

One solution to the problem was for the amateur to obey the technical regulations. Inductive coupling, good power-supply filters, key-thump filters — these were required at the amateur station that was going to both obey the regs and stay out of difficulty.

Another solution was the formation of Local Vigilance Committees in every city where there was interference trouble. These committees were composed of three transmitting members of the League, a representative broadcast listener, and a member of the press. Each Committee was to announce its existence in the press, search out cases of interference, and do its utmost to solve them.

Amateurs of today are so careful of the band edges, and accurate measuring and marker equipment is so common, that it is hard to imagine the rather cavalier attitude taken toward the observance of band edges in the mid 1920s. For one thing, not many hams had frequency meters, and not everyone had an accurate wavemeter. The League appointed a number of OWLS, Official Wavelength Stations, who regularly announced their wavelength of operation so that listeners might calibrate their receivers, and standard frequency transmissions were made from the Bureau of Standards, the Massachusetts Institute of Technology, and Stanford University. The problem of off-frequency operation was complicated, too, by a factor which does not exist today. In these early days of ham radio, the U.S. assignments did not agree with foreign assignments, for there was no international radio law and no international allocations table. Thus, U.S. amateurs had a habit of sliding down to 30 meters, where some of the foreign hams were congregated.

As we have said before, all of this regulation was based on the "gentlemen's agreements" developed at the National Radio Conference called by Secretary of Commerce Hoover. But a legal decision early in 1926 said in effect that the Department of Commerce had no authority to impose on the stations operating below 200 meters any restrictions not expressly written into the radio law of 1912. This made wavelength assignments in narrow bands, quiet hours, limitations on types of equipment, all without legal standing. What resulted from this court decision was pandemonium in the broadcast field, but an adherence to the established order by amateurs. Broadcast stations came on the air by the dozen, increased their power, moved to "more choice" wavelengths — but the amateurs stood fast on their word.

Our title photo above shows delegates participating in the organization of the International Amateur Radio Union in 1926.

. . . It was freely predicted that when the conference adjourned amateurs would have 600 kilocycles at the British figures, and no more. There was good reason for this belief. . . . It represented more territory than many nations felt amateurs should have. Only a few countries of the world had any actual concept of the fact that amateurs could be anything but a liability; the rest, although they were made familiar with the American situation by formal discourse and private visit, could not stretch their credulity sufficiently to believe that the U. S. government actually granted these privileges of its own free will. They believed, instead, that American amateurs forced this recognition through political influence, and they were afraid of such a possibility in their own countries. There was no adequate way to control thousands of amateurs except, as Germany had indicated, control through technical considerations: making it so difficult to operate that amateurs could not do much harm in violation of the state's monopoly. Bands for amateurs? Well, perhaps; but small bands, narrow bands, in territory not needed for government use, and with all utilization highly restricted. There had even been talk of restricting all amateurs to 13 meters and below. Such was the attitude. And the British, despite their preconference cordiality, were among its most rigid upholders.

Days passed, in which much of the other business of the conference was settled. Eventually the actual work of constructing an allocation table was at hand. Recommendations were to be turned into regulations. Formal committee meetings resulting in no progress, informal discussions between delegates of the several leading nations were substituted, over afternoon tea-cups and evening delegation-whiskey glasses. The process was an involved and protracted one. Two delegates would get off in a corner and talk quite frankly until they discovered something they could agree upon. A third was brought into the circle, and then another, until finally general agreement on one point was reached. Then the same thing occurred in connection with other matters. Finally the stage was reached where most of these viewpoints had been reconciled among the larger and more influential nations, whereupon formal approval in committee was sought.

The amateur was well supported in this "tea-cupping," not only by his representatives but by the American delegation, from Secretary Hoover down. Major General C. McK. Saltzman, in charge of all technical matters, has always been a loyal friend of the amateur; so was Lieut. Colonel J. O. Mauborgne, U. S. A., Captain S. C. Hooper, U. S. N., and Lieut. Commander T. A. M. Craven, U. S. N. Captain Hooper presided at all informal meetings of the "tea-cuppers." Commander Craven conducted the actual negotiations during the time which Colonel Mauborgne later referred to as "those hectic days when a frequency channel was more eagerly sought than a million dollars." More than any other man, it was Craven who was responsible for the final Washington frequency regulations. He originated the "ladder" scheme of allocation for the frequencies above 1500 kilocycles; he conducted much of the informal negotiation; and, particularly, he and his associates safeguarded amateur radio.

Point by point, in seemingly endless detail, the tea-cupping went on. The upper amateur band was set at 1715–2000 kilocycles (the 1715 figure being the result of the European adherence to a wavelength scale) or 175–150 meters. After much argument, amateur bands centered at the American 80–40–20 meter figures, rather than the British suggestion, were approved. The width of these bands, however, was not so easily settled. Craven held out for wide bands; Shaughnessy [Great Britain] insisted on narrow bands, and most of the nations supported him. Australia, New Zealand and, at first, Canada occupied compromise ground. Agreement being impossible, Warner, in conference with Craven, evolved the idea of establishing N.G.P. (not open to general correspondence) bands for government stations, amateurs, etc., which each nation might sub-

From all of this was to come the Radio Act of 1927, which set the pattern for all future radio legislation in this country. The word "amateur" was used for the first time in any statute. The Act created the Federal Radio Commission and gave it powers to classify radio stations, prescribe the nature of the service to be rendered by each station, assign frequencies, prescribe technical standards, provide for the elimination of interference, and require logs.

Revised international regulation was just around the corner, it having gone fifteen years without a change. Since the London Conference of 1912 there had been a world war and a vast change in the technology of radio. When the Washington Conference was finally held in 1927, it had to provide for a whole new field — high-frequency radio — and many new services, including two which continue to be competitors for high-frequency spectrum space — amateurs and short-wave broadcasting.

Again, this conference would set the pattern which international amateur radio legislation would follow in the years to come. ARRL was by necessity the voice of amateur radio throughout the world, because in many other countries amateur radio societies were either non-existent or too new to have any influence in their govern-

allocate as she wished. This plan did not meet with general approval, but it offered opportunity for a pre-arranged compromise proposal by Captain Gino Montefinale of Italy for bands of variable width, as each administration desired, centered at the proposed figures and with certain maxima not to be exceeded. Thus Italy was added to the small group of amateur supporters. But France, England, Germany objected. The German tactics were especially violent; it was rumored that Germany had licensed a new station at 7200 kilocycles after the conference had started with no other purpose than to provide an obstacle to the amateur negotiations. Eventually a new Shaughnessy proposal—400 kilocycles at 18.75 meters, 200 kilocycles at 37.5, and 100 kilocycles at 75, a tremendous concession by the British but still unsatisfactory—was made, supported by all but France, Italy and the United States; this was referred to a still smaller group to which was assigned short-wave broadcasting matters as well.

The first action by this group was the acceptance of Commander Craven's proposal of 3500–4000 kilocycles non-exclusively, the existing American assignment. This was the first ray of light; at the very least, it assured adequate domestic territory in conjunction with the 1715-kilocycle assignment. The 20-meter band was next considered; after discussion it became apparent that 400 kilocycles was the only figure on which the group could reach agreement. It represented the maximum compromise in either direction that could be achieved by the "sub-tea-cuppers" in attendance—Colonel Mauborgne, Commander Craven, Major W. Arthur Steel of Canada (the only government representatives present), K. B. Warner, representing the amateurs, Dr. Van der Pol of the Netherlands, representing the broadcasters, Charles E. Rickard, representing the Marconi beam stations, and Captain H. Abraham of Germany, representing Telefunken.

With the 80-meter and 20-meter bands finally settled, this group tackled the 40-meter band, the most important of all. The United States demanded 7000 to 8000 kilocycles. But the most that the other delegates would consider was 200 kilocycles, for at 7200 there appeared a German station; since unanimous agreement was needed, and Captain Abraham was adamant, this proved a difficult stumbling-block. Another location was sought, but was blocked by Major Steel of Canada, who exhibited determined opposition to the amatuer cause, in complete variance with the anticipated Canadian attitude. Finally, Captain Abraham agreed to 225 kilocycles, amid general approval. Warner's objections were set aside. Additional bands at 28,000 to 30,000 kilocycles and 56,000 to 60,000 kilocycles, on a shared experimental basis, were readily fitted in, and this group reported to the larger group.

A night of debate among the amateur representatives followed. The U. S. delegation had expressed despair at securing any additional territory. The 3500–4000 kilocycle assignment was in itself remarkably magnanimous; should the international situation be accepted in order to strengthen the hold on the domestic bands? Maxim and Stewart were of the opinion that discretion was the better part of valor; Warner, however, held to the idea that the better plan was to gamble all on a last desperate attempt to salvage a usefully large international band. Eventually, it was decided to gamble comparative safety and hold out for 400 kilocycles at 40 meters.

When the subject came up the next morning, Warner, as the amateur representative, was the sole objector to the proposed table. Captain Hooper supported him; Shaughnessy opposed. Eventually after wearisome debate, Captain Abraham agreed to shift his station 75 kilocycles more, allowing 300 kilocycles; the British agreed to accept the change, and the group adopted the proposal.

From that point on those figures were not changed.

—Portions of this story in contrasting type are from *200 Meters and Down*, by Clinton B. DeSoto.

ment. Because of close contact with those who would be on the U.S. delegation, a position by the U.S. government favorable to amateur radio was assured. The League's Vice-President Stewart had appeared before the committee responsible for forming U.S. position and had stated the amateur case, many months before the actual conference. Subsequently, liaison with this committee was closely maintained. Because of this agressive policy for ARRL, Secretary Warner was able to report to the Board just prior to the Washington conference that the United States position on amateur radio was that it would attempt to secure international adoption of the privileges afforded amateurs in the United States.

This was a request which seemed nothing less than fair to U.S. amateurs, but which was to be met with great coolness on the part of other governments. The United States was one of the few countries where communications had developed on the basis of private enterprise, while in most other countries communications were a government monopoly, and the idea of numbers of private citizens being licensed to communicate freely without government control was considered dangerous. In fact, prior to the conference a number of countries announced their intentions of either eliminating amateurs entirely from the

T. A. M. Craven, who as a member of the U. S. Delegation played a key role in support of the amateur position at the 1927 conference in Washington. Mr. Craven subsequently served two terms as an FCC Commissioner.

frequencies above 1500 kc., or else limiting them to very low power and/or narrow bands of frequencies.

The League had a selling job ahead of it! Fortunately, as we have already recorded, the U.S. government had promised to support amateur radio. Now to tackle some of the other governments, with the help of such other amateur societies as existed.

The first break came when, in September, Secretary Warner and Canadian General Manager Russell were able to speak with the entire British delegation and representatives of other British Empire groups. As a result of this presentation, these British delegates agreed to give favorable consideration to U.S. proposals. But this was rather luke-warm support, and the conference got underway, 74 countries participating, with the amateur being supported warmly by the United States, half-heartedly by a few other nations, and not at all by a good many.

We need not chronicle in detail here all that went on during the weeks to come — suffice it to say that, thanks to the firm and unswerving support of the U.S. delegation, the allocations table was whacked out line by line, step by step, and amateur radio was provided for. And how was this done? We think you'll find the accompanying excerpt from *Two Hundred Meters and Down* edifying (pages 66–67).

When the Washington Conference of 1927 was over, amateur radio was for the first time provided for on an international basis. The frequency bands assigned represented for U.S. amateurs a loss of about one-third of the frequencies which had been provided for them by the "gentlemen's agreements" reached at the Hoover conferences but represented for many foreign amateurs substantial gains in privileges. Further, thanks to the firm support afforded by the U.S. government delegation, these frequency bands were far greater than if some of the other governments' proposals had been successful. For example, under the British proposals amateurs would have ended up with a total of 600 kilocycles, instead of the 7485 kilocycles that were in fact allocated to amateurs.

But what would amateurs do now that they were forced to operate in these narrower frequency bands? There were wails of anguish from some quarters that the League had sold the amateur down the river, that amateur radio was finished. But was it? Not quite. The League had embarked on a Technical Development Program, as will be related elsewhere in this series, so that clean stable transmitters and selective receivers were within the grasp of everyone. With these tools available, the nation's 16,000 amateurs found that they were not overcrowded in the bands available. And a good thing it was that the regulations had been stabilized and the techniques improved, for in the next half dozen years the amateur population mushroomed by some 300 per cent.

—···—

Among other developments during this period, one was to prove a particularly important and effective part of amateur radio through the years: the formation of the International Amateur Radio Union, having as its purpose the coordination and fostering of international two-way amateur communication. The coming of international DX and the prospect of worldwide radio had made it patently clear that some sort of international union among radio amateurs was necessary. President Maxim of ARRL laid the groundwork during a business trip to Europe in early 1924, and on April 14, 1925, the First International Amateur Congress convened, with 250 delegates in attendance. A constitution was written and approved, and officers were elected. Hiram Percy Maxim was the first president, Kenneth B. Warner the secretary-treasurer.

Membership was to be by individuals until there were twenty-five members in a country who could band together and form a national section. By 1928 there were enough strong national societies so that the IARU could be reorganized into the federation of societies originally contemplated. There was no provision for dues or financing, and it was agreed that one national society would be chosen to act as the headquarters society to conduct the affairs of the Union, act as a medium for the carrying on of Union business, and that its officers would be the officers of the Union. ARRL was chosen as the headquarters society and has so continued to this day.

The Union itself has played an important part in the international affairs of amateur radio, and has participated actively and officially in the international telecommunications conferences which have affected amateur radio.

Sidelights

"Anything labeled 'technical' is thought to be too difficult to understand," laments *QST*'s technical editor in *January, 1925* . . . At the Dakota Division Convention in *November, 1924*, Don Wallace was toastmaster at the "Don Mix" banquet . . . Belgium's hams are now licensed, and no longer have to operate in secret. *June, 1925* . . . The Headquarters office has moved from 1045 Main Street to 1711 Park St., Hartford. *July, 1925* . . . Even in 1925 there was a plea for honest signal reports. In those days you didn't say, "You're 40 db. over, OM." You said, "You're very, very, very QSA, OM!" . . . The regs didn't require that a log be kept, but Asst. Traffic Manager Budlong had some good suggestions on why an amateur should. *November, 1925* . . . The first National Convention of Canadian Amateurs was held in Montreal in *November, 1925* . . . The regs were changed in *December, 1925*, to permit phone operation on 3500–3600 kc., in addition to the phone privileges on 170–180 meters . . . Ten Swiss amateurs had their complete stations and all correspondence and QSLs confiscated by Swiss authorities, because the amateurs concerned had been communicating with foreign hams. *March, 1926* . . . ARRL dues were increased from $2 to $2.50. *April, 1926* . . . The editor opined that DXing was becoming too much of an obsession with some hams. *May, 1926* . . . The first edition of the ARRL *Handbook* was announced. *October, 1926* . . . A George Bailey, 1KH, wrote in to say that at the ripe old age of 39 he became a ham entirely through the study of *QST* and the *Handbook*. *June, 1927* . . . It was announced that there was now a licensed ham transmitter in Japan. Three unlicensed stations had been fined. *August, 1927* . . . 1MK, the ARRL Headquarters station, was moved from 1711 Park Street out to Brainerd Field, an airport along the bank of the Connecticut River, where operating conditions were expected to be much better. *April, 1928.*

Operating Achievements

An eminent radio engineer was talking with the editor of QST ***prior to the 1921 transatlantics. "It can't be done," he announced dogmatically. "Why," he explained, vest-pocket slide rule in hand, "the number of amperes that with a kilowatt input can be erected at the base of a 200-meter transmitting aerial of optimum effective height simply isn't capable of inducing the minimum required microvolts-per-centimeter of receiving aerial length to produce a signal of unit audibility at anything like that distance!"***

— Two Hundred Meters And Down

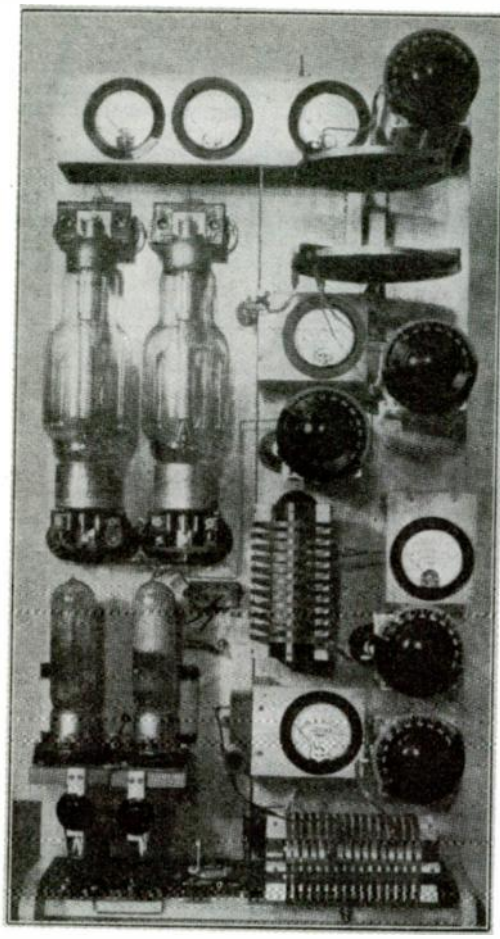
FORTUNATELY, most amateurs of the twenties were not familiar with the theoretical reasons why the shorter waves were "worthless." Their restless, inquiring minds . . . their indefatigable, pioneering spirit . . . started the trek downward in the exploration and development of unknown territory — soon to become the most valuable portion of the spectrum.

As month after month brought new successes with shorter and shorter wavelengths, every operator who could do so sought to establish two-way contacts and extend his station range. The first concentration on about 110 meters gave way to expanded activity in the new 80-meter band resulting from the Hoover radio conference. During the winter of 1924–25, hams on four continents were QSOing nightly at 80 meters. In order to encourage further exploration, ARRL offered trophies for original work on the 40-, 20- and 5-meter bands.

The League's Traffic Department kept busy with projects to improve operating and station capabilities. The eclipse of January, 1925, called for nationwide fading tests. The inauguration of President Coolidge in the spring of 1925 prompted another Governors-to-President relay. Washington's birthday was the signal for another set of Transcons. Midsummer short-wave tests for 40, 20 and 5 meters were announced, and the editor hoped that someone could break the existing DX record for 5 meters, which was the roughly 100 miles between Hartford and Boston. In May of 1925 English and Australian amateurs succeeded in having a daylight QSO on 20 meters, and at the same time there was a controversy in the pages of *QST* as to who had been the first to work across the Atlantic on 20 meters.

In the spring of 1925 ARRL granted a seven-month leave of absence to its Traffic Manager, Fred Schnell, so that he could conduct tests with the Navy on Pacific Fleet maneuvers. Using the famous call letters NRRL, his two suitcases full of ham gear kept in touch with shore far beyond range of the huge shipboard transmitters.

Recognizing the new frontiers in amateur radio, the 1926 ARRL Board renamed its Traffic Department the Communications Department. District Superintendents and City Managers were abolished; elections were announced in *QST* for the newly created post of Section Communications Manager for operating administrative purposes. Official Bulletin Stations were inaugurated, transmitting latest amateur news "each Saturday and Sunday night at 10:30 P.M." With BCI a continuing headache, the



This is the transmitter which Fred Schnell built for use on the NRRL cruise. It used a pair of 210s in parallel as a crystal oscillator, a pair of 203s in parallel as a frequency doubler, and a pair of 204As in parallel as a power amplifier.

Official Observer system was conceived as a means of amateurs helping each other keep out of trouble.

The first ARRL Headquarters station (beyond Mr. Maxim's 1AW at his home) was a 20-watt rig of four UV-202s in parallel, operated during the noon hour by some of the 18 staff members. Later, 1MK was moved to rented quarters at the Hartford airport, where two 204As and a single 861 gave a real punch to simultaneous 80–40-meter bulletin schedules.

In August, 1925, the Army announced a plan of cooperation between the Signal Corps and transmitting amateurs, approving an agreement that had been drawn up between members of the Signal Corps and the League's Board of Directors earlier in the year. Goals of this co-operative agreement were to secure additional lines of communication that could be used during a time of emergency and to build up a trained reservoir of radio operators trained in army methods of handling traffic. Hams participating in this program would be known as Army Amateur Radio Stations. The announcement in October, 1925, *QST* brought a rush of applications, and by mid-1926 AARS was operating in high gear.

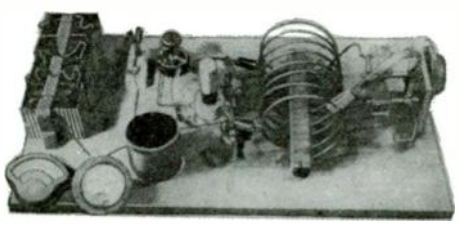
The trunk-line system of handling traffic took a back seat to a new 5-point system: each amateur was called upon to select stations to the north, east, south and west of him and keep schedules with them. From time to time these patterns were interconnected by interesting maps in *QST* so that a chain of schedules could be used for routing traffic.

It was in these earliest days of DX that the sixth district amateurs began establishing their reputation. In April, 1926, the first WAC certificates were issued, with the first two going to u6OI and u6HM.

The Jewell Electric Instrument Company sponsored a contest for low-power work, the winner to be that ham who achieved the greatest miles-per-watt. The wattage was to be the *total* input to all tubes in the transmitter, including filaments. Loren Windom, 8GZ, was the winner, and his outstanding achievement was the QSO with Australian 5BG, using an input power of .567 watts over a distance of 10,100 miles. This gave a record-breaking 17,820 miles per watt. The tube was a 199 with four volts on the filament and 70 volts on the plate.

In March of 1927 was carried the announcement of the first International Relay Party — the first DX contest. It was to run from May 9 until May 23, and rules were vastly different from present-day versions. Each U.S. amateur could send one, and only one, test message to each foreign country, but could receive as many test messages as he wanted.

A new opportunity for amateur exploration came in 1928 with the opening of the band at 10 meters. It was an unknown territory, and a few dozen amateurs tackled it in earnest, responsive to *QST* technical articles. Initial results were spotty and disappointing, particularly since many hams had hoped that it would turn out to be a "super" 20-meter band. However, some results were obtained. A schedule between W1CCZ and W6UF produced successful communication on seven consecutive days, and the entire series of QSOs was heard solidly by ZL2AC.



Loren Windom, 8GZ (who, just incidentally, happens to be one of our authors in this 1964 issue of *QST*), established some low-power records in 1926 using this rig. The tube is a UV-199, the plate power was 75 volts at 5 ma., the circuit was self-excited.

It was not until several years later that developing knowledge of the sunspot cycle brought a better understanding of the vagaries of the 10-meter band.

This too was a period of the earliest DXpeditions. The *Bowdoin*, the Coast Guard Ship *Arctic*, the yacht *Tahiti*, the airship *Shenandoah*, the yacht *Kaimiloa*, Schnell on the *USS Seattle*, the Savoy Geographic Expedition in Brazil and the Byrd expeditions to Arctic and Antarctic regions — these and many, many more carried amateur equipment and amateur operators and thus enabled amateurs to render communications services and establish the finest traditions.

In these few lines we have been able to tell you only briefly of the operating activities of amateurs in the middle 1920s. It was a period of exploration, of seeking out the capabilities of newly discovered bands, of seeking out the capabilities of unused bands, of contacting kindred spirits throughout the world.

And yet new techniques, new explorations were just around the corner. We will discuss another month what changes in the operating habits of amateurs came with different frequency assignments, different equipment and techniques.

Emergency Communications

DURING the 1925-29 period, amateur radio emergency communications took some rapid strides toward operational readiness. The first concrete step took place in an announcement early in 1925 to the effect that thenceforth "QRR" would be the signal indicating that there was a *railroad* emergency and all amateurs should stand by to assist in handling railroad traffic. The item in March 1924 *QST* was signed with the initials A.L.B. "Emergency traffic," it says, "will have precedence over all other forms of traffic."

The year 1925 was the one in which explorer Floyd Collins was trapped in Sand Cave, Ky. Communication was needed from the rescue site to Cave City, the nearest telegraph office, and was supplied by 9BRK, who set up a transmitter using two "5-watters" and 500 volts of dry batteries. At Cave City 9CHG did the receiving. This circuit remained in continuous operation for four days, with no sleep for the two operators; there just weren't any others available.

In the same issue of *QST* reporting the above emergency work is an item concerning a test being run by the Burgess Battery Company for providing an emergency power supply using standard "B" batteries for plate supply. The system used at 9VD consisted mainly of unplugging a pair of 50-watt tubes and plugging in a pair of 5-watters while a d.p.d.t knife switch made the change from a.c. power supply to the B batteries. Simple, but effective.

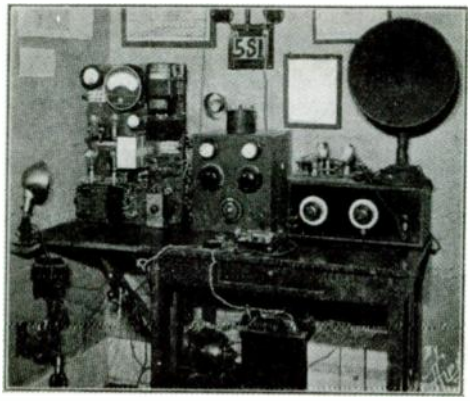
Emergency work hit the editorial pages of *QST* in January, 1926, when K. B. Warner urged all amateurs to take part in "railroad emergency" preparations. In January, the Pennsylvania Railroad requested a special amateur circuit set up to serve their system during emergencies and A. L. Budlong was put in charge. Several tests were held, and many amateurs participated. The distinctive call "PRR" was used during these tests and for years was the Pennsylvania Railroad's rallying call for amateurs serving the system.

Meanwhile, our Canadian friends were not idle. In November of '25, Canadian 4CG at Selkirk, Manitoba spent three days trying to get medical aid from Winnipeg for a critically ill woman and child, in the absence of regular communication facilities. Contact was finally made with 9EBT in Fargo, N. Dak., who wired Winnipeg and a doctor was dispatched to the isolated village of Selkirk in time to save two lives.

Even then, Florida hurricanes were "old hat" to the natives, but the use of amateur radio for emergency communication was something new and wonderful. After the particularly vicious hurricane that hit Florida in 1926, all wires and power lines were down and communications were just nonexistent. Dozens of amateurs bridged the communications gaps with their own battery-powered equipment. Amateur stations 4KJ and 4HZ received prominent mention in the writeup. Others mentioned were 4PU, 4SB, 4IZ, 4PI, 4FS, 4RM, 4HU, 4NH, 4DD, 4BN and 4VS, along with many stations out of the area who assisted in handling traffic. This hurricane's path and characteristics were used in the Florida 1961 Simulated Emergency Test described on page 20, March 1962 *QST*.

In February of 1927, San Diego, Calif., ex-

An emergency installation in 1924. This is 9BRK, who with 9CHG operated four days without sleep as rescuers attempted to reach Floyd Collins in Sand Cave, Ky.



5SI—A REAL RM LAYOUT
Note dynamotor at bottom, which furnished emergency plate supply during the Mississippi flood.

This station, 5SI, operated on emergency power during the 1927 Mississippi River flood. The dynamotor, operating from storage batteries, is under the table. Ray Arlege, 5SI, later served as ARRL Director from the Delta Division.

This picture and caption originally appeared in *QST* for August 1927.

perienced a communications emergency crisis when heavy rains washed out wire lines. Several amateurs handled all communications while repairs were being made, including 6DAU and 6FP.

Consciousness of the need for emergency power was being felt. The May 1927, issue of *QST* contains an article by 1AY describing a number of emergency power installations at various amateur stations. No mention whatever is made of gasoline-driven generators in this article. The primary source is always a battery or batteries. Some used banks of "B" batteries for plate source, with "A" or lead storage batteries for filaments. Others used battery-powered dynamotors. One unique system described is use of a spark coil to supply plate voltage for the tube, but caution is advised that this causes an "i.c.w. note," whereas only a "pure d.c." note is allowed in the lower-frequency bands.

Other instances of amateur work in emergencies during 1927 occurred in the flooded lower Mississippi River Valley; in Weeksburg, Kentucky, where a cloudburst hit; and in the New England area where a tropical storm caused considerable devastation. *QST* dispatches of this day are rather vague about the exact dates when these emergencies occurred, especially the Mississippi River flood, but we note that 5SI and 5SW were principals in this operation and received commendations from high officials. In the Kentucky emergency (June 1927) a cloudburst wiped out all contact with the outside for the mining town of Weeksburg, and 9DVT set up a schedule with 8DOI of Huntington, W. Va., for several days serving as the only means of communication. The New England storm of November, 1927, dumped so much water on the area that a large part of it was isolated by floodwaters. Thousands of messages were handled by amateurs in an operation so widespread and so prolonged as to constitute a literal mobilization of the entire emergency communications reserves of the New England states.

In early 1928 a flood followed a dam break at Santa Paula, Calif., and amateurs were instrumental in getting word to the Red Cross to send supplies and aid. Young 6BYQ was the hero who got the message through to 6ALX operating at 6AUT. Subsequently 6BYQ stayed home from school for three days to perform vital emergency radio operation in the disaster.

In late 1928 another hurricane belted the West Indies and Florida, but this time the amateurs were forewarned and experienced. NP4AAN in the Virgin Islands took over the naval radio station there and maintained contact with the Navy Department in Washington, part of the time using the Navy station's call, NBB. The storm hit Florida so hard that even the amateurs were off the air. Two amateurs in Palm Beach, 4AFC and 4AGR, set up emergency stations under the worst conditions imaginable, after one attempt that failed, and stayed on the air the entire week following, maintaining contact with the American Red Cross in Washington and other points. While they were doing this, their homes and possessions were swept away.

By this time, emergency work was becoming an important part of amateur radio, and the League was recognizing it. In the Communications Department section of *QST*, short editorial comments by staff members began to appear, and the 1928 Florida hurricane itself was the subject of an "up front" editorial. In the November issue, Louis Huber commented on "Hurricanes and Amateur Radio" and F. E. Handy on "Priority in Emergencies." In the December issue, a heading asked "Are You Ready?"

But there weren't many emergencies to speak of in 1929 — not communications emergencies, anyway. Not until December was there a report of one, this in New York State, the result of a sleet and snow storm which took down telegraph and telephone lines. The Niagara Falls Power Company asked W8OA to establish contact with Lockport and other New York cities, which he did with the aid of *W8s* ADE OE and AFM.

One thing of importance that did happen in 1929, however, was the issuance of a form by the Federal Radio Commission to be used by each applicant for an amateur license to explain why his operation would "be in the public interest, convenience or necessity." ARRL persuaded the Commission that in view of the already-established records of the amateurs in public service, the existence of the amateurs as a class should be considered in the public interest and the form was unnecessary. This was the beginning of our mandate as a public service, which blossomed fully in the thirties, as we shall see in forthcoming installments.

Technical Progress

THOSE of us whose memories date back to the time preceding World War I find it difficult, sometimes, to think of amateur radio as other than a "new" art; time passes so swiftly. It is hard to realize that much — perhaps most — of the technical foundation for communication in 1964 had been laid by 1924.

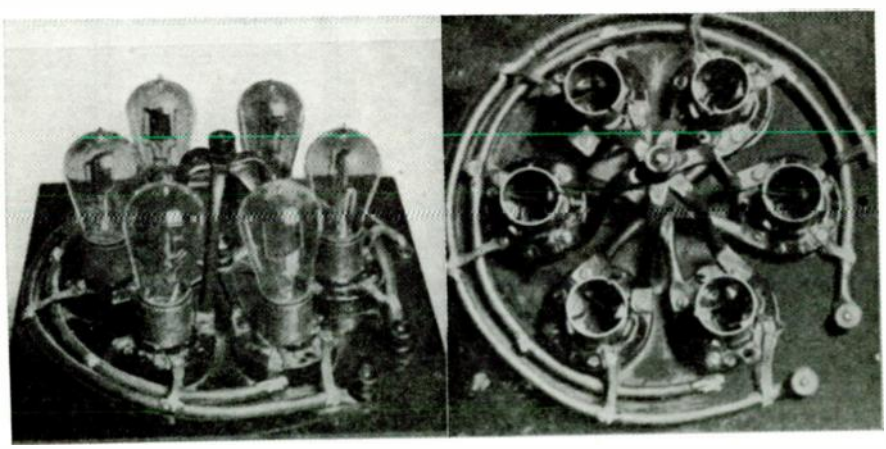
Take, for example, the problem of stable operation of vacuum tubes as amplifiers at radio frequencies. Last month, in reviewing technical developments in the early '20s, the "losser" method of stabilization was cited as the only one appearing in r.f. amplifiers for receiving; transmitting amplifiers, when such amplifiers were used at all, exhibited no means for preventing self-oscillation. The neutrodyne circuit, invented by Hazeltine and described by him in a Radio Club of America paper published in April 1923 *QST*, was the amateur's first introduction to neutralization. That there were other neutralizing circuits was not generally known because, as detailed in a paper by L. M. Hull in January 1924 *QST*, almost nothing had been published on this subject except in patents.

The Hull article described all the "anti-regenerative" circuits known at the time (and today, for that matter), covering resistance loading, reversed-feedback arrangements of several types, and bridge neutralizing circuits — including the "capacity bridge" in the same form as is used so widely nowadays in neutralizing tetrode transmitting tubes, although applied then to triodes.

This paper did much to clear up the fog surrounding neutralization and stabilization, but nothing much happened to transmitters as a result of it, at least not immediately. Although many m.o.p.a. circuits were shown in *QST* during the following several years, the amplifier invariably was treated as though a triode would automatically amplify, and not oscillate, when its grid was connected to the tuned circuit of a master oscillator. Which may be one reason why so few m.o.p.a. transmitters were in use in amateur stations!

However, there were plenty of other things to worry about in transmitters. Getting the oscillator to stay put on one frequency was one. Getting rid of key clicks for the benefit of the b.c.l. was another. For the former, it was recognized by 1924 that an oscillator circuit using a large tuning capacity and a relatively small inductance was capable of better stability than the customarily-used combination of a large coil and small condenser — the beginnings of what we now call "high *C*" circuits. It was also recognized that an oscillator inductively coupled to the antenna was both more stable and less likely to have key clicks that got into nearby broadcast receivers. Ultimately, in early 1925, a prohibition against direct coupling to the antenna was written into the regulations; thereafter, most transmitters used the Hartley circuit with loose coupling.

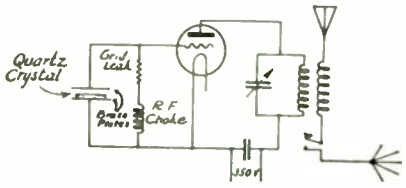
Then a most significant development hit the amateur world with the publication of July 1924 *QST* — an article by H. S. Shaw on "Oscillating Crystals." But for a year or more, the amateur and crystal control were on just speaking terms, nothing more. There weren't any crystals available. Crystal control really got started with an article by J. M. Clayton in November 1925 *QST*, in which it was shown how to make your own, starting with the raw quartz. For a while, it was not at all unusual for an amateur to cut and grind crystals, but eventually manufactured ones did come along — mainly thanks to enterprising



THE TUBE ARRANGEMENT

THE LAYOUT WITH TUBES REMOVED TO SHOW CONNECTIONS

Tubes in parallel were no novelty in the early 20s! This neat arrangement by 1GV had six 5-watt tubes and so officially was a "30-watt" combination (the rest of the circuit was hooked to the binding posts.) It actually ran at 800 watts input when the coal was poured on for the 1923 Transatlantics. (From February 1924 QST.)



Circuit used at 1XAU for operation with 5-watt tubes

The first amateur crystal-controlled transmitter used this circuit with two W.E. 5-watt tubes in parallel. Output was about 5 watts on 3150 kc. The triode oscillator circuit is still a standard. (From July 1924 QST)

amateurs who went into the business.

However, this is somewhat beyond the date at which we have to stop the present story. Through 1925 self-excited-oscillator transmitters were still the rule. Much practical information on improving them was coming along regularly, and the year 1925 wound up with a *QST* description by Ralph Heintz of a transmitter which had a considerable influence on later amateur sets — a tuned-plate tuned-grid circuit using copper-tubing coils that could be changed for various bands. It wasn't long before copper tubing took over for amateur transmitting inductances, and the t.p.t.g. started giving the Hartley a good run for its money.

Power Supply

By 1922 the chemical rectifier was well established, and something had been learned about how to get the best results from it. It was discovered that a single electrolytic cell could take a peak inverse voltage (the term had not yet come into existence, though) of only 50 to 100 volts, and that there was a distinct relationship between electrode area and current-carrying capacity. But the electrolytic rectifier was a messy thing at best, requiring continual attention, and so when the first gas rectifier, the Amrad S tube, was introduced in latter 1922 it was an immediate success. (Vacuum-tube rectifiers, at this time, were both expensive and short-lived.)

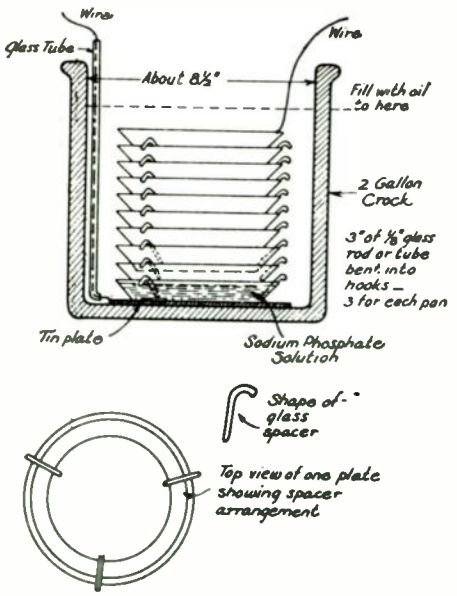
Rectified plate supplies did not give what we would today call good d.c. Confusion about filtering abounded until F. S. Dellenbaugh cleared the air, in a 1923 *QST* classic, with a thorough exposition of filter theory and practice. The article introduced the "brute-force filter," a term that became as much a part of amateur jargon as "conventional Hartley." In short order, the 30-henry choke and pair of 2-μf. condensers that comprised it became the standard amateur plate-supply filter. (Even today one runs across traces of the "30-henry" tradition.) The filter information was timely, because by now, 1924, the earlier expedients — raw a.c. and self-rectification — for getting plate supply for c.w. transmitters were beginning to be frowned upon. The modulation that such supplies put on the signal had no particular advantage for 200-meter oscillating-detector reception, and there was a growing feeling that these modulated signals were broader than could be tolerated under crowded conditions.

Later, in 1925, Dellenbaugh covered the problems of half-wave smoothing and filter-choke design. It would be hard to overemphasize the influence that these exerted on the amateur plate supply. Taken with a couple of other classics by the same author that came along much later, in the '30s, these 40-year-old articles still say the last word in plate-supply filter design.

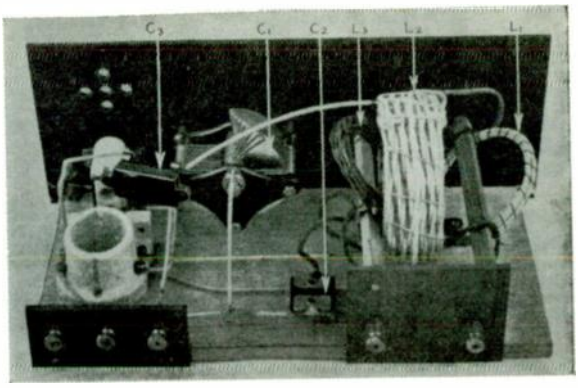
Receiver Revolution

A modest-looking article in December 1923 *QST* touched off an explosion in receiver philosophy, one whose effects were felt for many years to come. On "Short Wave Tuner Design," by Karl Hassel of 9ZN, it initiated an era of searching examination of r.f. losses in components and equipment.

Hassel's article ended the reign of the variometer in amateur tuners, and set the pattern for the condenser-tuned regenerative-detector-plus-one-stage-of-audio which became the standard amateur short-wave receiver for more than a decade. A persuasive followup by Kruse in February 1924 *QST* added detail on "low loss" — the term shortly became a byword in the entire radio industry — construction, with examples of complete tuners that met the low-loss criteria. Two of these, one built by Perry O. Briggs, 1BGF, and one by F. H. Schnell, 1MO-1XW, were duplicated by amateurs all over the world; one knew in advance that a QSL card, particularly from overseas, would almost invariably list the receiving equipment as a "1BGF" or "Schnell" tuner.



Maybe the original, but if not, at least a very early version of the electrolytic capacitor. Picked up from *The Radio Experimenter* (Australia) and printed in August 1924 QST, this homemade job used aluminum dishes stacked in a two-gallon crock. No mention of the capacitance, but an assembly of 10 dishes was said to be good for 1500 volts.



The 1BGF tuner, a widely built low-loss receiver based on principles outlined by Hassel in December 1923 *QST*. The accompanying article on "Low Loss Tuners" in February 1924 *QST* supplied the "low-loss" catchword that dominated receiving-component descriptions (and advertising) for several years thereafter.

Fig. 1

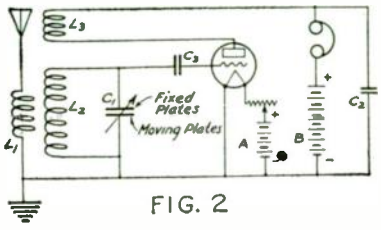


FIG. 2

FIG. 3

Both these sets, incidentally, used basket-weave coils, and that method of coil construction thereupon became a favorite. Ribbed forms, too, were used widely. Both types resulted from attempts to eliminate any insulating material, and with it losses, from the coil's field. Coils even were wound on no forms at all, the turns being held together with string knotted along the winding in cable-lacing style. Tuning condensers got critical attention, too, although here there was not much the amateur could do except pick the best available and create a demand for something better.

By the end of 1925, experience, backed by measurements which the radio profession was learning how to make, had eliminated most of the excesses that had accompanied some of the low-loss attempts. The residue was a healthy respect for the benefits that accrued from careful attention to details in receiver construction. It was also rather definitely established that the regenerative detector followed by an audio amplifier took second place to *no* other system for amateur short-wave work. Not that r.f. amplification and superhets lacked attention. Far from it. *QST* at this time was full of articles on both types of receivers. But with the tubes and components available, a low-loss regenerative receiver never came off second best in any competitive test, and usually was far out in front.

Actually, most neutrodyne and superhet receivers were designed for the 200–600 meter range, to cover both amateur and broadcasting wavelengths. There had been early amateur work as far down as 100 meters, as recounted last month, but it came to an abrupt halt for most amateurs in the first part of 1923, with the ruling by the Department of Commerce that amateurs did not have the blanket authority, under the 1912 radio law, to operate below 150 meters. Only those with experimental licenses could move down. (Schnell and Reinartz had "X" licenses for their work with French 8AB.) In late July 1924, the 80-, 40-, 20- and 5-meter bands were assigned to amateurs, but only to those who applied for license modification. It was not until January 1925 that all amateurs were free to use all bands. These regulatory maneuvers over an almost two-year period slowed down the mass move to shorter waves, giving "200" a somewhat longer lease on life than it otherwise would have had. The situation is reflected in the attention given to amateur-plus-broadcast tuning-range design.

Until the short-wave bands were opened to all, tuners invariably covered everything there was to be covered in one sweep of the tuning dial. With discrete bands available from 5 to 200 meters this had to change, and the plug-in coil came on the scene. The next logical step, spreading a band over the dial, was rather slow in coming; the first mention of the desirability of a more favorable tuning rate seems to have been in December 1925 *QST*. With it, receivers began to be "amateur-band," and to acquire some of the characteristics we take for granted today.

There were perhaps some fringe benefits, if one could think of them as that from the amateur viewpoint, of being confined to 200 for a while. One was the single-control tuning idea, exploited in both the neutrodyne and the superhet by J. L. A. McLaughlin and described in *QST* during 1924. Forty years ago, this was a real technical achievement.

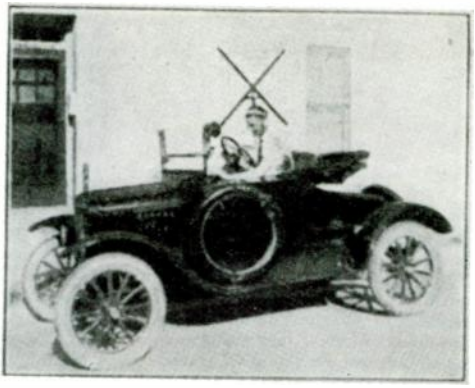
The Wild Waves

From the time that Hertz' experiments proved the Maxwell theory of electromagnetic radiation, it was known that light waves and radio waves were the same thing, the difference simply being one of wavelength. Radio waves therefore should obey the known laws of optics, and Hertz had shown that they did. Marconi's successful transmission across the Atlantic, over the curved earth, shocked the physicists into hunting for an explanation consistent with known wave behavior, and the Kennelly-Heaviside ionized-layer hypothesis was the most reasonable one in sight. It assumed that there was an ionized shell miles above the earth that acted as a conductor, confining the waves to the space between it and the earth and guiding them around the earth's curvature.

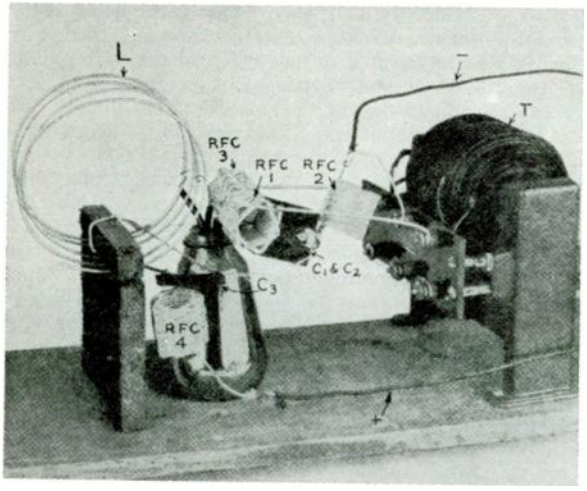
There was no direct proof of the existence of such an ionized region. Neither did the simple waveguide theory account for some of the things that amateurs regularly observed in their 200-meter work, the fading of signals being one of them. In the final report of the ARRL-Bustands fading tests, published in September 1923, it was suggested that fading might be caused by a combination of effects, including both transmission over the ground and reflection from the ionized region, along with absorption in a postulated lower ionized layer.

The reflection idea was seized upon later, when shorter waves were being explored and the existence of both skip zones and farther-out zones of strong signals was discovered. A further complication was the fact — and truly a marvel to the amateur of that day, used to 200-meter behavior — that the shorter waves such as 20 meters worked in the daytime but not at night. This was Utopia to a generation used to sitting up to all hours in order to "get out"! But it needed an explanation.

Over a period of several months, Reinartz had carried out tests with stations at varying distances on 20, 40 and 80 meters, and in April 1925 *QST* offered an explanation for the different behavior of signals on these bands. It was based on the reflection idea and the assumption that the ionized layer height was different for different wavelengths. It was not accepted by everyone, particularly the physicists, who insisted that the assumptions in it could not be reconciled with the known optical laws. Considerable discussion followed, one contribution of particular interest being a letter from G. W. Pickard which asserted that refraction rather than reflection was the logical explanation for wave bending, and suggesting that if the frequency was made sufficiently high, the wave would not be bent enough to get back to earth at all. In October of the same year a comprehensive article by Taylor and Hulburt of the Naval Research Laboratory described transmission experiments carried out by the Navy, much of the work involving amateur cooperation, and offering a theory based on refraction in an ionized region at substantially fixed height, but varying in its characteristics both diurnally and seasonally. In view of the limited experimental data available, and in the absence of any direct measurement of the ionized region, the theory outlined in this article is remarkably close to the currently known



The original amateur mobile station, 6GD-6BKA. The equipment was a hand-carried portable using the same circuit and components for both transmitting and receiving. *QST*'s editor gleefully applied the name "transceiver" to it, crediting Matty, 9ZN, with having coined the term some years earlier.



Getting on 5 meters took some care, when the band was first opened. This oscillator, shown in October 1924 *QST*, used a C-202 tube with the base removed—a step necessitated not primarily to reduce tube capacitance but to eliminate high-frequency losses, which caused bases to get hot enough to blister. The circuit here is the series-fed Hartley, using basket-weave chokes.

mechanism of the ionosphere. Thanks to data obtained with the help of amateurs, the radio world was well on the way toward solving the mysteries of long-distance radio transmission.

Antennas

Before space runs out on us, a quick word about the antennas of the era. With operation going to waves as short as 5 meters, amateurs began to get free of the ground. Frank Jones, in May 1925 *QST*, described 5-meter experiments using a Hertzian-type antenna with reflectors — really going back to the beginnings of radio! In June of the same year a note from Pickard described the Zepp antenna, consisting of a half-wave dipole with a quarter-wave two-wire feeder — the first instance of a true transmission-line feed, although single-wire feeders of unknown performance characteristics had been used by a few experimenters.

For the most part, however, the amateur antenna of the day was an "antenna" with a practically identical "counterpoise" wire under it, the combination being more-or-less center fed. It was worked at about its fundamental frequency on long wavelengths and on harmonics at the shorter waves. That it did pretty well is established by the DX records of the time, which as far as actual distance goes were just about as good as those we hang up today.

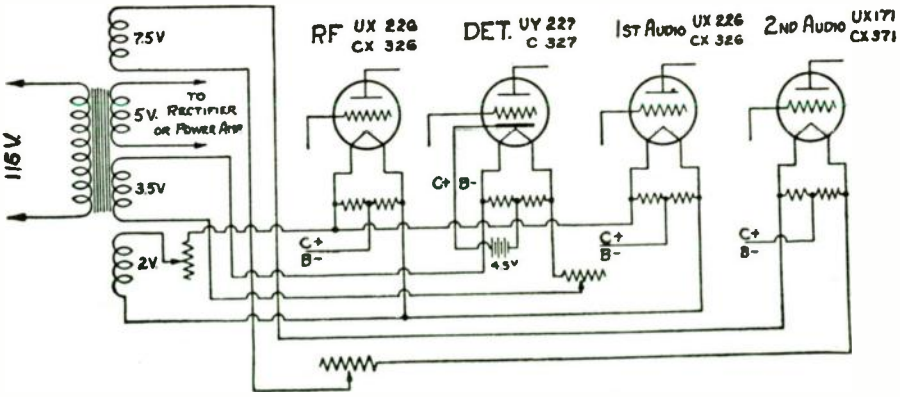
Advertising: The Broadcast Boom (Part II)

CONFLICTING claims for batteries, B-eliminators, power units as sources of plate power for tubes in broadcast reception were getting a little too strong. In November 1927 Grigsby-Grunow-Hinds shouted "Warning!" and declared that such statements as "No batteries, no eliminators, your light socket supplies all power" were "absolute falsehoods." However, a.c. was being used for filament, actually heater, supply with certain new tubes and in August of 1927 General Radio said, "complete a.c. operation" with "the newly announced a.c. tubes." The first Arcturus a.c. tube ad appeared in November.

Advertisers' interest in amateur radio began to accelerate in 1926 and 1927. In May of 1926 Grebe first described the CR-18 with coils for the 200, 80, 40, 20 and 10-meter bands. Parmco's short-wave receiver came out in June 1927. Plug-in low-loss coils for receivers were advertised by Aero, Gross, Teco, Chi-Rad, Seattle Radio Lab. Pilot's first ad was in November 1928.

De Forest announced the H Tube in January 1926 and in July included two rectifier tubes, the HR and 9R. The UX-852 was brought out by RCA in May 1927. National Radio Tube's Rectobulb appeared in July. Dubilier condensers "for . . . amateur transmission" came cut in January 1926, Tobe condensers in February 1926, and Flechtheim in October 1927. REL commenced its advertising campaign in April 1926. In the same issue of *QST* American Sales offered a c.w.-phone transmitter that "can be used on 40 and 80 meter bands with slight changes." Arsco advertised "Complete transmitter installations 5 to 1000 watts" in March 1927. "For the twenty meter band" said Cardwell in June about its

Complete A. C. Operation



For the past several seasons the trend has been toward complete battery elimination. Many satisfactory plate supply units operating from A. C. have been developed but filament operation from an A. C. source has presented more of a problem due to the larger currents required and increased expense in the rectifier and filter circuits.

The newly announced A. C. tubes offer an excellent solution to this problem. The above diagram shows how to adapt the filament wiring of the popular type of receiver to A. C. operation by use of General Radio parts especially designed for this purpose.

T-199 transmitting condenser. In December 1926 General Radio offered quartz plates.

General Radio took notice of v.h.f. activity in 1927 by bringing out a 5-meter wavemeter in June.

High-voltage rectifier tubes were fairly new, but high-voltage rotary rectifiers had been offered by Marlo, Advance and Stahl since 1924. In August 1927 Rectifier Engineering Service began to push the mercury-arc rectifier.

Recognition was given by several advertisers to new tubes, new circuits and new frequency allocations during 1928. In February Thordarson printed a diagram of a power supply for a 210 transmitter, saying, "This unit when in operation in the 9JC transmitter was reported from coast to coast at R 5 with a pure d.c. note." Utility Radio's high-voltage condensers were recommended in the same month for tuned-plate, tuned-grid circuits. Amrad's Mershon condenser which had been displayed for years as excellent for receiver supply use was advertised in March for "power supply devices employing the 210 tube." REL offered a supply in May with power output for two UX-852s or one 204A. In July Weston declared that its Radiation Ammeter "will give you the exact amount of current supplied to the antenna at the wavelength of 10 meters now being advocated." REL announced a new wavemeter for the 7000–7300 kc. band in September.

Crystals for amateur use were advertised in 1928–1929 by Scientific, Precision, Research Engineering, Master Optical, J. T. Rooney, Mort Kahn (yes, he's the same Mort Kahn, now W2KR), West Coast Radio Labs, Bethesda Crystal Lab, American Piezo Supply.

Shielding for receivers was consistently recommended by Aluminum Company of America. In February 1928 National Radio Tube brought out the Inductron, a plug-in coil sealed in the glass envelope of a vacuum tube.

Television with scanning discs received a play in 1928 from National in June, Clarostat and Baldor in August, Esco in September. In February of 1929 Raytheon advertised the Foto Cell as a TV sending tube and the Kino Lamp as a TV receiving tube.

New code-teaching machines and methods of increasing code speed began to make their appearance. The first Teleplex ad was in April 1927, Dodge Radio Shortkut in January of 1928 and Candler in May 1928.

Radio Schools of the late twenties included West Side YMCA Institute and Radio Institute of America in New York City, Eastern Radio Institute and Mass. Radio School in Boston, Federal Radio and Railway Institute in Chicago and Gulf in New Orleans.

In 1929 RCA brought out nine new tubes for amateur transmitting, some of them destined to be ham favorites for many years. They were the UX-866, UX-860, UX-865, UV-211, UV-845, UX-842, UV-849, UV-851, UV-872. National

Radio Tube offered a new rectifier, a mercury vapor tube called the R-3.

New receiving tubes in 1929 were the Cunningham CX 345 and C 324, the de Forest Audions 410 and 422. Pilotron and Triad tubes were first shown in October and Eveready Raytheon in August.

The first ad on a publication that is as useful to hams today as it was in 1929 was printed in the January issue of *QST*. You guessed it — *the Radio Amateur Call Book*.

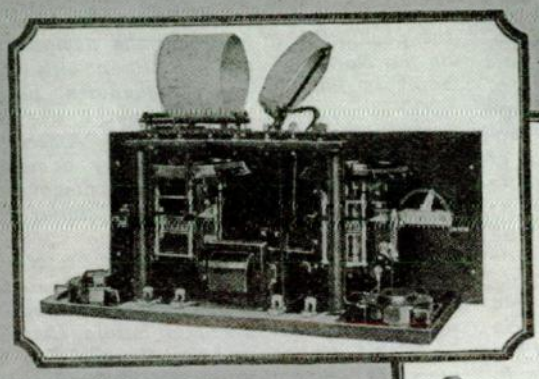
Radio service men were seriously recognized in 1929 with instruments being offered by Hickok, Jewell, Weston and Supreme.

Expeditions were used as a basis for ads through 1929. In August 1926 the Karas receiver advertisement showed the American Museum Greenland Expedition. Burgess batteries were used by Commander Byrd on his North Pole flight. Cardwell talked of its contribution to the University of Michigan Expedition in 1926 and George Dyott 1928 Brazil Expedition. "We are depending on your product" was the Pyrex quotation in 1928 from Byrd Antarctic Expedition's radio engineer, and in 1929 Formica, Burgess and Sangamo used this famous explorer's adventures in their ads.

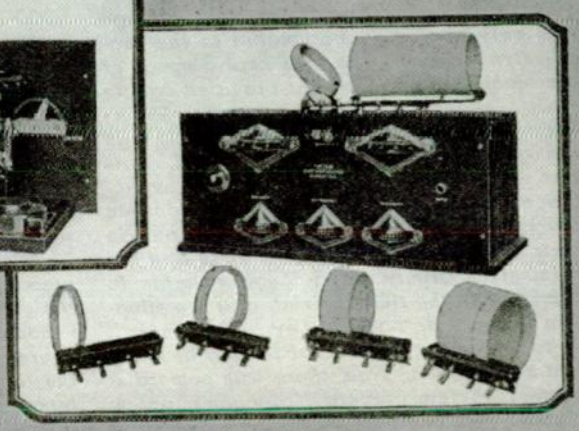
With the exception of a very few insertions by firms like Crosley, Browning-Drake and Silver-Marshall, BCL advertising had disappeared from the pages of *QST* by July of 1929. For the last half of the year ads were directed to amateurs: meters, transformers, chokes, resistors, condensers, batteries and other components; coils including "The most efficient short-wave coil ever made" as modestly described by Transcontinental Coil; transmitters and kits; receivers, not forgetting the introduction of Pilot's Super Wasp in June and National's SW-4 in July of 1929.

Stores in 1929 included Radio Specialty, Wholesale Radio and Leeds in New York City, Barawak in Chicago, and Cameradio in Pittsburgh. Manhattan Electric Bargain House and American Sales in New York concentrated on surplus.

Circulation of *QST* was between thirty-five and forty thousand. The cost of a one-page ad in 1929 was $175.



Front view of CR-18 with 200 meter coil intake and additional coil for 10, 20, 40 and 80 meter bands.



General view of interior of CR-18.

A. H. Grebe & Co., Inc., 109 West 57th Street, New York

Factory: Richmond Hill, N. Y.

Western Branch: 443 So. San Pedro St., Los Angeles, Cal.

It is written:

"A perfect vase never came from a bad potter's wheel."

When one realizes its origin, the superior reception of the CR-18 is not to be wondered at.

Doctor Ma

The GREBE CR-18

This Company owns and operates stations WAHG and WBOQ; low wave rebroadcasting stations, mobile WGMU and marine WRMU, and stations 2ZV and 2XE.

All Grebe apparatus is covered by patents granted and pending.

ARRL:

The Boom Years

AT NO POINT *in the story of amateur radio has either the necessity for leadership among the amateur body, or the effectiveness of the leadership enjoyed by that body, been more clearly demonstrated than in the transition period from the liberality of 1928 to the restrictiveness of 1929. In point of actual fact, the change was only nominally noticeable to the progressive amateur who had kept abreast of the technical development provided by the ARRL leadership. Of even greater importance than the technical factor itself was the psychological attitude involved. This was expressed in several ways. The expectation of tougher operating conditions in 1929 caused amateurs generally to pull in their belts and spit on their hands and set themselves grimly for a tough struggle to come; when the time arrived, and the situation was not as bad as they had expected, there was a pretty general feeling of relief and satisfaction. True, there was some discontent. A few perpetual objectors, a few chronic malcontents, a few congenital trouble-makers, and a few sincere amateurs honestly convinced that they had been unjustifiably short-changed, refused to accept the new order of things.*

On March 21, 1928 the Senate ratified the Washington treaty, ending an abortive and disorganized attempt on the part of a few amateurs, notably in the Middle West under the Amateur Radio Protective Association and in the West under the Santa Clara County Amateur Radio Association, to effect senatorial rejection of the treaty. Amateurs generally, although disappointed at the outcome of the conference, supported the Board of Directors of the ARRL in its decision to accept the terms of the treaty.

On March 9, before the treaty had even been ratified, the ARRL, seeking expansion of the domestic frequency assignments, took up with the (new Federal Radio) Commission the possibility of securing the assignment on the North American continent only of a band in the regional frequencies, below 6000 kilocycles. It was planned to use this band, tentatively called the "American Eagle band", as supplementary domestic territory. The idea was, however, discovered to be impossible of adoption under the treaty.

The process of readjustment and acclimatization was not so difficult as had been anticipated. Four stations were required to work where one had worked before. Could it be done? Trial showed that it could. The ingenuity of amateur radio—expressed through the ARRL Technical Development Program—had conquered the problem, as it had conquered other problems before. For one thing, the development of sharp, stable transmitters and selective, bandspread receivers, resulting in the reduction to a fraction of its former value of the normal transmission band required for radiotelegraphic transmission, was basically adequate to cope with the stringency of the new requirements. For another, it had long been recognized that amateur use of the old frequency assignments had been unbalanced, inefficient; in the 7000–8000-kilocycle band, for example, 80 per cent of the stations congregated near the low-frequency end. Crowding the remaining 20 per cent into the 300 kilocycles remaining did not add greatly to the interference.

It was not Utopia; it never had been. Interference was bad; it always would be. But the restrictions were not throttling. Work could

Portions of this story in contrasting type are from *Two Hundred Meters and Down*, by C. B. DeSoto.

go on, subject to little more than added inconvenience. Amateur radio could forge ahead to new accomplishments. For the most part, amateurs simply went about their routine amateur radio, operating every day as much as was possible in that day, enjoying it all to the utmost, and not bothering themselves about situations beyond their control or active interest.

There was one quite pronounced change, however. Realizing that, while the international bands had been severely cut, the domestic bands remained substantially the same, amateurs forgot a lot of the DX-craze that had held sway for four years or more, and turned back to a more solid form of internal communication, the backbone of the art. Message-handling saw an impetus, as did experimentation. From that viewpoint the Washington treaty was a distinct advantage to amateur radio. It saw the renunciation of the unhealthy distance urge and, indirectly, it provided the solid background on which was to be builded the greatly expanded amateur radio structure of the decade to come.

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Just a few months before the international allocations conference was held in Washington in the fall of 1927, Congress had finally replaced the Wireless Act of 1912 with the Radio Act of 1927. In so doing, it created a new regulatory body, The Federal Radio Commission, having control over all radio stations.

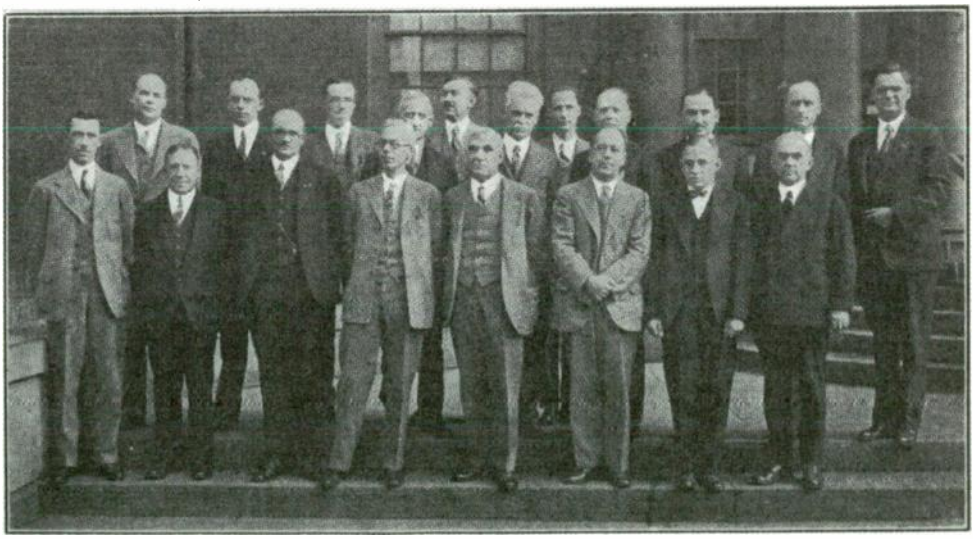
Amateur radio, through the ARRL, sought representation on the five-man commission, and urged upon President Coolidge the appointment of such men of proved amateur spirit as J. C. Cooper, Jr., of Jacksonville, wartime ARRL director; Colonel John F. Dillon, sixth district Supervisor of Radio, Charles H. Stewart, vice-president of the League, and C. M. Jansky, Jr., Dakota Division director. Of these, the only successful candidacy was Colonel Dillon's. Jansky, while actually appointed, failed of confirmation due to adjournment. On Col. Dillon's decease in the autumn of 1927, the appointment of A. H. Babcock, Pacific Division ARRL director, was unsuccessfully urged. Even though it did not have any of its own number on the Commission, the amateur body fared well at its hands, and little difficulty was experienced in securing the continuation of the old Department of Commerce regulations, with suitable alterations as changing conditions necessitated.

Although no amateur served as a Commissioner in those days, Paul M. Segal, 9EEA, did serve as Assistant General Counsel of the FRC for nine months in 1929–1930, keeping his post as Director of the Rocky Mountain Division, but temporarily abandoning the position of ARRL General Counsel to which he had been appointed in 1928.

The transition from Department of Commerce to Federal Radio Commission was practically undetectable as far as amateurs were con-

U. S. Frequency Allocations Before and After the International Conference

1928	*1929*
1500– 2000 kc.	1715– 2000 kc.
3500– 4000 kc.	3500– 4000 kc.
7000– 8000 kc.	7000– 7300 kc.
14,000–16,000 kc.	14,000–14,400 kc.
28,000–30,000 kc.	28,000–30,000 kc.
56,000–64,000 kc.	56,000–60,000 kc.
400– 401 Mc.	



The ARRL Board of Directors for 1928, above, authorized the Technical Development Program, asked for restoration of the Extra First Class license, and took other steps to fit 16,000 hams into the narrow new bands of 1929.

cerned. The FRC picked up the rules and allocations laid down by the fourth Hoover conference and continued these in force, with minor modifications, until it had to comply with the international allocations which became effective on January 1, 1929. The table on page 71 shows the startling contrast between the domestic allocations in force in 1928 and the new international bands of 1929.

As if to demonstrate that, domestically at least, restriction had not clipped their wings too badly, the radio amateurs of the country proceeded to turn in a record-breaking performance in the Governors-President Relay of 1929. At 5:00 P.M. on March 3rd, eleven Washington, D. C., amateurs set about receiving the congratulatory messages sent from all over the country to President Hoover. At 5:00 P.M. the next day they closed down, with a total of 41 official messages received, in addition to numerous private messages of greeting and felicitation. That all the governors did not send messages was not the fault of amateur radio; some apparently found political considerations overpotent.

Past Governors-President Relays had been held primarily to acquaint the newly elected president with amateur radio; in 1929 this was hardly necessary, for who should know more of amateur radio than Herbert Hoover, after four national radio conferences? Indeed, his son, Herbert, Jr., was then a licensed amateur and a member of the Washington Radio Club! But it was a worthwhile operating activity, nonetheless.*

The annual report to the Secretary of Commerce of W. D. Terrell, Chief of the Radio Division, showed a slight decrease in the number of licensed stations during the 1928–29 fiscal year, probably due to Washington Treaty reaction. On June 30, 1929, there were 16,829 stations, against 16,928 at the same time the previous year, a difference of 99.

Upon petition by the ARRL, the Federal Radio Commission on November 6, 1929, reopened the amateur sub-band from 14,100 to 14,300 kilocycles to amateur radiotelephone operation, for use by operators holding Extra First Class amateur licenses or who displayed technical qualifications sufficient to merit a special endorsement.

At the beginning of 1930 there was pending in the United States Senate a bill introduced by Senator Couzens of Michigan which would have created a national communications commission to control all forms of wire and wireless communication. Pursuant to instructions by the ARRL Board, Hiram Percy Maxim on January 31, 1930, testified at length before the Interstate Commerce Committee concerning the value of amateur radio, and the desirability of perpetuating it in any contemplated legislation. This statement is one of the strongest documents ever written in behalf of amateur radio; the Couzens bill, S.6, failed of passage, but no member of that committee who heard the statement will forget the worth of the radio amateur.

Although the basic radio law was not changed, the regulations of the Federal Radio Commission with respect to amateur radio were revised effective April 5, 1930. The principal alteration lay in the structure of the regulations; in practical effect, the changes included a new regulation concerning the use of adequately filtered direct-current plate supply for the avoidance of modulated or broad signals, transferring the 56- and 28-megacycle bands from a "shared

* Now of course W6ZH and President of ARRL.

Whitehurst v. Grimes

No history of amateur radio in the late 20s would be complete without mention of the first Federal court case, pursued relentlessly by the League's long-time General Counsel, Paul M. Segal. The story is best told in *Paul M. Segal — A Tribute:**

"In the middle twenties, a number of communities all over the country passed ordinances restricting, licensing, taxing or prohibiting operation of amateur radio stations. The board grew concerned about this harassment and asked Segal to pick out a test case to defeat these ordinances once and for all. The first case he picked, involving Portland, Oregon, collapsed after Segal had filed suit in Federal Court, when the town fathers amended their ordinance so that it would not apply to any stations licensed by the federal government. Segal then brought suit against the city of Wilmore, Kentucky, and its chief of police, J. W. Grimes, on behalf of R. B. Whitehurst, 9ALM, seeking to overturn the city's ordinance requiring a license costing $100 a year for the operation of an amateur radio station within the city. After several weeks of intensive on-the-scene effort in Kentucky, Segal had the case blocked out to his own satisfaction and went back home to Denver, leaving a local attorney to mop it up. In September, 1927, Judge A. M. J. Cochran of the U. S. District Court for Eastern Kentucky handed down the decision: amateur radio is interstate commerce, even though no compensation is involved and even within a single state because of its effect on other communications between states, and as such must be regulated only by the federal government. The case, known as *Whitehurst v. Grimes*, is today a cornerstone of amateur defense against local attacks on our right to operate."

* *QST* for January, 1962, page 40.

experimental" to an "exclusive amateur" basis, the compulsory keeping of station logs, and the definition of quiet hours.

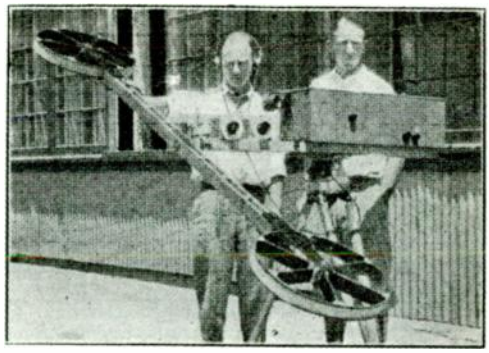
The Washington International Radiotelegraph Convention went into effect on January 1, 1929, and continued in force for five years. Prior to its termination, a new treaty, the International Telecommunications Convention regulating wire as well as radio communications, was concluded in Madrid on December 9, 1932.

Despite numerous adverse preliminary proposals, notably by Japan which proposed harmonically related amateur bands beginning with 100 kilocycles at 80 meters, this conference made no changes in amateur frequency assignments, and preserved substantially similar operating regulations. The status of amateur radio had changed mightily since the Washington conference; instead of being regarded as dangerous interlopers, amateurs were accepted as one of the definite phenomena of the radio art, and it was evident that the international communications world recognized the amateur as an accepted part of the radio picture, to be preserved and perpetuated.

The conference itself was much larger than Washington. Seventy-seven nations were represented, and nearly a hundred international associations and operating companies, with a total attendance of more than six hundred persons—probably the biggest and most important international conference ever held.

The amateur delegation to this conference consisted of two groups. The American Radio Relay League was represented by Secretary Warner and General Counsel Paul M. Segal; Clair Foster, also appointed by the ARRL Board, had refused the appointment. Representing the International Amateur Radio Union were Kenneth B. Warner, its secretary, Arthur E. Watts, vice-president of the Radio Society of Great Britain, and Miguel Moya, president of the Association E.A.R. *The active work was done by Warner, Segal and Watts, assisted by members of the* Red Espanola.

Of the attack on the amateur bands, that directed against the low-frequency bands was most intensive. The 1715-kilocycle band, in particular, was the object of concerted attack on the part of European nations, who wanted it for the small-boat service for which it had been demanded at Washington as well. Great Britain, Canada and the United States, after strenuous fighting, successfully frustrated this attempt, however. In connection with the 3500-kilocycle band, the American delegation, supported by Canada, attempted to make the assignment exclusive to amateurs; general opposition, led by Great Britain, eventually defeated this plan. Prior to the conference a number of nations had submitted proposals



Apparatus used in radiolocation of minerals, described in QST for June, 1928.

threatening the 7000-kilocycle band. During the Conference the Netherlands made a proposal similar to that by Japan, limiting the 3500-kilocycle amateur band to 100 kilocycles and that at 7000 kilocycles to 200. Counteracting these was the proposal by Canada, withdrawn shortly after the opening of the conference, for widening of the band to 7000–7500 kilocycles and a similar proposal made after the conference was under way by the delegate from Honduras, who was Angel Uriarte, a Spanish amateur, then secretary of the Red Espanola. *In the end, the Dutch and the Japanese withdrew their proposals for narrowing and the* status quo *was preserved. There was no attack at all on the 14,000-kilocycle band; and the 28- and 56-megacycle bands, although questioned, were also preserved. The general sentiment with relation to amateur matters seemed to be to preserve the* status quo *at all costs; attempts to decrease and attempts to increase amateur privileges were equally resisted by the great body of delegates.*

In mid-1932 a new magazine devoted principally to amateur radio was inaugurated in Hollywood, Calif., by K. V. R. Lansingh, W6QX, as the successor to a regional sheet called The Oscillator, *which had ceased publication at the end of 1931. Excepting for numerous regional and local publications, this was the first magazine for amateurs outside of* QST *since the general desertion to the broadcast field in the early 20s. The new magazine was called* R/9, *and outlined its purpose as being to provide an open forum for amateur radio, in which the "inside workings" of amateur politics and policies were to be aired. To this program there was added, about the first of 1933, a certain proportion of technical information for the provocation of wider amateur interest.*

Effective with the July, 1933, issue of the magazine Radio—*which, it will be recalled, started out as an essentially amateur publication entitled* Pacific Radio News *in 1917,*

Sidelights, 1928–1930

Members of the Experimenters Section and ORSs — as skilled and neutral observers — were asked by the Federal Radio Commission to conduct a survey of broadcast reception, particularly from the standpoint of heterodyne interference. — *January, 1928, QST* . . . Readers complain of rubber-stamp messages, poorly addressed traffic, failure to QST, poorly adjusted "bugs", and stations crowding the low edge for DX.—*February, 1928* . . . Murphy has been around for a while: "Antenna comes down, 203-A burns all to blazes, new Jewell milliammeter likewise annihilated and my dog dies of nothing in particular, all in the space of forty minutes." — *1BFX in the March, 1928 issue* . . . Editor proposes gentlemen's agreement for division of 40 and 80 into segments for North America, Europe and the rest of the world. — *April, 1928* . . . Editor urges amateurs to use the 10-meter band. — *May, 1928* . . . Radio prospecting equipment for the detection of minerals was the subject of an article in *QST*. — *June, 1928* . . . Ten-meter scatter communications postulated by Warner. — *July, 1928* . . . Jenkins Labs in D.C. started a weekly TV show for amateurs on 6420 kc. — *August, 1928* . . . Canadian licenses issued after April 1 bore VE calls, in preparation for the 1929 rules; the U.S. also started issuing calls beginning with W and K. — *August, 1928* . . . Amateur Extra First Grade license restored at League request, with 20 w.p.m. and a special examination required. — *September, 1928* . . . A formal agreement between the U.S. and Canada was signed, permitting third-party traffic handling between amateur stations of the two countries, effective January 1, 1929. — *March, 1929* . . . The question, "Why will operation of the station be in the public interest, convenience or necessity?" on the FRC application blank need not be answered by amateurs. At League request it was agreed by the Commission that amateurs as a class met this requirement! — *April, 1929* . . . An amateur reports increasing his code speed 8 w.p.m. during a month of sleeping with the headphones on copying a "non-stop" commercial station. — *August, 1929* . . . Transmitter hunts, already popular in Great Britain, should be tried here, an editorial says. — *June, 1930* . . . Editor answered readers' complaints that "*QST* is getting too technical." — *August, 1930* . . . The Wouff Hong, already well established in amateur radio, was likened to a garrote appearing on Commodore Decatur's flag, in an article by The Old Man. — *August, 1930* . . . The Board of Directors asked that the authorities start applying legal penalties to those amateurs operating out-of-band, for the good of the fraternity as a whole as it faces future international conferences. — *August, 1930* . . . Readers complained the QRM on 80 phone was so bad the band was becoming useless. — *August, 1930* . . . Ham radio station W1ESE was operated from the Junior Achievement Hall of the Eastern States Exhibition. — *December, 1930*

entered the more profitable popular broadcast field in 1923, and became a trade journal in 1929—H. W. Dickow, its current publisher, announced another change of policy which would again make it a magazine intended primarily for amateur consumption. Emulating R/9, the policy was to provide a preponderance of technical material, accompanied by an editorial viewpoint concerning itself almost entirely with amateur politics, purporting to represent the minority viewpoint in amateur affairs as administered by the American Radio Relay League.

Effective October 1, 1933, a complete revision of the Federal Radio Commission's regulations respecting amateurs was made. In detail, the changes were numerous; the effect upon actual operating was, however, slight. Three forms of amateur licenses were established, Classes A, B and C. The radiotelephone sub-band in the lowest frequency amateur band was increased from 1800 to 2000 kilocycles; radiotelephony was also permitted in the low frequency quarter of the 28-megacycle band. Only filtered direct-current power supply was permitted. Mobile operation on the ultra-high frequencies and informal portable procedure under all amateur station licenses was permitted. An entire new plan of amateur-operator licensing was evolved, with a requirement for appearance for personal examination at all points within 125 miles of 32 examining centers. In line with these regulations, on June 22, 1934, amateurs were authorized to operate at will in the entire region above 110 megacycles, for experimental purposes.

The five years between 1929 and 1934 were the boom years of amateur radio. During that period the number of licensed amateur stations snowballed to tremendous figures. First evidence of this came with the publication of the annual report of the Director of Radio of the Department of Commerce for the fiscal year ending June 30, 1930. During the twelve months preceding there had been an increase of 2165 amateur stations—from 16,829 in 1929 to 18,994 in 1930. But this was only the beginning. On June 30, 1931, the Federal Radio Commission reported approximately 22,739 stations licensed, 3745 more. In 1932 there were 30,374, an increase of 7635. Even this growth was overshadowed in 1933, however, when the figure jumped to 41,555—11,181 new stations added! The next year the boom began to taper off, the net growth being 4835 to a total of 46,390 in 1934. Then the curve began to flatten off definitely, with a total of 45,561 licensed stations on June 30, 1935, and 46,850 on June 30, 1936.

A variety of reasons have been ascribed for this growth—almost 300 per cent in five years. Of course some of it is "paper" growth. It was in this time that the govern-

ment changed the life of amateur licenses to three years, during which period there were almost no deletions through expiration. The early portion of this period was also the time when many amateurs took out separate licenses for portable work, making for misleading duplication. Aside from these considerations, undoubtedly the principal contributing factor was the depression. This operated to induce growth in amateur numbers in several ways. Leisure time was greatly increased; men and boys who previously had had no time to spare for radio now took up the art in active earnest. The radio broadcasting and associated merchandising fields had been hard hit by the depression, and purchasing power was down; manufacturers, realizing what was occurring in amateur radio, turned to the amateur field to sell their products. Cut-throat competition lowered prices; intensive applied research improved quality; and correspondingly the amateur boom expanded to still greater proportions. In 1934 an amateur station could be installed for 50 dollars that would have cost three times that figure in 1929. The result: many impecunious school lads, as well as depression-hit leisure-timers who still retained some financial resources, bought this new cheaper and better radio gear and got on the air. One new recruit told another, and still another, and the circle grew.

Operating Trends

JANUARY 1st [1929] marks the dividing line between the old and the new in amateur radio . . . We now enter the new days with our new methods, with the new spur to accomplishment and with enough things to do to keep us busy and excited for five years." So read the editorial in the January, 1929, issue of *QST*.

The editor was right.

There were new amateur regulations, new equipments, new activities. And amateur radio was growing. The five years between 1929 and 1934 were the boom years in the amateur radio population growth. In 1929 there were 16,829 amateur licenses. By 1934 this figure had grown to 46,390 — an increase of some 300 per cent.

First, there were some old problems to be solved. Off-frequency, out-of-band operation continued to be a source of complaint. Amateurs were violating the edges of the bands and interfering with Navy and commercial stations. There were even reports of interference with aircraft distress traffic. The official concern over this problem was mirrored by the number of editorials devoted to the subject, the number of technical articles telling how to build frequency-measuring gear, the identification of marker signals near each band edge so that amateurs would know when they were straying.

The new regs required better signals, but the bands continued to have too many rough notes. In order to call attention to this problem, *QST* each month for a while listed the "prehistoric" signals heard during the previous month. On the other hand, *QST* also carried a regular listing of high-quality signals, obviously hoping that the one list would become smaller and smaller and the other list would become larger and larger.

Besides encouraging better signals, there was an effort to encourage better operating practices, and so there was founded the A-1 Operators Club, a select group to which you could gain entrance only through nomination by your peers.

Operating activities continued to grow with the growth in the size of amateur radio. There were the DX Contest, Governors-to-President Relay, work with expeditions, Sweepstakes, Field Day, frequency-measuring tests, and so on. The first Sweepstakes, held in January, 1930, was won by W1ADW, who worked 153 stations in 43 sections during the two weeks of the contest. This obviously was a stellar performance for 1930, but it demonstrates so clearly how times and standards change, because present-day SS champs work 153 stations in the first two or three hours of the contest.

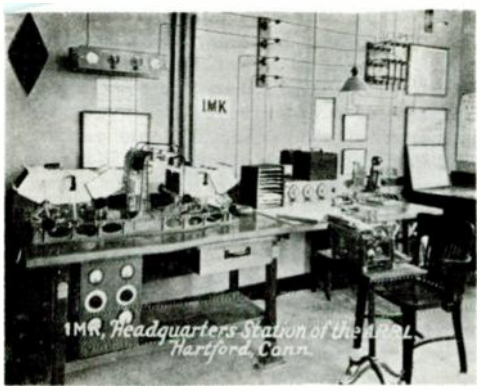
The first Frequency Measuring Test was held in late 1931, with sixteen stations sending the "unknown" frequencies on two bands. The winner was the late Boyd Phelps then W2BP, who achieved an accuracy of 99.99 per cent.

The present ARRL QSL Bureau system also dates back to this period. The scheme was given a trial run in the second call area during 1932, and then in 1933 was set up to cover the whole United States. Then, as now, the problem was in getting all hands to send in stamped, self-addressed envelopes.

In 1933 we also had the first Field Day, an activity which over the years has become one of the most popular amateur activities. W4PAW, on the air continuously for the 27 hours of the contest and using six operators from the Indian Rocks Beach, Fla., location, worked about 60 stations in 28 sections.

All phases of amateur radio grew during this period, but especially worthy of note was the growth of phone work. Technical advances had made high-quality phone operation possible for any amateur who so desired, and the phone sub-allocations were increased to accommodate this increased activity. The Official Phone Station appointment was announced, phone operators proved their worth in transcontinental tests, and there was a special *QST* column headed "With the Phones."

All bands, all modes were being utilized by



This was W1MK, the headquarters station of the ARRL in the 20s and early 30s, located at Brainard Field, Hartford, Connecticut.

amateurs. Two new areas of exploration were the 28- and 56-Mc. bands. Amateurs dug into the 28-Mc. band hoping that it would turn out to be a super 14-Mc. band, but were sadly disappointed. It was not for a number of years that the effect of the sunspot cycle was recognized and the band achieved usefulness.

Two Hundred Meters and Down tells the story of the 56-Mc. exploration.

In the early part of that year it occurred to a few individuals that there was a definite place, not only in amateur radio but in all branches of the art, for communication limited to just a few miles, or, as was first supposed, "line of sight" distances. In the summer issues of* QST *James J. Lamb and Ross A. Hull of the ARRL headquarters staff described the construction and operation of thoroughly reliable and effective 56-megacycle apparatus. The equipment itself was a great improvement over that used in the early experiments; the transmitters were simple, low-powered, easily adjustable, and practically foolproof. The receivers, based on a revival of Edwin H. Armstrong's superregenerative circuit which had waited ten years since its invention for widespread adoption, were marvelously effective. The order of performance given by this equipment was entirely disproportionate to that of the 1924–27 brand. Immediate amateur interest hailed its introduction. Especially in the metropolitan areas, where many stations were audible within the range of the equipment, local radiotelephone systems mushroomed into amazing proportions. In a few months hundreds of stations were actively on the air on five meters in the New York, Boston, and Philadelphia areas; interest, although slower, was nonetheless widespread in other regions. Before a year had elapsed there were thousands of five-meter stations, some owned by old-time amateurs who sought new thrills, some by ordinary traffic-handlers or DX men seeking a sideline interest, many by brand-new amateurs, attracted by this fascinating local phone work with simple, inexpensive, compact gear.

But despite the pioneering aspects of amateur radio, despite the "state of the art," despite the efforts that had been made by responsible amateurs, there was still much room for improvement. Self-policing of the ham bands was not entirely effective, policing by the Government almost nonexistent. Quoting from an editorial in the April, 1934, issue of *QST:*

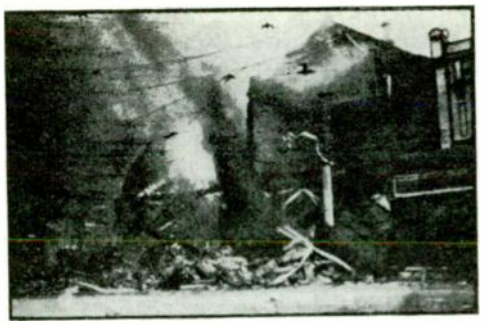
> "For many years there was almost no enforcement of the amateur regulations. Most amateurs realized that these regulations were for our common good and willingly complied, but there were always those who through carelessness, inexpertness or perversity failed to comply — and enough of them to detract seriously from the enjoyment of the rest of us . . . Late last year the Federal Radio Commission commenced a general policing of the high-frequency services, including the amateur service, from ten monitoring stations. Amateurs observed in an apparent violation are now served with a "discrepancy report" requiring them to make an explanation for the Commission's information. For successive *proved* offenses, increasing penalties are to be meted out. Out-of-band operation and inadequately filtered plate supply are receiving chief attention . . ."

This period of amateur radio history had brought great strides in amateur operating activities, but there was more to come. There *had* to be more to come, for the size of the 1934 amateur population required the utilization of at least 1934 operating techniques.

Emergency Communication

In mid-December of 1929 a heavy sleet storm hit western and northern New York State, bringing down telephone and power lines and isolating many cities. Western New York's SCM, W8PJ, organized amateurs in the area who did an outstanding job for telephone and power companies and railroads. In the northeastern part of the state, W8DQP went almost without sleep for 72 hours to take care of badly needed communications in Glens Falls.

New regulations for the Army Amateur Radio System, effective in November of '29, detailed



New Zealand's earthquake in 1931 showed officials of that country that amateurs are useful, and emergency-consciousness is still apparent today among the ZLs.

definite AARS procedures to be followed in the event of emergencies.

Mr. Maxim's testimony before the U.S. Senate committee on Interstate Commerce in 1930 made prominent mention of amateur operation in emergencies. "For many years," he pointed out, "not a single major breakdown in general communication has occurred that amateurs have not played a major part." He then went on to give details of amateur service in numerous emergencies, finally asking "Is it worth preserving, or no?"

The U.S. Naval Reserve started getting into the act in May, 1930, when it held a nationwide emergency drill, mostly on Navy frequencies. Shortly thereafter, a cooperative agreement with the Red Cross was announced. Thus, 1930 can be seen as the year when military services became actively interested in organizing amateur radio for emergency communications purposes.

Another sleet storm, in November 1930, hit the north midwest, wiping out all communications between Jamestown and Fargo, N. Dak. W9CBM and W9DGS were the principals in filling the gap.

In September 1930 a hurricane approaching the Virgin Islands brought a QRR from K4AAN, who made contact with W3CAB in Washington. Amateurs throughout the southeast were alerted, but the hurricane never did get around to hitting the U.S. mainland.

In 1931, amateurs began to get into emergency work with a vengeance; after that, almost every month reports were received of emergency work by amateurs somewhere. The New Zealand earthquake received "up front" *QST* treatment in the May issue, thanks to special efforts by ZL2AC in writing it up and transmitting it by radio to W1SZ, *QST*'s managing editor. Other 1931 emergencies can receive only mention: sleet storms in Nova Scotia in February; shipwreck off Newfoundland in March; snowstorm in Maryland in March; earthquake in Nicaragua in April; power line failure in New Hampshire in April. These are just a few of the reported emergencies in which amateurs assisted in our growing awareness of our potential for public service.

It would be pointless here to rehash each and every emergency as it occurred, throughout the years. There were floods and earthquakes and storms, fires and explosions, train wrecks and airplane crashes — much the same pattern as today. You cannot name a disaster in the annals of history of that time in which amateurs were not taking part. The California earthquake of 1933? W6BYF was on the air ten minutes after the first shock, telling the world about it when no one else could. Storm followed storm in 1932–33–34 — snowstorms, blizzards and sleet storms in winter, tornadoes in spring and summer, hurricanes in the fall, and amateurs were on the job everywhere.

Meanwhile, thinking amateurs and ARRL (one comprises the other) were beginning to think along lines of preparedness and getting organized, and herein lies the *real* story of amateur radio emergency communications. We have already mentioned early efforts on the part of railroads to organize amateurs, first under the Pennsylvania Railroad with the rallying call "PRR," then the use of "QRR" to signify a railroad emergency, and later the use of QRR to signify *any* emergency involving amateurs. Other railroads and the armed services also showed interest in organizing amateurs for emergencies, the Army in connection with its AARS (Army Amateur Radio System) and the Navy as a part of its reserve training program.

Early in 1933, ARRL started thinking in terms of "preparedness," and an article in *QST* with that title appeared as a lead in the Communications Department, calling attention to the ex-

A big job was done by amateurs like these operators of W6BYF in the 1933 California earthquake.

FEDERAL RADIO COMMISSION
Washington, D. C.

March 18, 1933

The American Radio Relay League,
38 LaSalle Road,
West Hartford, Conn.

Attention: Mr. K. B. Warner

Dear Sir:

The Commission takes pleasure in informing you that it has received information commending the amateurs of Southern California for the splendid work done by them in handling communications in the recent earthquake area.

The names of the individual licensees who coöperated in this work are not known to the Commission. However, it is known that amateurs have always rendered every possible assistance during times of such emergencies, and it is hardly necessary to add that the Commission believes such service to be of the highest order of importance.

It will be appreciated if you will express through the medium of the American Radio Relay League the Commission's appreciation of the prompt and efficient action which was taken by amateur licensees in bringing aid to the stricken area.

Very truly yours,

/s/ HAROLD A. LAFOUNT,
Acting Chairman.

istence of a number of networks organized for that purpose. "Far-seeing amateurs," said the article, "are organizing in order that amateur radio will be prepared when the elements go on a rampage."

Emergency work received editorial mention in 1933, in the same issue of *QST* in which Clinton B. DeSoto's article on the California earthquake appeared. A copy of a letter from the acting chairman of the Federal Radio Commission commending the amateurs also appeared in this article. Lessons were learned from the earthquake operation which were duly summarized in subsequent issues, along with supplementary reports.

Late that year, QRM in emergency work first reared its ugly head, as W4ACB decried some of the superfluous tactics of amateurs engaged in emergency work and also inimical practices of those not taking part.

Early in 1934, the Federal Radio Commission called a conference to discuss a plan to concentrate all emergency communications on certain frequencies, to be strictly controlled by government agents. ARRL attended the conference and pointed out that such a plan would throttle the amateurs' ability to render spontaneous on-the-spot assistance as required. Although the conference resulted in certain provisions being made for emergency operations by all services, the amateurs were not specifically affected by it, and our ability to render maximum public service was preserved — *entirely* because ARRL was on the spot to see that it was.

Meanwhile, amateurs continued to perform. In California, in Canada, and in the Pacific Northwest amateurs went to work on floods, storms, lost fliers, railroad emergencies and every kind of emergency imaginable, still without specific preparation, but attracting wide public attention nevertheless.

But preparations consciousness was there. The November '34 issue of *QST* contains a description by Michigan's SCM, W8DYH, of the arrangements between amateurs and the Detroit police. And in 1935 the ARRL Emergency Corps was formed — about which more next month.

Technical Progress — 1926-1929

IDLE speculation may be profitless, but it is sometimes interesting. One cannot help but wonder, in the light of later knowledge, whether the early amateur achievements in long-distance communication and short-wave work would have had the same chronology if the matter had been simply one of progress in technology. Coincidence or not, the early transatlantic successes occurred during the minimum period of a sunspot cycle — just when conditions would be most favorable for propagation on the frequencies in use at the time.

One thing is certain: In the immediately succeeding years the theories proposed for explaining the behavior of short waves were strongly colored by the fact that all of the data were obtained during and shortly after a sunspot minimum. The connection between the sunspot cycle and the maximum usable frequency was not at first suspected; in fact, the idea that there was a *maximum* frequency that would be refracted by the ionosphere was just gaining acceptance by the end of 1925.

The early 5-meter experimenters were not among the believers; they held fast to the tenet that since experience at 80, 40, and 20 had shown that the shorter the wave the better the DX, by logical extension "5" should be a super-DX band. The physicists, on the other hand, were inclined to put the upper frequency limit in the vicinity of 30 Mc., based on such knowledge of the ionosphere as was in existence.

The DX will-o-the-wisp inspired the 5-meter men — never more than a handful, in numbers — to battle the technical problems of getting equipment to work satisfactorily with the tubes and components then available. It cannot be said that any great success followed their efforts, although there were scattered reports — difficult of verification at this late date — of 5-meter

signals being heard at transcontinental and even transatlantic distances. Actual two-way work was confined to 10 or 15 miles, in most cases, although there were at least two instances that deserve mention as foretelling what was to come much later: In July 1926 *QST*, communication over a distance of 120 miles, between 1OA and 2EB, was chronicled; from the behavior of the signals it appears that the work was done during a favorable temperature inversion. Then in the June 1927 issue a 5-meter crystal-controlled transmitter, 2XM, was carried to a mountain top from which a distance of 150 miles was covered — the first reported mountain-top expedition for line-of-sight work.

In the meantime, the non-amateur world — of physics, in particular — was busy with the problem of the ionosphere. The newly devised pulse method of ionosphere sounding was providing data that began to bring order into the propagation picture. Pickard, in 1927, showed a correlation between radio propagation and sunspots, and the now-familiar relationship between the cycle and high-frequency propagation began to take form. By 1929 the upper limit of ionospheric propagation was set, in most minds, in the neighborhood of 30 Mc., under favorable sunspot-cycle conditions. By this time, also, amateurs had an international assignment at 28–30 Mc., and some long-distance work had been done by the few stations that managed to get on the band. But the cycle had gone through its peak, a rather low one, in 1927–28, and the favorable period did not last long. As for frequencies above 30 Mc., they had come to be considered good only for line-of-sight.

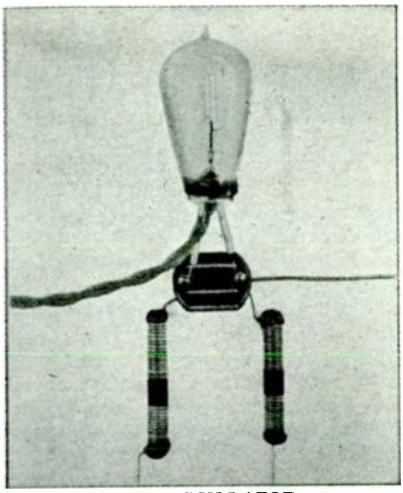
It was a nice, clean-cut picture. But like most tidy theories about natural phenomena, it was far too simple. It was to be shattered, just as the 200-meter myth had been a few years earlier, by amateur activities to be taken up in a later part of this series.

Receivers

Throughout the latter part of the 1920s the regenerative detector plus one or two audio stages continued as the standard receiving setup. There were occasional attempts at using superregeneration — an interesting set of this type was built by 6GD for use with a loop antenna in some airplane tests — but without any lasting result. Selective or "peaked" audio amplifiers were advocated as a means for improving c.w. selectivity, and now and then the radio-frequency amplifier was revived — again without much effect. Without effect, that is, until a really radical innovation came along — the screen-grid tetrode, announced in December 1927. Here, at last, was a tube that promised to overcome the shortcomings of the triode.

The first version of the screen-grid tube, the UX-222, was made for battery operation, as were the other receiving tubes up to that time. The same *QST* issue that announced the 222 also carried articles by H. P. Westman, then Assistant Technical Editor of *QST*, and R. B. Bourne, 1ANA, on receivers using the tube for r.f. amplification. The r.f. was followed by the usual regenerative detector and audio, the whole being shielded and filtered to prevent interaction and instability. A short time later *QST* also carried a description of a broadcast receiver using several r.f. stages, again with thorough shielding and filtering. Possibly because of these constructional complications, the tube did not get much of a play in amateur receivers — or possibly because it was universally believed that the good old regenerative detector would bring in anything that an r.f. stage would, anyhow. In point of fact, the 222 was a rather poor performer, judged by the a.c. model, the 224, that followed within a year or so. In the interim, curiously enough, its chief application was as an untuned coupling stage between the antenna and the detector. This had the desirable effect of reducing the influence of the somewhat unpredictable antenna constants on the oscillating detector, but invited cross modulation — especially with local broadcasting stations.

By the end of 1929 the new "a.c." tubes were beginning to spell the demise of the storage "A" battery — to no one's regret! "B" substitutes were by this time well established, so complete powering from the a.c. line was finally within grasp. And with a.c. operation a new era in receiver design shortly would open.



THE OSCILLATOR

A UV-202 tube with a short stem. The fixed stopping condenser is a Sangamo 10,000 pfd. or .01 μfd. receiving condenser. The lead to the right is the antenna feed lead, the twisted pair at the left supplies the filament current. The two chokes are in the positive plate supply and grid-leak lines. Note their method of winding. The end sections are effective at ¾-meter and are loaded by the center section so as to be effective at 5 meters also. Having a spaced portion at both ends permits connecting them in either way. The chokes are so effective that if one is put in each filament supply lead the grid may be grounded but the oscillator will continue oscillating.

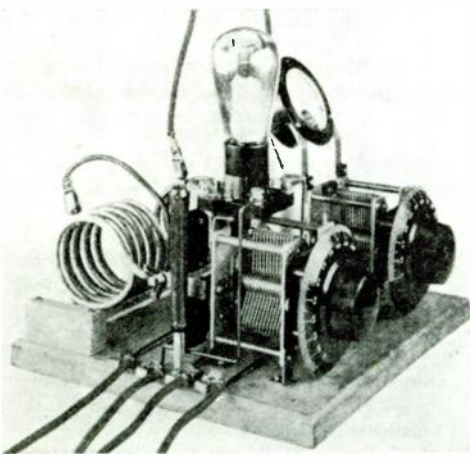
Transmitter used in the first amateur ¾-meter communication. Oscillation was actually at 1½ meters, the antenna being tuned for transmission of the harmonic. (From August 1927 QST.)

Transmitters

In 1926 the main transmitter topic was crystal control. The next two years saw a good deal of information published on processing quartz to secure oscillating crystals and on using those crystals in practical transmitters. Crystal cutting with the muck saw and the diamond saw were described, and one article in *QST* (May 1927) suggested lapping a number of crystals simultaneously between two large flat disks, a scheme later used by many crystal manufacturers. Ready-ground crystals began to get into circulation, and the beginnings of the crystal-controlled era were in sight.

Today's generation, conditioned from the beginning to crystal control and multistage transmitters, would take in stride — so it thinks — the problems that confronted the early crystal converts. (How many of the younger generation has ever used triode oscillators and neutralized triode amplifiers?) Some lessons had to be learned — among them the important one that a crystal could stand just so much and no more. Although attempts were made to use crystals in high-power oscillators, those who tried it quickly learned better, even though the early crystals were able to handle much more power than the little fellows we have today. So amplifiers became essential if more than a few watts output was wanted. Here was unfamiliar ground, although the master oscillator-power amplifier had been used sporadically for about as long as there had been tube transmitters. The old method of simply hooking in an extra tube and calling it an amplifier didn't work; the result of the inevitable self-oscillation was a blown crystal.

And so out of necessity came the neutralized amplifier. The circuits had been in existence for several years, as we noted earlier in this series.



The "1929 Hartley", a 210 oscillator featuring heavy tank construction for handling the high circulating currents that accompanied high C, and towel-bar supports that allowed sliding the antenna coil toward or away from the tank for coupling adjustment. The breadboard construction was typical of the period; metal chassis came along some years later. (From August 1928 QST.)

Now they began to be used. But neutralizing, then as now, was a puzzling procedure to those not accustomed to it. Careful explanations were in order, and continued to be so from then until the present day. Those who were successful at it had transmitters with outstandingly steady signals.

Along with crystal control and neutralized amplifiers there entered a new technique — frequency multiplication. To those brought up on simple oscillators coupled to an antenna, this was the beginning of an age of complications. But the reward — a stable signal on a known frequency — was worth it.

However, the simple oscillator transmitter was by no means through. (It was not until the mid-1930s that it began to be outnumbered by the crystal-controlled sets.) The example set by crystal control focussed more and more attention on the instability of "conventional Hartleys" and the like. More emphasis was being put on using a large C/L ratio in the oscillator tank; on using loose coupling to the antenna to overcome the instabilities that tight coupling introduced; and on using good d.c. plate supplies to sharpen up the signal. By 1926 these principles had had plenty of exposition, but they were not widely applied. It took a real jolt, the 1927 Telecommunications Conference in Washington, and the aftermath of facing narrowed bands beginning in 1929, to bring home the lesson that better signals were becoming a necessity and not just a matter of individual pride.

In preparation for 1929 the League undertook a technical development program aimed at improving equipment to the point where amateurs could accommodate themselves in narrower bands without creating intolerable QRM. Under the direction of Ross A. Hull, a study was made of transmitter stability, with the result that for the first time, so far as we are aware, some actual numerical data on stability of transmitters were accumulated. The over-all result was a confirmation of the existing principles, carrying them to what at the time seemed like the nth degree. From this work the term "high C" was born.

One of the hardest lessons to swallow was that an oscillator transmitter simply would not be stable until the antenna coupling was loosened to the point where a large part of the possible power output was sacrificed. Acceptance of the unpalatable truth probably had much to do with hastening the trend to crystal control, since it did not apply to amplifiers.

The latter half of the 20s saw the introduction of transmitting tubes designed with high-frequency use in mind. The first of these was the DeForest "H" tube, introduced early in 1926. With no base, and with plate and grid leads brought out at widely spaced parts of the bulb, it represented an attempt to reduce interelectrode capacitances and high-frequency losses. It was followed about a year later by the 852, using much the same general idea but rated at higher power, and provided with a standard four-prong base for the filament connections.

After the introduction of screen-grid receiving tubes, a screen grid was added to the 852 structure to make the 860, which made its appearance in the latter part of 1928. Concurrently, several transmitting tube types were being developed primarily for the broadcast service, and audio power amplifiers (all triodes) were being added to the receiving-tube collection. Notable among the latter was the 250, which was widely used by amateurs both as an oscillator and modulator.

The tube shortage was over.

Phone

A large proportion of the amateur fraternity has always wanted to do its communicating by voice, and this was just as true in the '20s as at any other period. But the state of the phone art was not very far advanced, and too many amateur phones could only be described by the word "awful." Loop modulation, a species of grid modulation, and vague attempts at Heising modulation were the rule; nothing else was known. The relationship between the modulator and the modulated amplifier was a mystery to most. Modulation percentages were low, distortion was high — and worst of all, modulation applied to an oscillator, the universal method, gave rise to more frequency modulation than amplitude modulation. Picturesquely termed "wobbulation", the f.m.-a.m. combination got progressively worse at the higher frequencies, resulting in excessively broad signals that gave phone a bad name.

The same problems faced the broadcasters, so a great deal of professional attention was focussed on modulation. By 1928 some basic principles were emerging. Tubes were developed that would give respectable amounts of audio power by the only method known at the time — what we now call Class A_1 amplification. Circuits were devised which permitted modulating an r.f. stage 100 per cent with a minimum of distortion. The modulated oscillator was discarded in favor of the modulated r.f. amplifier; furthermore, it was found that a buffer amplifier was needed between the oscillator and modulated stage to protect the former from reactions that would vary its frequency.

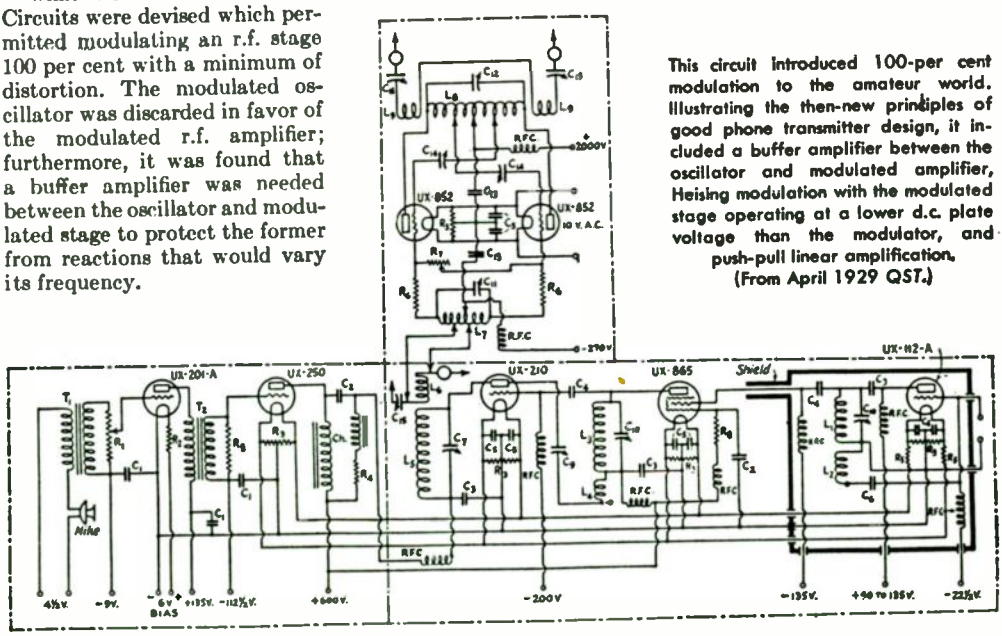
These things were not long in penetrating the amateur world. One of the projects of the League's technical development program was the design of a modern phone transmitter incorporating the same principles. It resulted, in April 1929 *QST*, in the description of a phone transmitter that, for the first time in amateur practice, had 100-per cent modulation. Using a 112 master oscillator, an 865 (then just announced) screen-grid buffer amplifier, and a 210 modulated amplifier, it provided the necessary oscillator stability and isolation. For increased power the set had a pair of 852s in push pull as linear amplifiers, capable of about 100 watts carrier output. This was about the highest power an amateur could hope to get, with 100 percent modulation. Phone was neither easy nor economical.

Nevertheless, the principles of proper phone operation began to sink in. With high modulation percentages and a stable carrier, a good low-powered phone proved to be more effective than a high-powered splatter generator. Phone had at last achieved respectability.

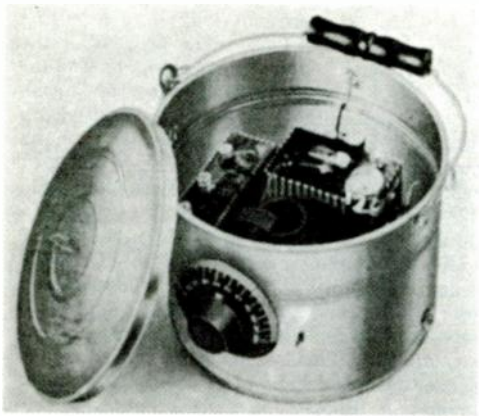
Transmitter Monitoring and Measurements

The unshielded regenerative receivers of the 20s were useless for checking the quality of the transmitter's signal, and they gave only a vague notion of what the frequency might be. Dependence had to be placed on reports from distant stations — these were as reliable then as they are now! — and on absorption-type wavemeters. Something better obviously was needed, especially after the 1927 conference when narrower bands were in prospect. And so the transmitter "monitor" came into being.

The original suggestion for a monitoring scheme seems to have been made by J. K. Clapp



This circuit introduced 100-per cent modulation to the amateur world. Illustrating the then-new principles of good phone transmitter design, it included a buffer amplifier between the oscillator and modulated amplifier, Heising modulation with the modulated stage operating at a lower d.c. plate voltage than the modulator, and push-pull linear amplification. (From April 1929 *QST*.)



An early transmitter monitor—a 199 oscillating detector, complete with batteries, installed in a "growler" for shielding. (The younger generation is not expected to recognize the container, familiar in a bygone era.) The picture is from July 1927 *QST*.

in December 1926 *QST*. Utilizing a separate oscillating detector circuit, shielded well enough to reduce the transmitter's strength to manageable proportions, the device enabled the operator to hear his signal as others heard it — a boon to transmitter adjustment. The same article also pointed out the utility of the oscillator for "zeroing" on the other fellow's wavelength. In the succeeding years increasing emphasis was placed on the necessity for a monitor, and in time no station was considered adequately equipped unless it had one.

It shortly became obvious that the monitor had another valuable property. Properly calibrated, it became a heterodyne frequency meter — more accurate and more satisfactory to use than the absorption-type meter which always had been a somewhat uncertain crutch for the amateur to lean on when he wanted to know whether or not he was inside a band. The construction and calibration of the combination frequency-meter-monitor was a favorite subject in *QST* articles for the remainder of the "self-excited" transmitter era. It would be hard to overestimate the value of this one piece of equipment in the campaign to clean up transmitter notes and keep them inside the assigned bands.

Although space has not permitted dwelling on the subject particularly in this series, measurements have always been very much a part of the amateur scene. However, even a brief history should note one piece of equipment that has survived practically intact — the grid-dip meter, first described by Hoffman of 9EK in August 1926 *QST*. A versatile device, indeed, to last as long as it has! Even this, though, had a long-forgotten progenitor — an oscillator using a plate milliammeter which kicked up instead of down when coupled to a tuned circuit on the same frequency. Such a "plate-kick meter" was written up in a 1919 issue of *QST*.

Near the end of the decade, the increasing role of phone earned recognition in amateur measurements. The "modulometer", described by J. J. Lamb in August 1929 *QST*, made use of the by then well-known peak-reading v.t. voltmeter to perform both r.f. and audio measurements in the phone transmitter — the first such instrument designed specifically for amateur use.

Antennas

Last month we mentioned that the amateur was beginning to free himself from the antenna-and-ground concept that had dominated antenna thinking for so long. The process was greatly accellerated with the publication of a report by Kruse in February 1926 *QST* on polarization experiments performed by Pickard. This work showed that short-wave signals were mostly horizontally polarized at the receiving point even when they were vertically polarized on leaving the transmitting antenna. Coming at a time when interest in the Hertzian oscillator or linear half-wave antenna was rising, the article was influential in shifting attention to horizontal wires. In turn, this led to more use of radio-frequency transmission lines and more demand for information on how to operate them.

The Zepp and a single-wire feed system of more-or-less uncertain characteristics were known. Both single-wire and two-wire tuned lines got a thorough going-over in July 1926 *QST*. Windom, 8GZ, described a method of adjusting the position of the single-wire line on a half-wave antenna for maximum power transfer and minimum line radiation. This was later amplified by the same author in the September 1929 issue, the single-wire feed system thereafter being popularly known as the "Windom" (a name misapplied to a quite different off-center-fed antenna of later vintage, although we suspect it may have been done by some discerning gent who appreciated that it *worked* the same way as the real Windom on some frequencies).

Two-wire lines were of the tuned variety — that is, no attempt was made to reduce standing waves — and explanations of their operation were in terms of current and voltage distribution

The original grid-dip meter, described by W. A. Hoffman in August 1926 QST. The plug-in coils covered the range from 12 to 800 meters.

similar to the distribution on the antenna itself. It was not until January 1928 that a mention of a matched termination appeared, in an article by W. van B. Roberts describing a matching network to be used between the line and the antenna. This was before the days of low-impedance lines; a direct match by the antenna itself was precluded because home-constructed lines had characteristic impedances of the order of 400 to 600 ohms. Although the higher efficiency of a matched system was recognized, few amateurs wanted to have their operation confined to a single frequency. Hence the tuned line, with its flexibility in respect to band changing, was preferred — together with single-wire feed, which also offered flexibility.

Along with a better understanding of transmission lines, the directive properties of antennas were beginning to be appreciated. This, too, was the beginning of the beam period, and the now-familiar Yagi began to get a little use on the higher frequencies, 28 Mc. and above. The real blossoming of the beam, though, is a later part of our story.

Surplus and Single Signal

IN THE SPRING OF 1930, *QST* advertising began to take on an appearance that was somewhat schizophrenic. The personality of the advertising pages was split between new amateur equipment, components and tubes on one hand, and a rash of surplus houses on the other. The surplus situation worsened (as they say in G-land) during the next two years. When a store, Hatry & Young, felt it had to advertise "New standard parts only. No surplus, dumps or tricks" it was unhappy evidence that something had to be done. Something was done, in April 1933, and the something was of greatest importance. However, before we examine the solution to the surplus problem, let's see what advertisers in more desirable categories were doing.

Important equipment announcements were made by two present-day friends — National and Hammarlund. In October of 1931 National first advertised the SW-3, following with the HFC 5-meter converter in August 1932, the AGS in October 1932, the FB-7 in March of 1933.

Hammarlund first advertised the Comet Pro in April of 1932.

The modest crystal transmitter announcement by Arthur A. Collins in January 1932 was the forerunner of a selection of some forty transmitters to come from Cedar Rapids during the thirties. These included such different models as the 32B, which used a pair of 46s, and the 213C, a 1000-watt rig.

The first ad on Shure Brothers microphones came out in February of 1932.

Tubes? A plethora. Between April 1930 and December 1931 de Forest brought out thirteen tubes ranging from the 430 and 431 receiving audions to the 507, a 10,000-watt water-cooled monster.

Cunningham, a subsidiary of RCA, announced ten receiving tubes; and RCA brought out three for transmitting and one for receiving. There were rectifiers by Perryman, CeCo, Rectobulb, Odeon, Hytron, Thermionic Labs; transmitting tubes by Duovac, Triad, Vacuum Products Lab; special tubes by Arcturus, Canatsey, Telephoto and TV Corporation.

No fewer than fifteen new crystal manufacturers advertised in *QST*, with an unusual geographical coverage. The east was represented by such firms as Standard QRH Crystal Labs in Jackson Heights, N. Y. and Precision Crystal Lab in Springfield, Mass. Herbert Hollister was in Merriam and American Piezo Supply in Kansas City, both Kansas. Bliley was, and still is, in Erie, Pa. Standard Radio Labs, Dallas, took care of the southwest and La Grayce Co. in San Francisco put the west coast on the crystal map.

A half-dozen radio school advertisements, including that of the Radio and Television Institute of Chicago with Fred Schnell's picture in it, started in *QST*. Instructograph's first appearance was in the February 1930 issue.

John Rider, well known technical author, ran his initial ad in December 1930. John Rider, Publisher, is a *QST* advertiser today.

It is interesting to see how ideas for accessories to amateur radio recur. In *QST* for December 1932 de Wilde Company advertised a 24-hour World Clock with foreign cities printed on the face. Theodore Stern offered "Your call on a pin," chromium plated with safety catch. "Who's Who in Amateur Radio" was brought out by Radio Amateur Publishers in February of 1933. Within the last several years similar offers have been made a number of times.

Ignition interference is nothing new; it plagued hams of thirty years ago. Allen-Bradley said in August 1931, "Stop interference on radio-equipped cars with Bradley suppressors."

To the ham who was building, A. L. Munzig and F. W. Sickles were offering transmitter coils and in July 1931 Arthur J. Hunt showed an "Ultra Modern Tuner" called the Vari-Coil. Manufacturers of filter condensers were Siemen-Zwertusch, Condenser Corporation of America, Dubilier, Cornell — the last two not yet having merged.

Power and modulation transformers were on sale by Amertran, Webster Electric, Broadcast Service. Cage or doublet antennas could be bought from Thorola or Lynch Manufacturing.

General Engineering Corporation, Stromberg-Carlson, and Gates Radio advertised power supplies, Gates preferring the name "Rectifier."

The Delco Ham Speaker by United Motors Service and the Brush Development Crystal speaker were shown. Trimm Featherweight phones were advertised for the first time in May 1931.

Quite a selection of microphones was available during the three years. E. F. Johnson, Astatic, Ellis Electrical Lab, Gavitt Mfg., Kellogg, Universal, International Broadcast Equipment, Mayo Instrument, Radio TV Industries, Remler, Sound Engineers, Samson Electric, were in *QST*.

Don H. Mix first offered the Sentinel Magnetic Overload Circuit Breaker in December 1932. (He's W1TS, now an Assistant Technical Editor of *QST*).

Ham receivers were shown by de Forest, Radio Construction Co., Stenode Corp. of America, Hendricks and Harvey, McMurdo Silver. The Sparton short-wave converter was advertised by Sparks-Withington.

For those who wanted to experiment with television there were Jenkins with a Radiovision Kit, TV Manufacturing Company of America, Globe TV, Norden-Hauck.

Wide-awake advertisers kept an eye on *QST*'s technical articles. Examples are REL's parts for the TNT circuit in April 1931 and Delta's "Special units for the new crystal xmitter in November *QST*."

One name that had been in *QST* for many years made its exit as a manufacturer in 1932 — Acme. In February, Delta Manufacturing Company's first ad showed "Acme Apparatus" in parentheses; in December, Delta announced that it was the successor to Acme Apparatus Co.

Two other long-time advertisers combined: Weston-Jewell appeared in September with instruments for radio service men. And in 1931 one of the best-known company names of the era disappeared forever from the advertising pages of *QST* — de Forest. The last de Forest ad ran in December.

During this period a technical development took place that was of utmost significance in receiver design. Jim Lamb's *QST* articles in June, August and September of 1932 on single-signal reception influenced manufacturers and their advertising immediately, and that influence is felt today, thirty-two years later.

M and H Sporting Goods in Philadelphia was alert and advertised in November "Everything you need to make the Single-Signal Superhet described in Aug. and Sept. *QST*." Hendricks and Harvey advertised a single-signal receiver in December. In March of the next year, 1933, Leeds described its new Supreme Single-Signal Super. In September of 1932 National advertised "Special Parts for . . . 'single-signal' h.f. receiver as described in Aug. 1932 *QST*." Specifications of the new FB-7 in March of the following year stated that "both the circuit and the chassis layout have been designed for ready addition of mechanical filter (quartz crystal) when desired for full 'single-signal' operation."

Stores, now grown into distributors, that still advertise in *QST* include Harrison Radio, first ad in April 1930; Uncle Dave's Radio Shack, now Fort Orange Radio, August 1930; Burstein-Applebee, July 1932; Lew Bonn, September 1932.

But what about the advertisers of surplus who were worrying both *QST*'s readers and *QST*'s advertising department? That word "plethora" should have been saved for them, because in the thirty-nine months from January 1930 through March 1933 there were more than two dozen such houses using advertising space in *QST*. Merchandise on sale varied from "Bankrupt Radio Stocks," through tubes of unspecified manufacture and $75 generators for $4.95, to Army and Navy radio surplus bargains.

After serious discussion it was decided in the spring of 1933 that *QST*'s advertising policy must be radically changed. Advertising rate card No. 8 which came out in February and went into effect with the April 1933 issue carried the following: "Advertising is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League." The April editorial explained *QST*'s new firm stand; an advertisement quoting the paragraph from the rate card was printed in *QST*.

That advertising policy has been rigidly observed ever since. The same paragraph is on *QST*'s current rate card and the advertisement appears in *QST* every few months — in fact, it's in this issue.

So, with junk surplus out of *QST*'s advertising columns and with single signal entrenched as the best method of reception — with no patent royalties for manufacturers to pay — it looked like good days ahead for readers of *QST* advertising, and for the advertisers themselves.

Rate card No. 8 gave the cost of a full-page advertisement as $210. *QST*'s circulation was approximately 35,000. QST

ARRL President Eugene C. Woodruff, W8CMP, unveils the Maxim Memorial Plaque during the dedication of the new W1AW on September 2, 1938.

Maturity

QST has earlier described the formative years of amateur radio, and the dark days of World War 1; the exciting years of discovery and achievement in the early twenties, followed by the coming of international law; the threat of extinction through crowding, headed off by a tremendous program of technical development in the late twenties; and the boom years of the early thirties, in which the amateur population more than doubled in four years' time.

Now comes the period 1934 to 1939, much more difficult for a writer than previous eras. It cannot be dismissed as an unimportant segment, for in this time the interpretations of Federal regulation and the administrative practices of the League were hewn out of the raw material available into a shape still recognizable today in amateur affairs. Yet the achievements would be measured in inches where they had been in feet, or even in yards. It is a time of myriad small changes, of gradual maturity rather than sudden change.

International Regulations

In the field of international regulation U.S. amateurs had to discover that, while they were not alone and friendless, neither were they free to do whatever they wished. Moreover, they found that, in return for the strong support and interest of their own government, they had to accept — and at conferences even fight for — decisions of the government not entirely to their liking.

Almost as soon as the Madrid Telecommunications Convention was ratified by the Senate in 1934, amateurs began thinking about and preparing for the Cairo Conference, the next at which the governments would discuss radio allocations. Amateurs of the day were particularly anxious to have the 80- and 40-meter bands expanded, for these were a sea of QRM. In November 1934, the League's secretary told a club official that expansion of 7 Mc. would certainly be a goal of the League as it prepared for Cairo. In May, 1935, though the Cairo Conference was a long time off, having by then been scheduled for early 1938, the League Board of Directors set up a special Cairo Committee of three directors headed by Atlantic Division Director Woodruff, a highly respected college professor and later ARRL president. The committee was given an appropriation of $2000, quite an amount for a Board committee in those years.

In November, 1935, Dr. Irwin Stewart, then vice chairman of FCC and still active in U.S. telecommunications circles, warned amateurs to keep their feet on the ground in planning for Cairo. His remarks still are germane; we reprint them elsewhere in these pages.

In the spring of 1936, U.S. — and ARRL — preparations for Cairo got underway in earnest. At its annual meeting, the Board adopted the recommendations of its Cairo Committee, including one that the League would seek 3.5–4.5 Mc. and 7.0–7.5 Mc., expansions of 500 and 200 kc. respectively. A special speaker at the meeting was Gerald Gross, chief, international division of FCC (who today is Secretary-General

of ITU and who holds the calls W3GG and HB9IA).

The FCC held public hearings in June. ARRL chose to appear on the final day, and Messrs. Segal and Warner had prepared a masterly presentation showing how they policed themselves, how crowded they were, especially at 40 and 80, why they needed additional space, and even studies showing where the increased allocations could come from, if only an engineering basis were to be used by the nations at Cairo. In tribute to our forebears, we can say it was easily the best performance of the hearing, and compliments from the industry poured into the Hq. and appeared in the trade press.

But sympathy and understanding do not automatically solve all problems. The Cairo Preparatory Committee, made up of users of radio in government and industry, which met the following month, felt itself obliged to turn the League down on its request for additional frequencies. Warner and Segal took an appeal to the FCC and then to the State Department, but the word in both places was the same: No. The U.S. went on record then in favor of the status quo, firmly committed to support our allocations in toto, but equally committed to refrain from asking for more space.

In November and December 1937, a regional conference was held at Habana. The North and South American countries at the conference agreed to support the U.S. Cairo proposals, and to hold out for exclusive rather than shared bands. (The conference also adopted an agreement that, where internal legislation permitted, the republics of the Americas would permit unimportant third-party traffic. The joker lay in the words "where internal legislation permitted"; the U.S. has continued to enter into bilateral agreements wherever these are possible.)

Finally the Cairo conference itself started February 1, 1938. Before it was over, the ARRL/IARU representatives knew they had been at a conference! There were a great many proposals hostile to amateur radio, but the U.S. and Canadian delegations, with the help of the other American republics, held the line as far as allocations in this hemisphere were concerned. Amateurs in Europe lost chunks of 80, most of 5, and with the rest of the world outside this hemisphere, henceforth had to endure propaganda broadcasting in 7200–7300 kc.

Ross Hull, right, and Roland Bourne, W1ANA, now curator of the League Museum, did pioneer work on radio control of models. The 16-foot glider pictured here is familiar to hundreds of visitors to 38 LaSalle Road, where it hung in the main lobby. The man on the left is not Bourne, however, but By Goodman, W1DX, Editor of the *Radio Amateur's Handbook*.

National Regulations

Not long before it was destined to join History, the Federal Radio Commission rearranged the amateur regulations along lines still recognizable. The Class A, B and C licenses were created, at ARRL request, with the Class A taking over the function of the special phone license and carrying with it phone privileges in the 80- and 20-meter bands not available to the old First Class or the new Class B and C. The Class B was the basic license under the new rules, carrying c.w. privileges in all bands and phone on 160, 10 and 5 meters. The Class C was to have the same exam as the Class B, and carry the same privileges, but it could be taken by mail with a volunteer code examiner and volunteer witness, only by those living more than 125 miles from one of the 32 examining points. The FRC regretfully stopped issuing Amateur Extra First Class licenses at this point, solely as an economy measure in that Depression year.

Tests weren't long then — only ten questions. But they were essay-type, and were chosen from a list of several hundred. Memorization didn't help much, but luck probably did, in getting questions on which the applicant was fully brepared. Incidentally, it did no good to ask a buddy what questions he had — there were 16 versions of the Class A test and 256 of the Class B/C! Failures on the exams stayed right around 30%.

In June Congress adopted the famous Communications Act of 1934 which scrapped the Federal Radio Commission, created a new Federal Communications Commission, and charged it with overseeing the field of electrical communications, wire as well as radio. Amateurs were not much affected, though, because most of the people we'd been dealing with were transferred intact to the new FCC along with all our regulations.

Enforcement of the amateur rules had been almost non-existent during the early thirties, but it got increasingly better during the decade. Monitoring stations were furnished with "all-band" receivers in 1933, and commenced to spend two hours a day monitoring the amateur bands. Later, oscilloscopes were obtained, and FCC used them in part to check amateur modulation. The regulations in force today, which provide that amateurs must have means of insuring operation within the bands and of modulation not exceeding the capability of the transmitter and in no case in excess of 100%, were adopted during the mid-thirties. Retransmission of broadcast

signals was prohibited, and later the transmission of music for "test purposes" was stopped after the League showed it had been greatly abused. In its place went the rule we have today, permitting the use of a single audio tone for testing. Filtered power supplies were required up through ten meters, and then in 1938 through 5 meters. Amateur TV was pulled out of the 1.8 and 56 Mc. bands, but authorized in new bands made available at 112 and 224 Mc., and in the wide open territory above 300 Mc.

At League request, the code speed was raised from 10 to 13 w.p.m. in 1936. A Board request for expansion of the Class A phone band from 3.9–4.0 to 3.850–4.0 Mc. was forwarded to FCC but was later withdrawn when amateur c.w. operators sent in petitions containing 5100 signatures against the move, and FCC thereupon ordered a hearing. The ten-meter phone band was first 28.0–28.5 Mc. This was extended 500 kc. in 1933, and in 1937 switched and expanded to the more-familiar 28.5–30.0 Mc. allocation.

In 1933 special licenses for portable stations had been discontinued and the "notification" system we now have was started. Initially, amateurs were required to indicate portable operation by following their call with BT and the number of the call area in which operation took place. After repeated League protests about the confusion which arose, particularly when messages were being handled by a portable, the prescribed prosign was changed to the slant bar. Mobile operation was first permitted only aboard private aircraft, and then only on v.h.f. Then just before it went out of business, the FRC changed the rules to allow "portable mobile" operation on frequencies above 56 Mc. by all amateurs without special notice or license. The definition of portable mobile used then is part of the definition for ordinary mobile today, and covered the usual installation in a car quite nicely. In 1938 the rules were further liberalized to permit maritime mobile operation outside the continental limits of the United States, except when within foreign waters, on 10 meters and the v.h.f.s only.

Canadian rules have not been treated separately since development closely paralleled that in the United States, except that the principle of having Canadian phone bands in addition to those of the U.S. had already been established. The licenses were then, as now, issued for the period April 1–March 31, and any new rules would be announced when the new licenses were made, remaining in force until the next year.

League Affairs

On February 17, 1936, Hiram Percy Maxim, the Old Chief, The Old Man, co-founder of the League and its president from the start 22 years earlier, passed on of a throat infection at the age of 66. The extent of the loss can only be imagined by those of us who have come along since. Suffice it to say here that amateur keys and mikes the world over lay silent when Hiram Percy Maxim, W1AW, was laid to rest.

CBS President William S. Paley presents the first Paley Trophy to Walter Stiles, W8DPY, for his public service work during the 1937 Ohio River Floods.

At its May meeting in 1936, Dr. Eugene C. Woodruff, W8CMP, head of the Departments of Electric Railways and Radio at Pennsylvania State College and most senior of the 1936 Board of Directors, was elected president of the League on the first ballot. George W. Bailey, W1KH, was then elected as vice president (Dr. Woodruff served two terms as president, in his quiet but able fashion. He joined the ranks of Silent Keys in 1944. Mr. Bailey, now W2KH, followed W8CMP into the president's chair in 1940, and occupied it decisively until 1952. He is still active as a consultant for the IEEE, a merger of the IRE and AIEE, and on the air.)

In 1936 shortly before the Board meeting a serious flood struck New England. Much of Hartford was severely damaged by the waters of the Connecticut River, and the headquarters station W1MK at Brainard Field near the river was practically destroyed, no trace of its antenna structures being found after the waters receded. Combining its needs and its sentiments, therefore, the Board decided that a new station be built on a suitable site to be found, in memory of Hiram Percy Maxim. In December 1936, the FCC, in the first action of its kind (although it has since become standard procedure), assigned the call W1AW to ARRL in memorium, and it was used for headquarters transmissions even before the new station could be built. (During the 1936 flood, the lesser-known League Hq. club station, W1INF, handled a great quantity of flood relief traffic. This station still exists in the ARRL laboratory, but its equipment is seldom the same for two successive operating periods; thus its phonetic nickname, "It's Never Finished.")

A fine piece of farm land was located in thinly-settled Newington, Conn. measuring 7⅓ acres, for a three-room building with garage, and plenty of space for a rhombic antenna. On September 2, 1938, the Maxim Memorial station was dedicated, and commenced its services as W1AW which have continued ever since (except for the war years) at the same location. Now in 1964 a fully-

Text of remarks by Dr. Irwin Stewart, Vice Chairman, FCC, to a meeting of the Washington Radio Club, November 2, 1935:

I came here tonight to say one thing, and when I have said it I am through. It is this: in your preparations for the Cairo Conference, keep your feet on the ground.

It is no news to you that frequency allocations must be determined by international agreement. It is no news to you that some countries endeavor to suppress amateurs; that many countries merely endure amateurs; and that only a few countries actively encourage amateurs.

You can be proud of the fact that of approximately 60,000 amateurs in the world some 45,000 of them are in the United States. You must recognize, however, that these figures furnish the source of your greatest weakness in an international conference. Aside from the United States and certain parts of the British Empire, only one country has as many as 1000 amateurs. Bands that to you mean terrific congestion, to some countries represent waste space. Far from wanting to set aside more space for amateurs, many countries may feel that too much space is now set aside for amateurs. After all, if space is needed for some service deemed nationally more important, what is more logical than for a delegation to insist that it be made at the expense of that service which is deemed nationally of less importance?

The moral? Simply this: at Cairo no important delegation will go farther for amateurs than the American Delegation, and many will be reluctant to go as far.

I do not know who will compose the American Delegation nor what its position will be. I am sure, however, that a conscientious effort will be made by the delegation to establish that position which is best conducive to the development and use of radio and, therefore, to the best interests of the United States. Actively assist in the formulation of that position and, once it has been formulated, whether or not it contains everything you desire, support it loyally.

If you try to go farther than the American position you may lose part of what you have. If you work with the American delegation, there is a fair chance that the American position may be adopted internationally.

grown up area of single residences surrounds the acreage, and in place of the rhombic sits the gleaming new headquarters.

Speaking of headquarters, the League had moved to West Hartford from Park Street in 1931, occupying the top floor of 38 LaSalle Road. By May 1937 things were much too crowded, and the Board therefore authorized the taking of a five-year lease on the whole building. By September, the office had been spread out accordingly, with a great sigh of relief by Warner and his crew!

League Organization

From the viewpoint of League organizational

Sidelights, 1934–1939

There were complaints in 1934 that *QST* was too technical. . . . Ham radio was part of the program in many CCC camps. . . . Secretary Warner wondered out loud whether there should be a special license, with no code requirement, for serious experimental types interested in exploring the v.h.f.s. . . . An FRC engineer thought amateurs could get better results if they avoided local contacts on the long-distance bands such as 7 and 14 Mc. . . . The Board urged FRC to look into the problem of auto ignition noise. . . . Four monthly versions of *QST* were established, with regional advertising and station activities being printed separately for the East, West, North and South editions. . . . The Lamb Noise Silencer (*QST*, February, 1936) got a tremendous play from the daily press and weekly magazines outside the radio field. . . . The 1936 Board agreed to publish Clinton B. DeSoto's history of amateur radio, *Two Hundred Meters and Down*. (Anniversary Section Editor's Note — Thank Heavens!) . . . The Board permitted alternate directors to attend the 1936 Board meeting at their own expense. . . . Many complaints about the Class C license; it's notorious that no one ever fails the code test! . . . Secretary Warner complained mildly that members are not too interested in the serious affairs of amateur radio; only 60 copies of the Cairo hearings document, 39 copies of the Board's investigating committee report and 15 copies of the annual reports of the officers were ordered by members. . . . Mr. Maxim's son and daughter with League cooperation created the Hiram Percy Maxim Memorial Award to be awarded annually to the amateur age 20 or under adjudged to have accomplished the most in amateur radio. The award carried a $100 prize and a miniature Wouff Hong. The first went to a youngster named Victor Clark, then W6KFC (1964 note to contest men and DXers: recognize him?). . . . The Paley Trophy for outstanding service to the public through amateur radio was also established in 1936, by the Columbia Broadcasting System. A blue-ribbon panel of judges awarded it first to Walter Stiles, W8DPY for work in the 1937 Ohio River Valley floods. . . . Ross Hull, famous v.h.f. pioneer from Australia who had been on *QST*'s staff for ten years and had become its Editor in December, 1937, was accidentally electrocuted at his home workbench on September 13, 1938. . . . The *Handbook* and the *License Manual* were printed by the Braille Service, New York Chapter, American Red Cross through the cooperation of ARRL and the Library of Congress, copies to be available through the regional libraries for the blind affiliated with the Library. . . . The International Morse Code period which had been . . . . . was changed to . _ . _ . _ ; the comma took over _ _ . . _ _ , heretofore the symbol for!

life, 1934–1939 starts with a note of discord. A misunderstanding on international third-party traffic regulations, and consequent disagreement on League policy thereto on the part of Clair Foster, W6HM, and others, was blown up, with the help of two commercially-published magazines *R/9* and *Radio*, into a violent disagreement by members of this group with virtually everything the League did. Particularly, the campaign sought to discredit Secretary Warner. While *QST* never answered in kind, a policy still regarded as a wise one, President Maxim did feel the necessity of sending out a letter to clubs and SCMs early in 1934, shooting down the worst of the distortions. The two magazines merged, keeping the name *Radio*, and continued a policy of snapping at the League's heels. The time of widespread criticism and unrest was short, however, and the League continued to merit and to have the confidence of active amateurs.

Up until 1934, anyone interested in amateur radio could be a member of the League with full privileges, including the right to vote and to hold office. That year, the Board changed its policies, amending its by-laws so that henceforth members had to be licensed amateurs in order to vote. Life members and those who have not had a lapse in League membership since 1934 still have the right to vote, however, even if they do not hold ham tickets.

The League's officers and directors had to meet tighter rules, too. There had always been a prohibition against directors earning their living by selling things to amateurs. In the thirties, however, this policy was broadened and spelled out in the By-Laws with examples of who could and who could not stand for election. In 1937 the holding of an amateur license for two years and League membership for a year became a requirement for SCM candidates, while for directors it was four and four. Affiliation of clubs was made more meaningful, too. The Board decided that clubs should have 60% of their membership also members of the League, and control should be in the hands of licensed amateurs. This policy, proving a little stringent, was later modified to the 51% League membership, 51% licensed amateur rule we have today.

A proposal that the League adopt a scheme of local chapters, state federations and an actual national convention, each group sending delegates to the next higher one, kept recurring during the 30s, but always was overwhelmingly defeated. Steps were taken, however, to broaden the members' contacts with the organization. Regular travel and administrative accounts were established for the directors, and SCMs were reimbursed for specified travel. Assistant directors were appointed, and then were placed on the mailing list for most of the information previously sent only to directors. Then the League's Constitution was amended to provide for the election of alternate directors who would have power to represent the division at Board meetings if the director was unable to be present. Some (including Secretary Warner) thought that slates of candidates should be put up, with a two-man team running inseparably, as in the U.S. election for president and vice president. But this was not the majority view, and since the first alternate director election in 1934, the voters have picked the two men separately. The Board ordered that the Executive Committee minutes be published; since the Board meetings of those years always had actions ratifying the work of the executive, it was only logical that these actions be published with the Board minutes.

The League had thus survived another radio conference, a change in regulatory bodies, a change in its own top officers, a minor insurgence within its ranks, and a depression, emerging stronger and more mature than ever before.

The Late Thirties

FROM the Hq. station 1MK at Brainard Field Mr. Maxim sent the annual Navy Day Receiving Competition message by his own hand each October 27th, this exercise being the predecessor to Armed Forces Day. Three ARRL Phone-C.W. Transcons in January 1931 brought operations for that year to a high pitch of excitement. The results took some 12 *QST* pages. A Crossband Get-Acquainted Party on 3.5 and 7 Mc. was the means for promoting fraternalism and versatility in November. Two 10-hour Transcons in December topped off the operations in 1931. With 500-watt rigs on two bands, 1MK was making a name for itself in the service of the fraternity; all hams made it a point to get *that* QSL. A key station in a 19-day midwinter amateur collaboration with the Army Air Corps "arctic patrol" in 1930, the Hq. station made a name for itself anew. In the presidential election year 1932 ARRL bought available election-return service for all League members. The 8 hrs.

W6KFC (now W4KFC) was the Arizona SS Certificate winner in 1936, and second high nationally. His transmitters ended up with the ubiquitous (in them days) 210s. His receiver was an ACR-136.

8 mins. continuous tape transmission at 22 w.p.m. had a big following and brought reports from all over the world.

The first Field Day was announced by the League in 1933 as an "international" FD and enthusiastically acclaimed by the fifty who reported. Following annual FDs embraced the 20- and 60-watt level and emergency power supply multipliers, also confirmed the emergency test pattern and many options for participation. The A-1 Operator Club to encourage a high caliber of operating in our amateur bands got its start in 1933. ORS and Trunk Line Stations utilized a General Traffic Hour (6.30–8.00 P.M. local time) using directional CQs or CQ TFC to supplement other scheduled provisions. With the growth of phone the Official Phone Station appointment was announced in late 1933.

Five meters was in its hey-day as we reported last month. Ten-meter tests also were popular . . . the band being referred to as 'hot' and 'boiling.' ARRL repeated its 10-meter tests of 1934 the following year to fire up even more interest and occupancy of this band. In September 1934 a one-year 28-Mc. DX operating contest was announced, RSGB and ARRL working hand in hand in this one. A 10th anniversary of Transocean work was celebrated. There was a series of 3.5 Mc. transocean tests, somewhat on the pattern of ARRL's earlier International Goodwill Test. Besides quiet periods for logging calls, this time there were designated periods to try QSOs. A 20th Anniversary Relay was announced during 1934, with an elaborate organization of Connecticut stations mustered to help 1MK get the incoming traffic.

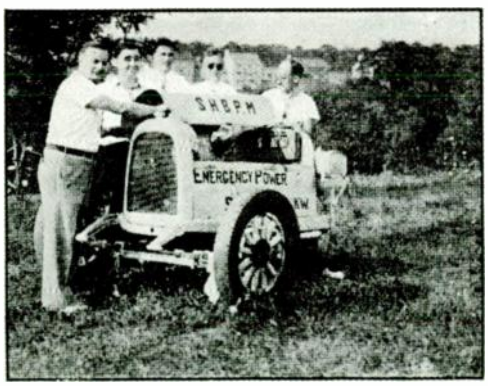
In late 1934 2½- meter experimentation was advanced when the first 100-mile contact could be reported between the Boston and Hartford areas. In early 1935 a frequency-use registration was made with a 10 percent response which indicated that as of 1935 two amateurs out of every three were opposed to opening any part of the 7-Mc. band to phone. As of that year 95% of the interest of amateurs was entirely in the four lowest-frequency amateur bands.

One of the big events of that year was the undertaking of a pre-Cairo operational occupancy survey of 4-4.5 Mc. and 6-8 Mc., this to assist our amateur service conference delegation with practical data on the operating side.

There were many firsts in these boom years. The Sweepstakes quickly assumed a first-place interest in amateur operating. In its first five years participation steadily mounted to *ten times* the initial interest! This was a decade in which message handling, with better organized means supported by ARRL stepped upward from a steady pace of 400,000 annual handlings per year to 1.5 to 2 million message handlings. In 1931 the ARRL Trunk Line system had been reorganized. By the mid-thirties 14 TLs were functioning covering east-west and north-south and interlocking at numerous points. All-ORS, crystal control, each TL station had an alternate and five-day-per-week skeds.

This period of League doings was replete with activities. A series of Canada-U.S.A. contact contests was started in 1934 to renew and foster the bonds of friendship through the years. The Copying Bee was a unique activity. Tricky text and code combinations were transmitted (50 words). For several years this was an annual December exercise to "copy what you hear." Sometimes the winners could make but 95% of the copy accurately even at 20 w.p.m.! Fun and challenge! The first ARRL QSO Party was held in January 1938. In a 20th Anniversary Party April 7–8, 1934, President Maxim received even more messages from members in every ARRL Section then on the occasion of his 60th birthday relay in 1929. An elaborate organization of Connecticut amateurs supplemented W1MK's efforts in getting the incoming traffic!

The League was requested in 1935 to assist the Bureau of Standards in checking fading drop-outs of signals in wide parts of the spectrum, this observed at 54-day intervals.



This was typical of Field Day power sources in 1938. This one was used by the South Hills Brass Pounders and Modulators (Pittsburgh, Pa.) and delivered a total of 4 kw.

This was VE2BV operating VE2KH in the 1938 Field Day. A 6L6 ran 12 watts input from a 6-volt Genemotor, while the receiver was a t.r.f.

The true operational weight of interest in Field Day began to make itself evident with the third FD in 1935. Participation was that year 53% on 80 meters, 32% on 40 meters, 12% on 5 meters but only 2% on 20 meters and 1% on 160 . . . just to convey the ever changing picture of band use for the benefit of today's readers. VK contest-results were reported annually. A combined VK-ZL international DX test was announced in the fall of 1935. The annual U.S.A.-Canadian QSO Contact Contest, sponsored by a Canadian group continued to gain in popularity. There were 1.75-Mc. DX tests and an REF Cup Contest. The year recorded continuing expedition interest. There was the Morrisey W1ØXDA, the Bol-Inca expedition CP1GB, an Andes-Amazon expedition and by now amateurs were following other amateurs around the world with the early globe-circling flights.

These were years of increas ng objectivity in amateur radio. The Worked All States Award announced in January 1936 *QST* was issued to 230 amateurs the first year. The Communications Department announced DXCC in September 1937. The 100-country goal became the leading and standard token of DX operating accomplishment in the worldwide sphere. The Emergency Corps was established and grew in its capabilities from 1935 to step up our organizational means to give public service in disaster communications. FCC advanced its examination requirements to 13 w.p.m. in 1936. Also that year ARRL revised its message form and simplified group count to a text-only count with an "extra delivery credit" thrown in, all assisting amateur radio to reach higher performance levels. W2BSR proposed a new RST signal reporting system. This represented an advance in completeness of reports between amateurs. The logic and brevity of the new system made it an instant success, although arguments as to the feasibility of a 5-point or a 9-point scale for audibility would go on for some years.

A William S. Paley Award was established and announced in late 1936 for the individual amateur contribution most useful to the American people. W8DPY, W9RSO, W9MWC and W1BDS were successively declared winners of this CBS Trophy, emergency-operating achievement in the public service field and the challenge of widespread

The dedication ceremonies at W1AW on September 2, 1938.

disasters, hurricanes and floods bringing such work to the front.

A Maxim Memorial Relay, February 17, 1937 on the first anniversary of the passing of our founder again required organization of Connecticut stations to receive incoming traffic. The relay activity was carried on progressively all one evening following the transmission of President Woodruff's message through OBS and OPS.

August 1937 was marked by the holding of a successful Low Power Contest (25 watt limit).

The Maxim Memorial Station bearing our founder's call W1AW was completed in 1938 and a Dedication Relay held in September of that year.

By the end of 1938 the new WAS certificates numbered about 500, the rejuvenated Rag Chewers Club had 2000 members (it runs 6000 a year currently!) and there were 1000 operators in the A-1 Operator Group. A band occupancy survey in the mid-thirties covering 1¼ to 160 meters indicated a 68% predominance of c.w. telegraph users and a 32% over-all interest in voice work. A question put to the gang about 40-meter phone (not then permitted) brought a 68% negative response . . . all characteristic of this operating era. Emergency Corps registrations hit the 3000 and the 5000 mark. Two- and six-meter work came to the fore in 1939 when ARRL held two U.H.F. Relays. Successful message work on v.h.f. became a fact; these relays were the predecessor of our present three v.h.f. contests a year.

Emergency

ELEVEN emergencies were reported in the 1935 volume of *QST*. These included a lost plane in the Adirondacks in December of '34, and a northwestern storm in October. In January of '35 there were two storms, one in British Columbia and one in the Md.,-Del.-Va. area, and a flood in the lower Mississippi Valley. In March came a heavy snow-and-sleet storm in the Duluth, Minn., area. In late May and early June the midwest experienced severe floods. In July a disastrous flood occurred in New York state; also in July, amateurs took part in a search for a lost yacht; and in September a Florida hurricane gave amateurs another opportunity to perform in the public service.

This was all well and good, and much favorable publicity for amateur radio resulted in the increased tempo of emergency communication. At headquarters, however, it was soon realized that a need for organization existed. Thus, in the September issue of *QST*, in the small type of the Communications Department, the formation of the ARRL Emergency Corps was announced. "Join now!" adjured the announcement. "Every

This is the type of flood washout that took communications with it at Ithaca, N. Y., in 1935.

red-blooded ham should want to do his part! We need you!" Amateurs having emergency-type equipment were urged to send their "application" (a postcard listing their gear) to headquarters which, if OK, would result in issuance of a membership card.

The November issue gives the first membership list, including such familiar calls as W1CJD, W3BWT, W3QV, W6AM, W8OFO, W6YX, W4NC and VE3GG. Note that the requirement for joining was the possession of equipment capable of operating in an emergency, not, as now, merely a willingness to do so.

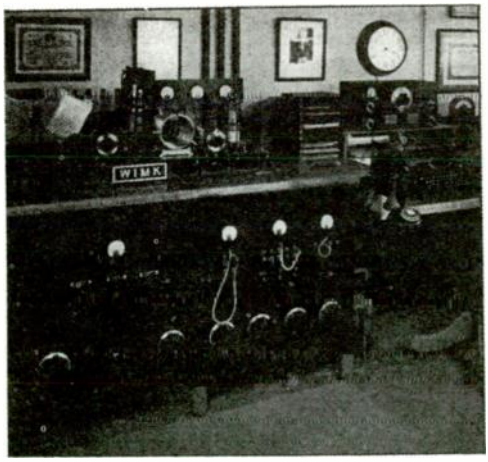
The year 1936 saw one of the greatest floods in history, striking right at the heartland of highest population and coming literally into the front door of ARRL headquarters as W1MK was completely inundated and destroyed. Two headquarters staffers, one an associate editor by the name of Ross Hull, the other an assistant secretary by the name of Clinton B. Desoto, were assigned the job of writing the story, and spent some time traveling around the northeast interviewing amateurs and taking pictures. The May '36 issue of *QST* carried the 15-page story, a masterpiece of prose in W1CBD's inimitable style. The 1936 flood created such heroes as W8DYY in Johnstown, detailed the controversial but dauntless work of W8BWH of Punxsutawney, and produced the first winner of the William F. Paley CBS Award, W8DPY of Coudersport, Pa.

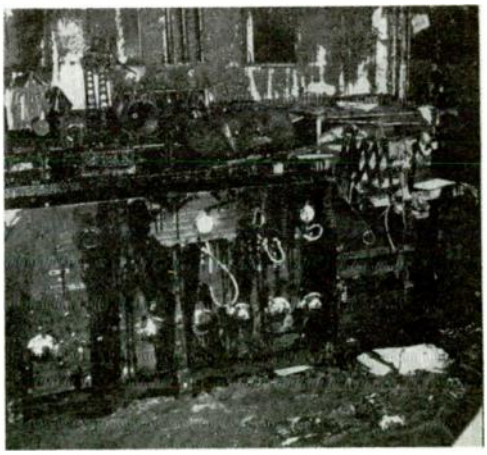
Meanwhile, the AEC grew, with additional membership lists appearing in the January, March and September issues of *QST*. By September, a second "division" of AEC had been created, called the "Supporting Division," the latter being those amateurs wishing to take part who did not possess emergency equipment. Total membership was now almost 300.

But it took another disastrous flood to bring about realization of the necessity for a closer-knit organization. In January of 1937 the Ohio River watershed flooded and sent billions of gallons of excess water cascading over normal river banks throughout West Virginia and Ohio, and southward along the Ohio and Mississippi. Once again W1CBD toured the flooded area, then took his agile pen in hand and composed a 16-page account of the activity, this time gathered from stacks of reports sent in by amateur participants. Equaling, if not exceeding, the 1936 flood in the northeast, the 1937 Ohio River Valley flood brought new concepts to the fore in emergency communications organization. Emergency preparedness was gradually becoming an obsession. The editorial of March 1937 *QST* was dedicated to the subject, with a special article on "Flood Relief Communications" by W9ZN immediately following it.

Comments, articles, suggestions followed in the wake of the flood. Gradually, the fervor died down, but the Communications Department was studying the subject with its field organization, and so indicated in October. The January 1938 issue carried, under *Operating News*, the first specifications for emergency coordinator appointments by the SCMs. Before enough of them had been appointed and gotten organized to do an effective job, another big disaster struck New England.

This was the hurricane of 1938, which came





Here is what the flood of '36 did to W1MK's transmitter! This spelled the end of an era for the ARRL headquarters station at its Brainard Field, Hartford, location. Activity was transferred to 38 La Salle Road, first as W1INF, then W1AW until the new Maxim Memorial Station was erected in Newington in 1938.

roaring across Long Island Sound and into Connecticut and Rhode Island without warning. Again, W1CBD tackled the job of writing up what the amateurs did. "Dazed by three staggering blows in rapid succession: hurricane, tidal wave and flood," said the lead, "overconfident and undertrained, ham radio generally reeled in its tracks for . . . 24 hours before pulling itself together." When they did, however, the hams did a job that wasn't soon forgotten. Among the principals were W1EBO of Norwich, Conn., and W1BDS of Westerly, R. I., who was later given the Paley Award for his heroic activity in getting the first word to the "outside" of the devastation wrought by wind and waves in his town.

QST continued to cajole amateurs with emergency preparedness dicta during 1938. In January, Communications Manager W1BDI outlined emergency operating policies, dropping inactive AEC members and setting forth some recommendations to FCC. In April, some of the lessons learned in current emergencies were discussed. "*Have a plan!*" was the theme. In November lessons learned in the New England hurricane were discussed, and the appointment of more emergency coordinators in all communities, regardless of size, was called for. Once again, the aftermath of a severe emergency brought much discussion of the general subject.

In 1939 the biggest emergency topic was the growing war clouds in Europe. However, during this year FCC came out with regulations for operation in emergencies containing real teeth, and ARRL completed an agreement with Western Union in which the telegraph company would actively assist in recruiting for the AEC. Early in 1940, the first feature article on the workings of

Wilson Burgess, W1BDS (center), operated an emergency-power station which was the only contact with Westerly, R. I., for several days following the 1938 New England hurricane. Other operators are W1KRF (l.) and W1KRQ.

ARRL emergency coordinators, written by W3ZD, appeared, and the battle for interested leadership appointees in the AEC continued. Subsequently, the increased preparedness resulting from the efforts of those already appointed showed to good effect in tornadoes and hurricanes in the south in February and August respectively.

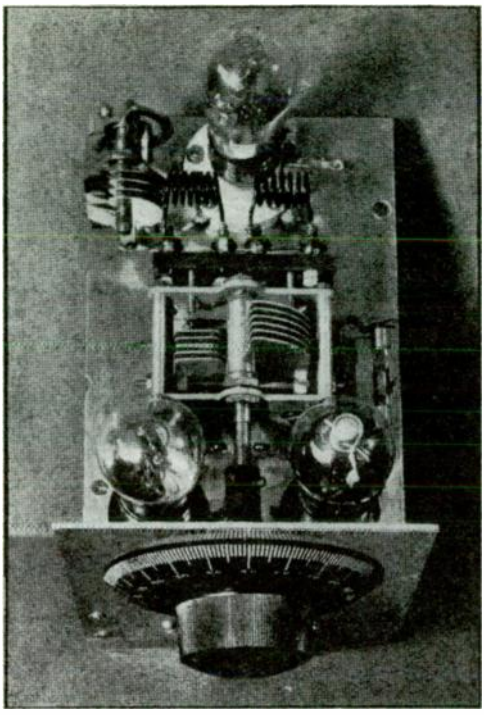
In 1941, with the war raging in Europe and a growing tenseness in the U.S., emergency organizers began looking toward defense preparations in case this country were dragged in. Amateurs also assisted in major emergencies in the Mexican earthquake (April) and the Texas hurricane (Sept.), as well as the usual scattering of other incidents, some minor and some major.

Although amateur radio was shut down when war finally engulfed us in December of 1941, emergency work by amateurs did not entirely cease, as we shall see later.

Technical Progress

THE first few years of the 1930s were exciting years from a technical standpoint, but to appreciate them thoroughly one should have at least a rough idea of what ham radio was like at the time. At the start of 1930, most of the hamming of the 17,000 U.S. licensed amateurs was c.w. in the 80- and 40-meter bands, with some activity in the 20-meter band. 'Phone was permitted on 160 meters (where BCI was an ever-present problem), on the *low* 50 kc. of the 80-meter band, all of the 5-meter (56-Mc.) band (with no activity), and on 14.1 to 14.3 Mc. by special permission (a very few takers). A typical c.w. transmitter would be a single-tube self-controlled oscillator working into a "Zepp" antenna (dipole end-fed with open-wire line) or possibly a "Windom" (single-wire off-center feed). The favorite tubes were '10s (25 watts input) and '03As (the so-called "50 watter," running about 100 watts). The 'phone would be the same transmitter "loop-modulated" or, if the operator was affluent and technically savvy, Heising-modulated. Although the correct technique for obtaining 100-per cent modulation with Heising modulation had been described in *QST*, it was seldom used or understood. The incidental f.m. of modulated oscillators was often considerable. The elite transmitter of the day was crystal-controlled, using a triode ('10) crystal-oscillator stage to drive a multiplier or a neutralized triode final amplifier. Plate power was obtained from supplies using thermionic or chemical rectifiers, an occasional motor-generator set, or mercury-vapor rectifiers.

The standard receiver was battery-powered, using plug-in coils, a regenerative triode detector, and one or more stages of audio amplification. More elaborate receivers included an *untuned* screen-grid r.f. stage and possibly a peaked-audio amplifier, after a popular Ross Hull design. The advanced amateur might have a superheterodyne for 'phone reception; if it was used on c.w. it would have an oscillating second detector. Practically all transmitters and receivers were homemade, although you might have your eye on one of the Pilot "Super Wasp" (regenerative) receivers that was newly available in an a.c. model. Homemade receivers generally used aluminum



The famous superregenerative receiver that made 5-meter 'phone practical. The caption accompanying this picture read, "56-Mc. receiver, the chief features of which are extremely high sensitivity, simplicity of tuning control, and an ability to operate reliably in a moving automobile."

panels, to reduce any hand-capacitance tuning effects, but the base of the receiver was likely to be a piece of ¾- or one-inch pine or redwood. Transmitters built on wood bases were the rule; the occasional panel would also be wood.

Operating was more leisurely and less hectic than today. One might call "CQ" on 7100 kc. and find a reply anywhere in the band. (Once you had found the band with your self-controlled oscillator you weren't tempted to move for every call.) This meant that calls after CQs could easily last for a minute or two, depending upon one's estimate of how long it would take the CQer to tune the band. Signal reports, based on QSA1-5 (readability) and R1-9 (strength) scales, tended to be more realistic than they are today. Lacking a tone scale, signals were described according to modulation as "ac," "rac" ("rectified a.c."), "dc" and "pdc" ("pure d.c."). Although, bug keys and side-swipers were available and used, code speeds were, in general, slower than they are now, although many operators were capable of as high speeds as they are today.

Transmitter Developments

It is interesting to speculate on just how much was known of the proper operation of vacuum tubes at the start of 1930. Practically all of the multistage transmitters described in *QST* that year showed a grid return running to a "−C" terminal, with no suggestion of grid-leak bias. The single exception was a description of the short-wave (to 10 meters) transmitter at NKF (Naval Research Laboratory), which showed a combination of grid-leak and fixed bias. Transmitting tube ratings made no mention of operating grid currents or dissipations, and no schematics showed provision for metering grid currents. The important metering was the plate current and occasionally the filament voltage. It seems probable that there were a few warm grids in those days! However, by late 1931 grid-leak bias began to appear and be mentioned, but without metering the grid current.

Exciting news for 'phone men came with Loy Barton's classic article on Class-B modulators in the November 1931 issue. Prior to that time the usual approach to phone (other than loop modulation) was to use Class-A modulators in the Heising circuit. This meant the very inefficient generation of audio power; e.g., *ten* 845 tubes (same envelope size as the '03-A "50 watter") in

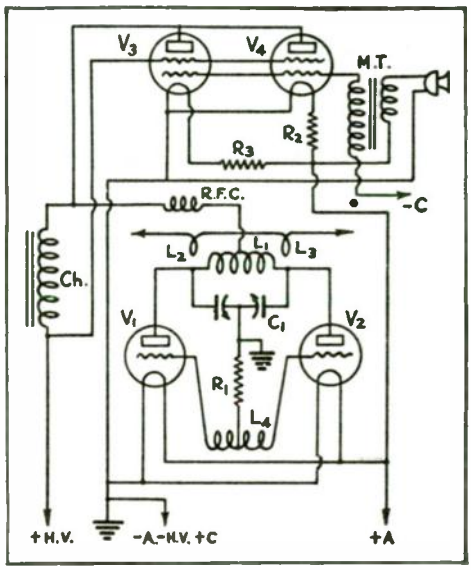


FIG. 1.— THE COMPLETE CIRCUIT OF THE 56-MC. TRANSMITTER

C_1 — Type 406B 25-plate Cardwell receiving condenser with stator split and plates removed to give 5 stator and 4 rotor plates in each section.

R_1 — 50,000-ohm Electrad wire-wound resistor.

R_2, R_3 — 2-ohm fixed filament resistors for Type '47 modulators; 12-ohm resistors for Type '33 modulators.

L_1 — 5 turns 1 inch inside diameter of ⅛-inch diameter copper tubing or wire.

L_2, L_3 — One turn each ¾-inch diameter of similar conductor.

L_4 — 7 turns spaced ⅛ inch of 22 d.s.c. wire on ¼-inch bakelite tube. Adjustment of turns and spacing may be necessary.

R.F.C. — 35 turns of 30 gauge d.s.c. wire on former 5/16 inch diameter. Turns spaced approximately twice diameter of wire.

M.T. — Microphone transformer made from old audio transformer with primary removed. New primary of 300 turns of 30-gauge d.s.c. wire. A split primary of 600 turns would serve for double-button type microphone.

CH. — Type 244 Silver-Marshall choke. Any similar choke rated at 150 ma., 20 to 30 henrys, would be suitable.

V_1 to V_4 — See text.

parallel and running 750 ma. at 1000 volts would deliver 200 watts of audio. Consequently the usual approach to high-powered 'phone was a low-level modulated stage followed by a linear amplifier (with its attendant inefficiency in a.m. service). The use of the high-efficiency Class-B modulators made high-level modulation practical. A *pair* of "50-watters" would deliver 200 watts of audio! With the transformer coupling between modulator and r.f. amplifier, 100-per cent modulation involved no dropping resistors as it did with the shunt-fed Heising system. How-to-build-them articles on transformer construction followed quickly, as did special zero-bias tubes designed for the Class-B audio application. Although designed for b.c. receiver audio, these new type '46 tubes were pressed into modulator service and also into r.f. work.

But the 'phone men didn't get all of the breaks, even if Class-B modulators were a giant step forward in making high-powered 'phone feasible. When receiving-type audio pentodes (the '47) were introduced early in 1932, they were quickly used as crystal-oscillator tubes because you could get more output from the stage before the crystal shattered than you ever could with the old '10 triode circuit.

Power supplies came in for long-overdue consideration when a classical series of three articles by Dr. F. S. Dellenbaugh and Robert Quimby

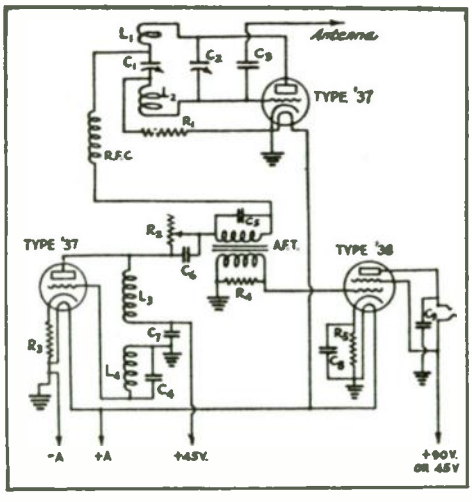
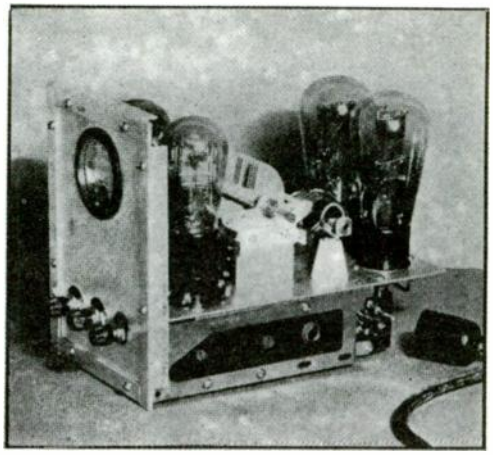


FIG. 2 — THE COMPLETE CIRCUIT OF THE super-regenerative receiver. The tubes are indicated in the same relative position as they are mounted in the set.
C_1 — 105 μμfd. Cardwell Type 404B variable condenser.
C_2 — 15 μμfd. Cardwell "Balancet" midget condenser.
C_3 — Antenna coupling condenser — see text.
C_4 — .0025 μfd. fixed condenser..
C_5 — .004 μfd. fixed condenser.
C_6, C_8 — 1 μfd. fixed condenser.
C_7 — .1 μfd. fixed condenser.
C_9 — .001 μfd. fixed condenser.
R_1 — 2 megohm gridleak
R_2 — 50,000 ohm Frost No. 2890 variable resistor.
R_3, R_5 — 2,000 ohm carbon type fixed resistors.
R_4 — 150,000 ohm carbon type resistor (or gridleak type).
L_1, L_2 — Each seven turns of 16 gauge wire ⅜ in. inside diameter with turns spaced the diameter of wire.
L_3, L_4 — see text.
"Grounds" indicated on the diagram represent connections to the metal chassis of the set.



The companion 56-Mc. transmitter used '71-A audio triodes in a push-pull oscillator circuit; the modulator was a pair of '47 audio pentodes in parallel.

described the virtues and design of the input "swinging" choke, at a time when the popular power-supply filter configuration was aptly called "brute-force." But the eye-popper of them all was the inspiring "Thirty-Three Watts per Dollar!" by Charles Perrine, W6CUH (September 1932), where he told how to operate two 852s, and even *one* 852, at a kilowatt input. (These tubes were rated by the manufacturer to be run in Class C at 2000 volts and 100 ma.) Perrine accomplished his feat with a combination of low-*C* tank circuits, high drive and bias, 4500 plate volts and — we suspect — short dashes.

Although the term wasn't used, interstage impedance matching (for optimum loading and maximum drive) was given some attention in 1933 through the appearance of interstage "link coupling" between tuned circuits. And in June of the same year Technical Editor Jim Lamb described his "Tri-tet" circuit that provided good second-harmonic output from a single-tube crystal oscillator. (Before this, crystal oscillators had always delivered fundamental output.)

The regulations forced a technical change in late 1933 when it became mandatory to use an "adequately-filtered power supply" on transmitters operating below 14.4 Mc. Prior to that time c.w. transmitters could use unfiltered power supplies on the output amplifier stage if the previous stages were powered by good d.c. The elite of the day used various methods for obtaining distinctive modulation on their c.w. signals, ranging from the use of 500- or 1000-cycle alternators to unfiltered 3-phase systems. When the regulations were announced, shouts and screams and accusations were heard all over the place, ranging from "Regimentation!" to "Now I won't be able to handle traffic as well!"

It should be noted in passing that VOX systems were described on several occasions during 1932, in an effort to discourage the tedious monologue of 'phone transmissions, but they apparently had no appeal. Late in 1932 relay racks

and aluminum bases and shelves were being advertised, but they seem to have had little influence on construction practice. Metal housings were extensively used only in portable gear and in "monitors" (the shielded single-tube receiver with which the conscientious operator monitored his transmitter and spotted its frequency).

Receiving

Except for the gradual spread of a.c.-operated receivers (in contrast to battery-operated), little happened to receiving in 1930 and the first half of 1931. Screen-grid tubes had been reported as good detector tubes (more gain) and were slowly replacing the triodes. In September 1931, the SW-3 receiver of the National Company was described in *QST*, extolling the virtues of the *tuned* (and ganged with the detector) r.f. stage. It rapidly became a widespread favorite of the hams who could afford it and the separate power supply and the additional pairs of plug-in coils for each band.

The truly significant receiving development of the period came with an article by Jim Lamb in the June 1932, issue. Up to this time it was an accepted fact of life that one tuned through a c.w. signal twice, and that there was nothing that could be done about it. The Lamb article pointed out that this made the bands appear to be twice as crowded as they actually were. It suggested a cure through the use of i.f. selectivity and an offset b.f.o. Strictly a "technical" article with no how-to-do-it content, it caused little stir among the hams. Not so the later August and September constructional articles! Here was described a crystal filter with incredible selectivity, which through proper adjustment could cause the "other side" of zero beat to disappear. (The idea didn't get across to everyone immediately. As late as '38 and '39, when any decent commercial receiver included a crystal filter, proper use of the filter and b.f o. was always a good topic for a radio-club talk. Since this new principle required the use of a superheterodyne for receiving, single-signal c.w. reception was the beginning of the end for the beloved regenerative receiver.

Five Meters

Sporadic attempts to "do something" with five meters were based on the use of low-frequency techniques (c.w., regenerative receivers) and were seldom a success. All this was changed almost overnight when Ross Hull described a *super*-regenerative receiver using regular receiving tubes (July 1931) and followed the next month with a simple self-controlled push-pull oscillator and parallel modulator using receiver power tubes. Field tests had shown that high power was not essential (the excellent a.g.c. characteristic of the superregenerative receiver may have influenced this conclusion) but, most intriguing of all, it was quite possible to work "duplex" on the 4-Mc.-wide band. The possibility of eliminating the "monologue" combined with the promise of simple and inexpensive 'phone was irresistible. The mating of superregenerative receiver and modulated oscillator was a natural, since the deficiencies of each complemented the other, and the audio quality was generally as good as the (carbon) microphone. Portable and mobile 5-meter operation was reported, and proper antennas (instead of random wires) were given some consideration. The original Hull superregen receiver had a separate quench oscillator tube and circuit, but it wasn't too long (1933) before the self-quenched superregen was devised and described. Transceivers (same tubes used for transmitting and receiving) became popular and were the standard for portable and mobile, as well as for much home use.

Five-meter 'phone had everything: low cost, simplicity, fun.

The Prolific Thirties

THE years between April 1933 and January 1940 saw the start of many manufacturers who have enjoyed the ups and weathered the downs of the amateur radio business to the present time and whose products we know so well.

The first Hallicrafters ad, in January 1935, introduced the Super Skyrider and established the "Sky" name as one of the best known in amateur radio. The first large-scale display of ads telling *QST* readers at which stores to buy a product was in the Hallicrafters Super Skyrider campaign in September 1935, and the first group of advertisements in *QST* by suppliers of components for a receiver appeared in 1938 when the Skyrider Diversity was first advertised. The SX-23 was introduced in March 1939. The first in a series of ads on new transmitters was in August of 1938. It was on the HT-1.

Barker & Williamson's air-wound coils appeared in February of 1937, to be followed in August by band-switching turrets.

November was the favorite month for initial tube advertisements, although Sylvania (then Hygrade Sylvania) had come in with the 830 two months before, in September 1933. Raytheon's first ad in November of 1933 was on the RK-18, Eitel-McCullough's in November of 1934 showed the 150T and Amperex followed in November of 1935 with the HF-200. Some of amateur radio's most popular tubes were the T and TH series brought out by Eimac in the thirties — the 35T and the 100TH being examples.

In addition to a complete line of transformers, United Transformer offered a booklet with technical data useful to amateurs. This UTC ad, the company's first in *QST*, was in February of 1936.

James Millen announced his new company in June 1939. The first ads by Electro-Voice, Instructograph, Lampkin, J. W. Miller, Petersen, Communication Products, also ran in the years between April 1933 and January 1940.

Distributors starting in this period who are

the SUPER-SKYRIDER offers these advanced features . .

WHEN the hallicrafters' SKYRIDER

THE INSTRUCTOGRAPH
(Code Teacher)

The Scientific, easy and quick way to learn the code. Send a post card today for literature. Machines, tapes and complete instructions for sale or rent. Terms as low as $2.00 per month. Rental may be applied on purchase price if desired. Rent for a month. If the Instructograph meets every requirement, buy it. If not, send it back.

INSTRUCTOGRAPH CO., 912 Lakeside Place, Chicago

the hallicrafters, inc.

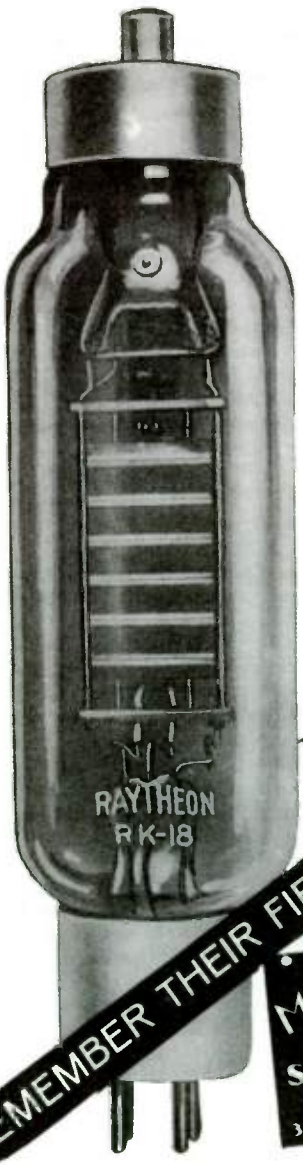
Unconditionally Guaranteed

PR CRYSTALS

Powerful Reliable

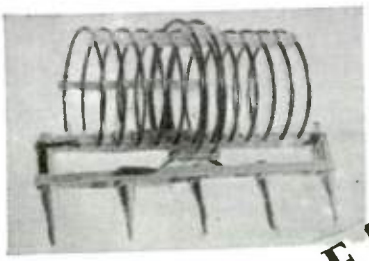
X cut 7000 KC ± 5 KC . . $1.25 2500 or 1750 . . $1.65
Low Drift ATCUT ± 5KC 40-80-160 . . . . . 2.25

PETERSEN RADIO CO.
COUNCIL BLUFFS, IOWA
Formerly Omaha Crystal Labs.



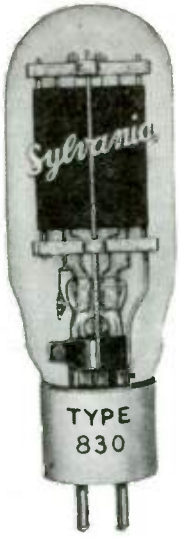
Why Bother with Messy Haywire Links When You Can Use

B&W LINKED "AIR INDUCTORS"



- Completely plug in
- 49 Types for every purpose
- Neat appearance
- Reasonably priced

REMEMBER THEIR FIRST ADS? THESE MANUFACTURERS Announces JAMES MILLEN



MICROPHONES OF ALL TYPES
Write for Details
SHURE BROTHERS COMPANY
Manufacturers-Engineers
S N SHURE, Pres
337 WEST MADISON ST CHICAGO, ILLINOIS

UNITED TRANSFORMER CORP.

76 SPRING STREET - NEW YORK, N. Y.

EXPORT DIVISION — 15 LAIGHT STREET, NEW YORK, N. Y.

A Transformer for Every Pur... ...very Purse

STARTED IN THE 1930's AND ARE IN QST TODAY.

EIMAC 150-T

Characteristics:

EIMAC-150-T Triode

Fil. Voltage 5 V.; Fil. Current 10 A.; Rated Plate Dissipation 150 W.; Amp. Factor 13; Max. Plate Current 200 MA.

Plate Voltage	1000	2000	3000
Plate Resistance	2750	1900	1250
Mutual Conductance	5800	7300	1200
Normal Power Output (75% eff.)	150W.	300W.	450W.

PRICE $24.50. Sold Only by Reputable Dealers.

Q-MAX R.F. COATINGS

Communication Products, Inc.

245 CUSTER AVE., JERSEY CITY, N. J.

for the MICROMETER FREQMETER

A FOUNDATION UNIT — CONSISTING OF:

- Precision Micrometer
- Band Spread Condenser
- Special Isolantite Coil Form
- Temperature Compensator
- Adjustable Pad Condenser
- Complete Circuit Details

Price Complete, Assembled, $14.80 net

G. F. LAMPKIN LABORATORIES

146 W. McMillan St. Cincinnati, Ohio

New Miller Preselector

Here is a simple, inexpensive and really practical Preselector. It will give you more distance and sensitivity with lower noise and absolutely no images. The coils cover the full range from 12 to 200 meters. Additional features include built-in power supply, two stages of tuned R.F., efficient output circuit, and single wire or doublet antenna.

"Build it Yourself" in Kit Form, No 302 Coil Kit $4.80

Or if you prefer to buy your equipment "tailor made" here is a real opportunity. Complete with tubes and metal cabinet $24.00

At Your Dealer or Write

J. W. MILLER CO.

5917 SOUTH MAIN STREET, LOS ANGELES, CAL

FRENCH TYPE HAND-SET

Particularly designed for 56 mc. and portable work. Incorporates a 2000 ohm earphone with a high quality microphone. High output with excellent fidelity. Light weight and durable. Separate cables from microphone and earphone allows any circuit combination.

If your jobber can not supply you, order direct

Type 214 (single-button) net, $6.00. Type 215 (double button) net, $9.00

THE ELECTRO-VOICE MFG. COMPANY, INC.
324 East Colfax Avenue, South Bend, Indiana

Crystal Transmitters

Radically new design suitable for Class B modulation or high output C.W. on 14, 7 and 3.5 M.C.

Consists of crystal-oscillator, buffer amplifier, and Class C output amplifier mounted on polished aluminum and hard rubber chassis with plug-in coils and plug-in crystal holder for quick change of frequency. Complete Kits, less tubes, crystal and power supply:

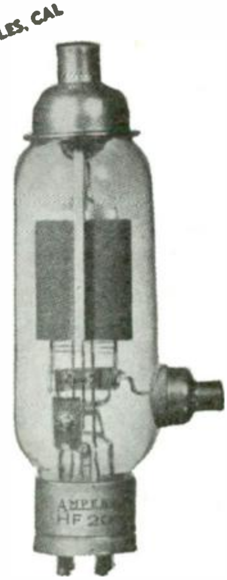
210 Output.....$37.25 203A Output....$47.50
852 Output.....$47.25

The smoothest, neatest little rig you ever saw — and what a Kick she has!

Immediate Delivery *Write for data sheets*

ARTHUR A. COLLINS

Cedar Rapids, Iowa Radio Laboratories, Inc., W9CXX



our friends today: Radio Shack, February 1934; Delaware Radio (now Willard Wilson), March 1934; Henry Radio, May 1934; Newark, November 1934; Harvey, November 1936; Wholesale Radio (now World), April 1939.

Several manufacturers already established as leaders introduced new products in the thirties. Hammarlund brought out two receivers that enjoyed wide acceptance and are used today: the Super Pro in March 1936 and the HQ-120, later the HQ-120-X, in December 1938.

National's famous HRO was first advertised in October 1934. It was followed by the NC-101X in December of 1936 and by the NC-80X, 81X, NC-44, NHU, and several transmitter kits during the next three years.

RCA design engineers were busy, as evidenced by a selection of more than forty tubes: receiving, transmitting and cathode ray.

The 1930s also saw the start of many manufacturers who were well known to us for years, but who have left the pages of *QST*. A few sold out to other companies, some went out of the amateur business and others went out of business completely. What old timer can forget the transmitters built by Harvey Radio Labs, Marine Radio or Temco? The Meissner Signals Shifters? RME? Bliley? Heintz and Kaufman? Taylor Tubes? The RCA crystals, mikes and TV parts, as well as amateur receivers and transmitters?

There were many other manufacturers who are, perhaps, not as well remembered, but who were important to amateur radio over a long period. Antennas, for example: the first rotary beam advertised in *QST*, the Mims Signal Squirter, February 1937. Receivers: how about E. M. Sargent? Remember the transmitter kits put out by Stancor and Thordarson? Readrite meters? The Mackey? Let's see how many of these companies you Old Timers do remember. Young Squirts with only twenty-five years of hamming can skip most of the list.

Receivers: Canadian Marconi, Howard, RCA, RME, A. H. Ross, Sargent, Tobe-Deutschmann.

Transmitters and Exciters: Abbott, All Star, Browning Labs, General Transformer, Harvey, Ottawa, Marine, Meissner, Radio Transceiver Lab, RCA, Stancor, Temco, Thordarson, Utah.

Mikes: Bruno Labs, Comet, Lifetime, Radio Receptor, RCA, Rathert, Tibbetts, Wright-De Coster.

Keys, code teachers, etc.: Audiotone Oscillator, American Code Reader, Fleron, McElroy, Signal, Visasig.

Crystals: Bellefonte, Bliley, Brazilian Importing, Gentry, Hi Power, Monitor Piezo.

Tubes: H & K, Hytron, Ken Rad, National Union, Sheldon, Taylor, Triad, Western Electric.

Transformers: Aalloy, General, Hilet Engineering, Jefferson, Kenyon, Transformer Corp of America.

Components: Electrad, Centralab, IRC, Yaxley; Aladdin, Barrett, Coto Coil, DX, Sickles; Bud, Eby, Insuline; Barr Labs; Western Radio; Aerovox, Condenser Products, Solar; Atkins & Brown.

Antennas, feed lines, rotors, towers: Ace, Amplovox, Bassett, Brach, General Rotary Beam, Mims, Verti-Flex; Bassett, Gray EO-1, Lynch, Transducer; Amplex, Mims, Skyrotor; Wincharger.

Accessories: Modulation meters by Doolittle & Falknor; frequency meters and standards by Guthman and Comm Measurements Lab; Tatellite by Sundt Engineering; vibrator power supply by Electronic Labs; clocks by Gordon Specialty and Chelsea; the Brush Transfilter; Trimm headsets; the Selectosphere; Par Metal cabinets; auxiliary power plants by Kato, Onan and Pioneer.

Test Instruments: Clough-Brengle, Precision, Radio City Products, Solar, Supreme, Triumph, United Sound.

Relays: Gordon, Guardian, Leach, Staco, Ward Leonard.

The many stores included Blan, Consolidated, Gross, Leeds, Terminal in the east; Cameradio, Radio Lab (remember how the air was filled with numbers in December 1935?) and Wilcox in the middle west; Shuler in the south; Offenbach, Radio Supply in the west.

Cathode-ray television reception received attention in *QST*'s advertising pages during 1938. Du Mont's April ad on the Phasmajector and the Television Sales and Service October ad on a kit were directed to experimenters; Meissner ran an ad in March of 1939 on a TV receiver ki. However, in May of 1939 RCA/NBC announced that "Television Broadcasting Begins on April 30th in the New York Area" and stated with prophetic accuracy that the date "marks the birth of a new industry." Three receivers for home use were advertised.

In 1939 the president of Zenith signed a pair of interesting advertisements. In the February issue of *QST* E. F. McDonald Jr. said, "I have always contended that the credit for most of the major developments we have in radio have been due to the American amateur" and in both ads he asked hams for suggestions on how to build a better loop antenna.

One of the most unusual ads was in August 1936 on W9XIO, Robie the Iron Man robot, who "walks, talks, smokes, and winks his eyes." Burgess doesn't tell us later whether lung cancer got Robie. Perhaps he just rusted away.

But it may be that the best ad of all ran in *QST* for December of 1938:

Advertising rate card #10 was in effect at the end of 1939. A full-page ad cost $240. The circulation of *QST* was a little over 42,000. QST

ARRL Serves in Wartime

IT WAS 1939. Fifty-one thousand U.S. hams and twenty thousand others around the world went happily along in their pursuit of amateur radio activities. W2USA and W6USA added ham flavor to the New York and San Francisco World's Fairs. The 1939 DX contest busted records for the number of participants and their eagerness, new high scores being rung up despite so-so conditions. The Board of Directors held its annual meeting in San Francisco. The "new 1939" broadcast receivers were the worst in five years — lots of gadgets, but no r.f. stages and little effective shielding against BCI. European broadcast stations on the forty-meter band were causing some interference and much irritation to Western Hemisphere amateurs.

Suddenly, in September war came to Europe. By the sixth, 121 of the 250 countries on the DXCC list were off the air, including Canada and most of the British Commonwealth. Canadians flocked to the colors en masse. By early 1941 more than half of the 3380 VEs were in uniform, some 900 as officers.

The United States was determined for a time to maintain the strictest of neutrality.[1] The League announced its own neutrality code for amateurs within a day or two of England's declaration of war against Germany: ARRL officials urged its adoption by amateurs in the strongest of terms, thus avoiding or minimizing government restrictions. Though lacking official force, the code was widely adopted by amateurs, accruing additional support for the amateur radio service in governmental circles.

After widespread uneasiness for a few weeks, things did settle down, and it was almost "business as usual" for W hams. There was some interesting DX to be worked yet, including KC4USA, KC4USB and KC4USC with the Byrd expeditions to the Antarctic. Marathon ragchewers could enjoy "duplex" operation on the 112–116-Mc. band. Experimenters began tinkering with wide-band f.m. in the 58.5–60 Mc. portion of the five-meter band. FCC regs were renumbered into a series beginning with 12.1. To streamline its operations, multiple choice tests were adopted by FCC, 50 questions for Class B & C and 40 for Class A, with grading now to be done in the field, at the examining points.

The Board came back to Hartford for its 1940 meeting, where George Bailey, W1KH, was elected as president. Charles E. Blalack, W6GG, became vice-president on the third ballot after spirited voting.

But remote though trouble may have seemed on the surface, it was in the Board's consciousness: $10,000 was appropriated from surplus for expenses tied to the preservation of amateur radio, and the president was appointed a committee of one to represent the Board in any situations requiring quick and decisive action.

Not long after, in June, 1940, the United States invoked provisions of the Telecommunications Convention prohibiting contacts between amateurs in the United States and those elsewhere: in other words, we were placed on the "ban list" by our government. Simultaneously, FCC banned all portable and mobile work on frequencies below 56 Mc. — except for ARRL Field Day! At League request, this restriction was modified to permit Amateur Emergency Corps drilling and testing during daylight hours

[1] The neutrality code had made things difficult for historians in one respect — since Canada immediately joined her British and French cousins in the war, the League had to regard Canadians as belligerents, and thus no news of Canadian participation in the war was printed in *QST* until May, 1941, when the column, "The Month in Canada" was begun.

on weekends and to permit genuine emergency communications at any time. All licensees, commercial and amateur, were required to send a set of fingerprints, a passport-type photo and proof of citizenship in to FCC by August 15, 1940, later extended to October 15. Some 100 amateurs quietly turned in their tickets!

It became apparent that there was at least a little subversive radio activity going on. The FCC monitoring system was, accordingly, expanded to several times its peacetime size; a call went out in September *QST* for 500 operators for this work and the quota was quickly filled: thus amateurs largely supervised and staffed the famous Radio Intelligence Division, headed by George Sterling, W3DF. The Navy Communications Reserve and the Regular Army both stepped up their recruiting of amateurs. The National Youth Administration and the Civilian Conservation Corps both called for amateurs to be instructors in radio training programs. And the famous ARRL code proficiency program was inaugurated, with more than 900 hams responding to the first certificate run.

In the spring of 1941, Arthur A. Hebert, W1ES, the League's convention traveler and treasurer for years (and its first general manager, before World War I) died at age 67. David H. Houghton, then as now circulation manager, assumed the additional duties of treasurer. Doubleday Doran & Co. published Assistant Secretary Clinton DeSoto's second book, *Calling CQ — Adventures of Short Wave Radio Operators*, this one for general public consumption.

The League adopted two classes of membership: Full, for licensed U.S. and Canadian members, and Associates, all others. (The practical effect was slight: unlicensed people who had joined or rejoined the League after a lapse since 1934 had already been denied voting privilege, the directors having felt that the affairs of the League must be strictly controlled by amateurs.)

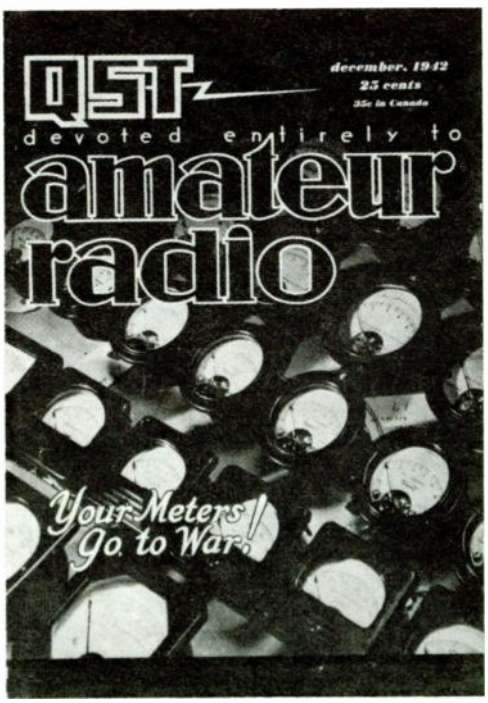
It became possible that spring for G.I.s on active duty to renew their licenses by informal letter, without proving activity on the air. Ten phone was expanded again to read 28.1–30.0 Mc., with f.m. from 29.25 to 30 Mc., at League request. Calling requirements were tightened, with identification necessary at the beginning and end of every QSO and every 10 minutes during longer transmissions, to aid monitoring stations. The League requested and got relief, however, for transmissions of three minutes or less, identification being required then only at the end of the series.

By June of 1941 tubes and parts were in rather short supply. The United States was then in a phase of "positive neutrality" and U.S. amateurs were recruited for a "Civilian Technical Corps" to operate and repair British radar equipment. Hams were also needed for a Bureau of Standards project connected with the war effort. The Office of Civil Defense began to get off the ground, and the League offered amateur radio as the backbone of c.d. communications. With greatly expanded armed forces, FCC announced that the Army would require parts of the 80-meter band, on a date to be determined, at which time in compensation for loss of phone frequencies, 7250–7300 was to be opened to A-3. The date finally settled on for the switch was December 20, 1941.

An uncanny sidelight here: in October, 1940, Secretary Warner had issued a statement to ARRL officials, echoed in his November editorials, to calm a jittery market in amateur equipment: "I believe we have all of 1941 clear before us, and that an amateur who wants to buy or build will get his money's worth." His prediction fell short by only three weeks: on December 7, 1941, Pearl Harbor, Hawaii, was bombed, the U.S. was at war and normal amateur operation was QRT.

By special FCC order W1AW continued on the air for five more weeks, at first calling the hams who had not gotten the word, and then with special war information bulletins to all amateurs. After the initial closing, special temporary authority was granted to some hundreds of amateurs at municipal request to continue on the air for local emergency communications only. Federal uneasiness about the war in general, and perhaps a suspicion that some municipal requests were merely political favors, led to a cancellation of all temporary authorizations, including W1AW's, on January 10, 1942.

On the Washington front, League officials maintained pressure on the authorities to create a civil defense communications system, which was



Meters, meters, meters. ARRL rounded up thousands at $3 a piece in less than three months, to relieve an acute Signal Corps shortage. This photo appeared on the cover of QST for December, 1942.

One of the earliest war-connected calls on the amateur service was for 500 hams to man the receivers and Adcock direction-finders of FCC's Radio Intelligence Division, headed by W3DF, W3LO and W7OK. Here, unidentified operators pin down a signal in the "Cruising Room."

Both coasts had World's Fairs 25 years ago, and hams were well represented by W2USA and W6USA. At the New York shindig W2DKJ holds the mike while W2HYJ points a TV camera at him.

finally accomplished effective in June 1942, under the name War Emergency Radio Service. Initially the rules were available to the public only through *QST* — the Government Printing Office was snowed under. The League also insisted successfully that, although station licensing was dropped, amateur operator licensing continue throughout the war, enabling amateurs to prove their ability before enlisting in the armed forces, and providing standards for WERS applications.

The League's position in 1942 was vastly different than it had been in 1917. The League and amateurs generally enjoyed an excellent reputation in Washington. Instead of being supplicants treated with suspicion, it almost seemed that — in the vast confusion which existed in official Washington — the ARRL was the cool calm voice of reason. "There is a shortage of radio operators, engineers, technicians? We'll get them through *QST*; how many and where do they report? The manufacturers can't fill the government's orders for communications equipment fast enough? Ham gear will do nicely; we'll collect a list of who has what, and send it along." More than once an amateur sold his gear to the government and enlisted as a radioman — and found an oh-so-familiar HRO staring him in the face at his first duty assignment!

By March 15, 1942, 14,813 amateurs were known to be in the service. The League published the Defense edition of its *Handbook*. Some miscellaneous chapters, on learning the code, etc., replaced the standard *Handbook* construction material, and the theory section was expanded. The booklet, *Learning the Radiotelegraph Code* was first published, and quickly became a best seller. A series of *QST* articles by George Grammer was reprinted as the booklet, *A Course in Radio Fundamentals* which used the *Handbook* as its text. All three of these works were immensely popular, not only with the armed forces but with teachers — the majority amateurs — in the thousands of radio training schools which sprang up all over the country.

For the next two years, ARRL was a printing

Among the first of many "alphabet agencies" to help win the war was the Defense Communications Board. Here, at the formative meeting January 6, 1941, ARRL's Bailey and Warner sit in the front row, next to the Navy's Reinartz, now K6BJ.

house and *QST* a clearinghouse. The "apparatus bureau" and *Uncle Sam Calling* kept humming through the pages of *QST*, among stories of "wired wireless," elementary cryptography, news and pictures of hams in service. The League shipped *Handbooks* and its other technical and training publications by the ton.

Though its public life was concerned only with the war, behind the scenes ARRL was preparing "insurance" of postwar amateur radio. In 1943 the Board appointed a post war planning committee and gave it $1000 for meeting expenses and the like. Then a national industry advisory group, the Radio Technical Planning Board, was organized, and the League was represented thereon by President Bailey with Secretary Warner as alternate.

In 1944, the Board authorized the president to open up a temporary full-time office in Washington if the need developed. Close liaison was maintained with the various official bodies in Washington; as a matter of fact, the Coast Guard was represented on the Interdepartment Radio Advisory Committee (IRAC) by Lt. Cmdr. A. L. Budlong, on leave from his post as Senior Assistant Secretary of ARRL!

Early in 1945, the joint FCC/IRAC allocations plan for postwar use of the 25 Mc. to 30,000 Mc. portion of the spectrum was announced. The new u.h.f. bands for amateurs were assigned adjacent to military segments rather than in strict harmonic relationship to lower bands, in order that the bands could serve as reserve frequencies for military use in wartime. The joint plan also provided for the first time for a Citizens Radio Service from 460–470 Mc. In May the remainder of the postwar proposal was published, calling for a new amateur band at 21.0–21.5 Mc., and retention of all other bands except 160 meters, already occupied by Loran.

There was quite a struggle within the U.S. before the table was accepted in all its particulars. For instance, the f.m. broadcasting service wanted to be left near 5 meters and expanded while the TV service also had eyes on six or eight contiguous channels in the vicinity. The domestic fixed service didn't get nearly what it wanted, and the U.S. idea was to wash out international broadcasting for direct consumption, substituting therefore an international relay broadcasting scheme to be delivered to the ultimate listener on v.h.f. f.m. broadcasts.

The allocations planned by FCC and IRAC with the cooperation, or at least the participation, of radio user groups was intended primarily as U.S. proposals to be presented at the first postwar international allocations conference, but those parts of it dealing with v.h.f. and u.h.f., particularly in the new territory above 300 Mc., were made effective immediately.

At every occasion, the League dropped the hint that amateurs, having had more than three years "vacation" from hamming, would be ready, willing and anxious to get back on the air as soon as possible. The old-timers remembered all too well that it had been almost a year after the armistice in 1918 before amateurs could resume transmitting.

By the time the shooting stopped, an estimated 25,000 amateurs had worn the uniform, and another 25,000 had done their bit at home, in essential war industry.

Organization and planning paid off. Hostilities ceased on August 17, 1945. League officers went into action. Just *four days* later, one band was released and amateurs were back on the air.

Sidelights 1939–1945

Call letter license plates were available to amateurs in Michigan in 1939, but were withdrawn the next year. . . . Freeman F. Gosden, the front end of "Amos 'n' Andy", received his license as W6QUT. . . . The first quarter-century of ARRL was marked by a special section in the May, 1939 issue of *QST*. . . . A League protest against the premature operation of "Radio Mondial", French broadcaster on 7280 kc. brought about its QRT. . . . "Picofarad" was defined as a "High-brow term for micromicrofarad". . . . A lace-bordered ad for *200 Meters and Down* triggered a letter from Ethel Smith, W7FWB, in July 1939 *QST* which in turn led to the formation of the Young Ladies Radio League. . . . The ARRL Secretary grumbled about amateurs asking Washington for precise interpretations of amateur regulations, and thus generating restrictive new rulings. (He had a point — it's still a good idea to ask ARRL first, so that the question may be answered informally.) . . . A voluntary questionnaire sent out by the Signal Corps in 1941 was returned by 72% of the amateurs within two months. . . . With national defense moving to the fore in 1940, amateur transmitter hunts were modified to simulate detection of a parachutist. . . . There was much talk of a Class-D license, with code speeds from five to ten w.p.m. suggested. Some proposed a simpler written exam, others a grade of 60% on the standard test. The idea was choked off by the War Department, which didn't feel that the increase in quantity of operators would make up for the lower quality. . . . After Pearl Harbor, some stations with special temporary authority to transmit for local emergency work relied on a key broadcasting station for news of an alert, an informal forerunner of Conelrad. . . . Early in 1942 radio equipment was in such short supply that Army officers toting satchels full of "green stuff" went around to hams' houses and bought up standard radio equipment on the spot. . . . As the Air Forces were troubled with little creatures called Gremlins, Signal Corps activities were loused up by Squimps, according to the January, 1943, *QST*. . . . The one-millionth copy of the *Handbook* was wrapped and shipped from LaSalle Road on September 9, 1943. . . . Several United Nations Amateur Radio Conventions were held at approximately six months' intervals in Cairo, Egypt, a crossroads of Allied war efforts. . . . A movie short, "Patrolling the Ether", was based on activities of the Radio Intelligence Division, FCC, and played up the fact that most of RID's personnel were drawn from the ranks of amateurs. . . . Two well-known New England hams, W1BVR and W1ALP, emerged from the 1944 director election with a 435-vote tie. W1BVR won the repeat three months later. (The two currently run ARRL affairs in Massachusetts, Mr. Noble as SCM in the West, Mr. Baker as SCM in the East.) . . . ARRL's President Bailey became executive secretary of IRE, while FCC's Gerald Gross (W3GG and now HB9IA) accepted an appointment to the headquarters of the International Telecommunications Union of which he is now Secretary General.

Communications in the War Years

In the months preceding Pearl Harbor amateur work was blacked out in one country after another. The U.S. observed a tight neutrality code. But two DXCC Awards were made in 1941, compared to some twenty the previous year! However, in 1941 there was a successful ARRL Member Party, a Battery-powered Equipment Test, our Ninth Field Day, the 12th Sweepstakes, a Code Proficiency Frolic and 1.8- and 28-Mc. WAS Parties in the last pre-war year. DX Competition work with certain W-areas had to be permitted (under quotas) to bolster the country multipliers. Canadian hams were off the air altogether. In December the United States entered the war. W1AW's authorization was extended after the general shut-down to permit latest bulletins to be sent to amateurs on defense matters, as well as to assist FCC in clearing the frequencies for use of the services.

During World War II ARRL continued the chief instrument to build our reservoirs of technical skill and talent. Affiliated club training programs were stepped up. The ARRL field organization continued to function, but with all activities bent toward aiding the war effort. Many directors and staff members and a membership self-trained and skilled in leadership as well as radio-operating and mechanics techniques entered the armed services. Additional to representation on land, at sea, and in the air, amateurs were recruited into many hundreds of vital posts in industry and used in training and expanding radar and electronics means. In this fashion the amateur repays the nation a thousand fold for his peacetime privileges!

Our civilian defense (WERS) effort is a story covered separately in detail. Those amateurs still at home as a substitute for operating turned to experiments with visual signaling, wired wireless, light-beam communication, and use of induction fields, also to use of tape recorders and academic familiarization with the Japanese Morse radio telegraph and Russian telegraph codes. By such means those who could do so filled out the wartime interlude in amateur operating.

The FCC amateur licenses that had been "suspended for the duration" were re-instated for the period August 1–November 15, 1945 in FCC's first post-war re-opening order. This permitted LSPH (licensed since Pearl Harbor) operators and others to use just 112-115 Mc. W1AW, given FCC-IRAC approval, was provided a limited reactivation to operate daily 8 to 11 P.M. EST on 3.5, 7.1 and 14.3 Mc. As of November 15, 1945 our ten- and five-meter bands also were officially opened. Canadian operators were similarly placed back on these bands by the DOT. General use of h.f. bands was to come later. A first post-war operational action by ARRL was to announce its Emergency Corps as opened to all civic-minded amateurs. The AREC and v.h.f. organizing job was expedited in the hope that every one of the 300 WERS-licensed cities would have provision for emergency communications without interruption on the November 15 disbanding of that service. The post of Section Emergency Coordinator was announced by the League to guide and promote regional ARRL-AREC planning.

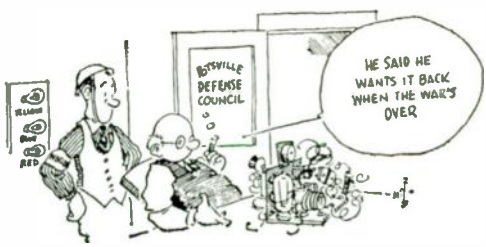
Emergency Communication

With the Japanese attack on Pearl Harbor, most of amateur radio went into suspended animation, but the Emergency Corps remained active. At the request of some civilian defense directors, certain amateur stations were reactivated for c.d. communications only, with the strict understanding that there was to be no casual "hamming," no rag-chewing, no DXing — nothing but necessary communication for civilian defense purposes. Said K. B. Warner in a yellow insert in Jan., 1942, *QST*, headed "WAR COMES!": "Amateurs in defense work are on their honor to censor themselves. . . . No rag-chewing will be tolerated and the fellows who engage in it will fare much worse than simply to lose their permits. . . . As we value our return to the air, let there be no monkey business about this."

Within a month's time, about 2000 amateur stations had been reauthorized for civilian defense. All ARRL Communications Department appointments were suspended except Emergency Coordinator. ECs were advised to contact their civilian defense directors and get their AREC groups reactivated for defense work, but we received little information regarding who had been reactivated, where, or for what purpose. Secrecy and security were tight.

But most amateurs were not used to the rigid controls, and some of them did not succeed completely in subduing the traditional ham urge to chew the rag. Uneasy at the laxness of operation, the Defense Communications Board in early January, 1942, requested FCC to cease issuing authorizations and to cancel all existing ones.

Strays



One of the first WERS licenses issued was to Akron, Ohio, which was assigned the call WODF. This is one of its control stations, with W8OJN 1 and W8BFJ operating. Equipment was Abbott TR4 transmitter-receivers and Abbott DK3 transceivers, featuring modulated oscillators and super-regenerative receivers.

Thus, on January 9, 1942, FCC issued the order which completely silenced amateur radio for the duration.

This was not the end, however. The Office of Civilian Defense was hard at work on a civilian radio service for communications in connection with Air Raid Protection, to utilize the former amateur 2½-meter band (112–116 Mc.), and other amateur bands on higher frequencies. Although not an amateur service, amateurs were specifically requested (by OCD) and expected (by ARRL) to participate, and were strongly urged to do so.

They did. There was no other operating outlet for amateurs, and they flocked to the implementation of the War Emergency Radio Service (WERS), with all its restrictions. ARRL supported the effort 100% with articles of advice in *QST*, technical articles on building WERS gear or modifying existing 2½-meter equipment to meet the rather rigid technical (for those days) requirements of the regulations. Non-amateur civilians were also recruited, qualified for low-grade commercial operating permits and put to work, usually under the supervision of an amateur.

WERS was administered by the local Civilian Defense Corps and licenses were issued to communities, not individuals. It was supervised by a "radio aide," almost invariably a licensed amateur. Most of the equipment was donated by amateurs, or modified or built by them for the purpose. July *QST* ran a complete list of ARRL emergency coordinators, over 700 strong, requesting non-AEC amateurs to register with them to assist establishing WERS in the community.

John Huntoon's first *QST* article as Acting Communications Manager was a description of the workings of OCD's "District Warning Center" plan for WERS licensing, based on telephone toll-line organization. The first two WERS licenses were issued to Akron, Ohio, and Lawrence, Mass., on this basis. A few weeks later, however, FCC issued a WERS license to the town of Manchester, Conn., which was in the Hartford Warning District. Since the regulations as written made no mention of licensing by warning districts, FCC said it could not deny a license if other requirements were met. Subsequently, many towns and cities were licensed independently of their warning district control centers. OCD and, at its behest, ARRL pushed the d.w.c. method of licensing, however. By mid-November, 1942, 53 municipalities had received WERS licenses in 20 different states, and 98 applications were pending at FCC. Leadership was about 98% amateur and personnel well over 50% amateur.

Recognizing, and in fact being largely responsible for, the preponderance of stay-at-home amateurs in WERS, ARRL during the ensuing war years went all out to support and advance it. After all, it was our only operating activity. October 1942 *QST* carried articles on operating procedure and how to train auxiliary (non-amateur) operators. February 1943 *QST* detailed OCD's plan for selection of frequencies. Technical articles on WERS equipment appeared in nearly every issue. Changes and amendments in the WERS rules were detailed as faithfully in *QST* as though the rules under question were the amateur regulations themselves. As far as most amateurs were concerned, WERS *was* amateur radio.

WERS was a poor substitute for amateur radio in emergency work, but they did their best. Here's the Granite City, Ill., control station in operation during a Mississippi River flood in 1943. That's Radio Aide W9THB at left, with W9GFF at the microphone. Note the ubiquitous TR4, a fixture in most WERS station units.

In 1943, FCC wrote more WERS rules, authorizing Civil Air Patrol stations to participate under their own licensing setups, separate from civilian defense and state guard stations. The complication of having three different kinds of WERS, each of which included a great number of amateurs, prompted separating them into categories as CD-, SG- and CAP-WERS. This categorization was made clear in an April 1943 *QST* article which examined and commented on changes. Descriptions of WERS organizations and pictures of gear used — much of it makeshift, because parts for 112–116-Mc. operation were scarce in those days — were also contained

in many issues of *QST* to keep the amateur at home interested and amateurs in the services informed of what was going on.

But, everything considered, WERS was a long way from amateur radio as most of us know it, and in 1944 and 1945, as the tide of war turned in favor of our side and the threat of enemy action against our homes diminished, enthusiasm for the prospect of reactivating the amateur bands built up rapidly.

For a few months following the outbreak of war, amateur radio took little part in natural disaster communications. Once WERS was activated, however, such activity became a part of its duties. An editorial by K.B.W. in the March 1943 issue decried the paper work in WERS which kept many amateurs from helping out in such emergencies; but in May and July amateurs were able to be of material assistance in floods along the Mississippi River and Lake Erie, respectively. In 1944, WERS was reported active in a hurricane along the Atlantic Coast and in three man-made emergencies, none of them caused by enemy action. In 1945, WERS participated in a Western New York snowstorm near the beginning of the year, in a number of spring floods, and in September in a Florida hurricane,

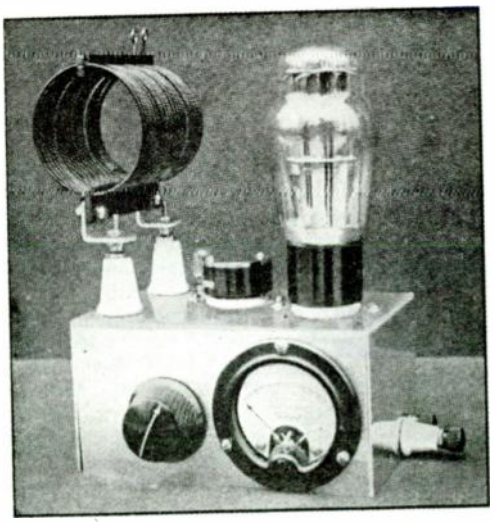
Shortly after "VJ Day" in 1945, FCC authorized the return of part of the 2½-meter band, to regular amateur operation, to be shared with WERS until the latter service was terminated in mid-November. Tension built up rapidly, and on November 15 FCC released amateur bands at 10, 5 and 2 meters for amateur use. Meanwhile, Communications Manager W1BDI returned from the wars, removed the eagles from his shoulders and announced reactivation of the ARRL Emergency Corps and the creation of a new appointment, Section Emergency Coordinator.

A new and very significant post-war era in amateur radio public service had commenced.

Technical Progress

In the spring of 1934 a typical ham might still be using a regenerative receiver and a Hartley oscillator with his Zepp antenna. A more advanced station would boast a multistage crystal-controlled transmitter (plug-in coils) and a homemade or a commercial superhet (plug-in coils). A 5-meter superregen receiver and a modulated oscillator, or perhaps a homemade or commercial transceiver, would be a station adjunct for local rag chews.

Transmitter progress in the period 1934 to the start of WW II was primarily refinement of established lines. Possibly spurred by increased commercial availability, more and more transmitters were built in metal cabinets and relay racks. At first they were still assembled on wooden bases and housed in the cabinet or rack, but eventually they went all the way in the "commercial" look and utilized metal chassis construction. A minority school stayed with the wooden framework or breadboard layout. The 6L6 receiving tube was the first "beam-power" tube to appear (1936), followed shortly by the 807 transmitting type, and they quickly became the "work horses" for all low-power applications. The 6L6 was touted as a good tube for the crystal oscillator stage, and the 807 was a small (relatively) powerhouse that required very little drive and, under some conditions, no neutralization. A popular series of articles by Fred Sutter, W8QBW, described many transmitter applications of the 6L6, starting with the "QSL 40" and culminating in the 100-watt "QSL Push Pull." These were compact 6L6 crystal-oscillator transmitters, built with a minimum of components and as much overload as the 6L6 could take.



A famous transmitter design of the late '30s, the "QSL 40" was widely duplicated. The caption for this picture read: "With chassis area the same as that of a postcard, this little rig packs quite a wallop."

Band-switched exciters and transmitters were considered and discussed in 1935 and '36, but the first applications appeared in exciter units about 1938. A band-switched exciter would be used to drive a final that used plug-in coils, or a more elaborate station might boast separate finals for each band. DX chasing prompted rapid-QSY designs, which included band-pass coupling, ganged tuning, and relay-switched circuits. Twenty-meter c.w. DX was often found *outside* either the low- or the high-frequency end, and band-edge crowding was the W pattern in the middle '30s. This called for good crystals and no little faith.

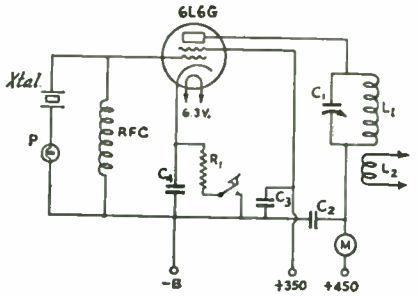
However, the major evolution in transmitter design was dictated by economics, and this in turn gradually resulted in a change in operating habits. Crystal-controlled multistage transmitters

were obviously superior to single-stage transmitters, particularly on 20 and 10 meters, but no one could afford a crystal for *every* frequency. Some form of stable adjustable-frequency control was needed. Earlier m.o.p.a. (master oscillator, power amplifier) design had centered around relatively high-powered oscillators driving amplifiers on the same frequency, and their use never became widespread. Commander Dow had described the "electron-coupled" oscillator-doubler in the January, 1932, *QST*, and George Grammer described in November, 1933, an exciter that used a *low-powered* oscillator that converted easily from Tritet crystal oscillator to electron-coupled self-controlled oscillator. Frequency multiplication took place in the oscillator stage and in a subsequent stage; the self-controlled oscillator became a crystal substitute, always on the same band regardless of the output band of the transmitter. However, it took several years and articles, and a change in operating techniques in the 1937 and '38 DX Contests, before the v.f.o. (it was always "e.c.o." in those days) really got off the ground. And when it did the T scale wasn't versatile enough to describe all of the variations in notes and keying characteristics! (Fortunately for historians and other interested parties, healthy examples of these aborigines are still available for study in any of our bands.) With the added freedom of v.f.o. operation the slow march began toward QSOs with both stations on the same frequency. In the late '30s a crystal manufacturer developed a variable air-gap crystal holder and a crystal cut that permitted a 1½% frequency excursion, but it wasn't enough to stem the tide.

One amusing (but not at the time) sidelight to c.w. transmitter design during the middle '30s was the use of "resonant filters" in the power supply. New regulations required "adequately-filtered" power supplies for all stages. A tongue-in-cheek article in *RADIO* described the virtues of a 120-cycle series-resonant filter across the rectifier output. While the 120-cycle component was suppressed as claimed, the higher-order harmonics came riding through beautifully, to add a distinctive modulation to the note!

In 1940, Harry Beecher, W2ILE, described an "electronic bug key" that made automatic dashes as well as automatic dots. Previously several commercial keys had been devised that made the dashes by other than electronic means, but they found little acceptance in amateur circles. The electronic bug, with its relative simplicity and single-knob speed control, was greeted as a forward step, although the first versions did not have the self-completing dash feature and consequently required considerable skill and a knowledge of what good code sounds like.

Encouraged by inexpensive Class-B audio power and increased spectrum assignments, phone activity increased rapidly from 1934 to 1941. It suffered many growing pains in the process. Overmodulation was a continual problem, despite many *QST* articles on proper operating and adjustment. Commercial oscilloscopes



The QSL-40 circuit was the essence of simplicity.

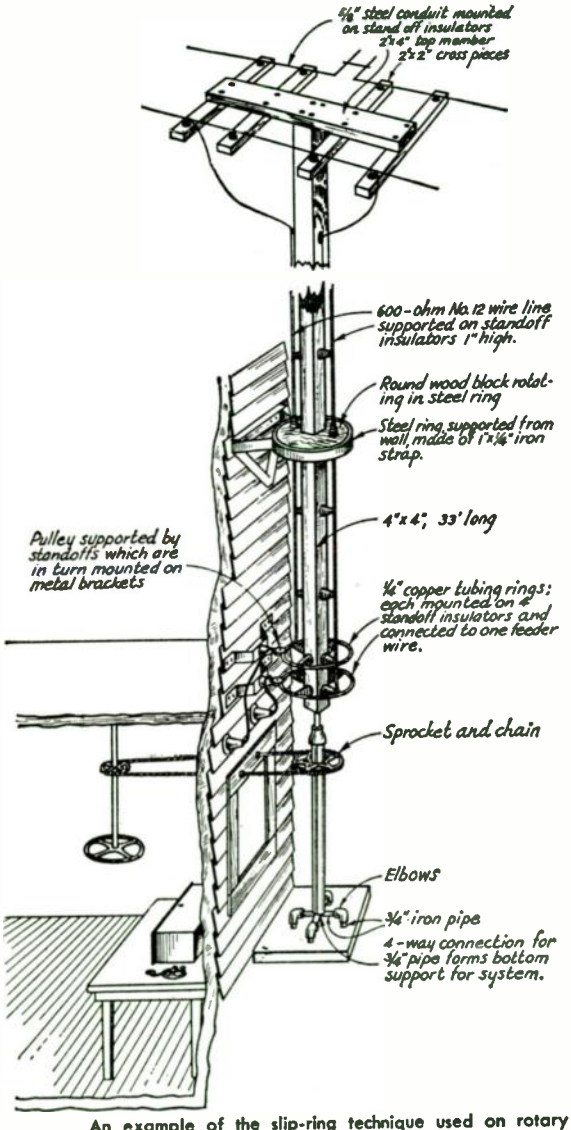
were available in 1934, as was the information on their use and interpretation. The inexpensive 913 'scope tube was introduced in 1937, but throughout the entire period an oscilloscope was more often than not the status symbol of an affluent amateur rather than a properly-used tool for better phone operation. There was much trouble with BCI (with the radio receiver always at fault), and this was particularly true on 160 meters. The not-infrequent Saturday-night "binges" (house party, open microphone broadcasting) on this lowest-frequency band did nothing for the radio amateur's "public image."

Suppressor- and control-grid modulation systems were described in 1934 and '35, and they were appealing to the ham who didn't want to go all the way with a big-enough modulator for the plate of his final. A big splash was made in 1939 when "cathode modulation" was rediscovered and loudly proclaimed to have all of the advantages of plate modulation with the economy of grid modulation. By the time a few down-to-earth articles on the subject had been published, however, a number of the special transformers that were required had been sold. Controlled-carrier operation, even with VOX (February, 1939) had a few staunch supporters, as did speech compression, but in retrospect it would seem that the promise of something-for-nothing always overshadowed a guarantee of something-for-something. The new (1939) technique of the Armstrong frequency-modulation system and its remarkable resistance to electrical noise found only a few followers, despite the fact that it did away with the need for large amounts of audio power in the transmitter. It did require a special receiver (or adapter), and this above anything else probably accounts for the apathy.

In the field of receiving the progress was almost strictly in the refinement of existing techniques. New tube types (metal tubes, 6-volt heater tubes, acorn tubes) were available in 1935, and in that same year iron-cored i.f. transformers first became available. (Good 455-kc. *powdered*-iron core transformers; the transformers of a decade earlier were lossy affairs.) In the December, 1938, *QST* D. K. Oram described a wider-range crystal filter circuit that made the 455-kc. crystal filter usable for phone, a significant advance over the previous circuitry that was used almost exclusively for single-signal c.w. reception.

In 1934 all commercial receivers used plug-in coils, and even in late 1936 the well-designed NC-101 used a tray of individually-shielded coils that substituted sliding contacts for the usual plug-in ones. However, the old bugaboo that switched coils would never work well at high frequencies was finally dispelled, and by the end of the '30s only the HRO stored not-in-use coils outside of the receiver.

Automatic volume control was, of course, merely a broadcast-receiver development applied to ham work. It did, however, make possible the use of a tuning indicator, later to become known as the (almighty) S meter. Probably the most sensational development of the period was the i.f. noise-silencing circuit developed by Technical Editor Jim Lamb and first described in the February, 1936, *QST*. It was hailed by the popular press as a "static eliminator" (which was never claimed by the inventor) and consequently received wide publicity. The circuit, in its original form or with modification, has been used in a number of commercial receivers ever since.



An example of the slip-ring technique used on rotary beams before coaxial line was available. Note also the use of the "armstrong" rotator.

In power supplies, neon bulbs had been found useful as voltage stabilizers (October, 1935), and amplified electronic stabilization was described in August two years later. The various voltage-regulator tubes (VR-150, etc.) became available in 1939, and it became standard practice to stabilize oscillator voltages in receivers.

Amateur radio pretty much discovered directional antennas for itself during this period, probably spurred on by a growing interest in DX. The first 14-Mc. rotatable beam described in *QST* (July, 1934) was a huge affair consisting of two 3-element vertically-polarized beams spaced a half wavelength. The "armstrong" method of rotation was used, and it is doubtful if this ambitious antenna, built and described by John Shanklin, W3CIJ, was whirled as often as some of today's lightweights. A 14-Mc. antenna that started a trend was the famous "Mims Signal Squirter," first described by W5BDB in December, 1935. This was a simple two-element beam with the ends folded. With wire elements, it was relatively simple to build and, best of all, it did show some directivity. Not all of the interest turned to rotary beams, however; there was a group of faithful followers of the rhombic, the Vee, and various phased arrays. Certainly the most popular of the phased arrays was the "8JK beam," two half-wavelength elements spaced ⅛-wavelength and driven out-of-phase to give a bidirectional pattern. W8JK is the well-known Dr. John Kraus, also responsible for the square-corner reflector and many other antenna designs. By the end of 1938 rotary 3-element beams similar to those used today were commercially available. A big handicap to the rotation of beams was the absence of flexible coaxial cable (essentially a WW II development), and devices such as slip rings or inductive coupling were required at the antenna. The standard transmission line was open-wire, although by the late '30s some lossy 75-ohm twisted pair was being used with dipole antennas for "matched" feed. It is interesting to note that the multiband antenna using several dipoles connected together at the feed point and fed by a single (twisted-pair) 75-ohm line was first described in June, 1937. The "pi network" was first described (February, 1934) as an antenna-coupling device between transmitter and either single- or two-wire feed. Its application to transmitter output tank circuits came much later.

The 5-meter band made several contributions during the period. In 1934 Ross Hull had almost accidentally established communication with Boston over a 100-mile path and five or six horizons through the use of a simple beam antenna at his end. Thinking the key was the beam, Hull was surprised to find that the communication could not always be duplicated. Seeking a solution to this variable propagation, he spent the

next several years recording signal levels over the path and trying to correlate the variations with some atmospheric condition. In May, 1937, he announced that his observations indicated that the extended range was possible whenever there was a "temperature inversion" along the path. It was a brilliant piece of work.

Along similar lines, amateurs were reporting 900-mile 5-meter contacts in the early summer months. These were duly reported in *QST* each year, with much speculation as to the cause. It was summed up in the September, 1938, *QST* by J. A. Pierce, W1JFO, of Harvard University. He told how, using the available amateur reports, he was able to establish that the DX was made possible by sporadic E ionization (called "abnormal E ionization" in those days).

Technical development in the 5-meter band generally tended toward refinement of stabilized-transmitter techniques, particularly after the FCC regulations made them mandatory in late 1938. This moved the transceiver and "fun" activity down to the 2½-meter band, which hadn't received too much attention up to that time.

An extensive series of articles on television started in the December, 1937, *QST* and continued for several years. An experimental commercial transmitter was broadcasting from New York City, and Ross Hull became interested in receiving their pictures. A rhombic antenna made the 115-mile reception possible, but on Sept. 14, 1938, the radio world was shocked to hear of Hull's death through accidental electrocution the night before. The high-voltage supply for his picture tube used a pole transformer (because one was available), and in his usual impatience with details not directly relating to the experiment he had failed to exercise the necessary precaution. *QST* lost an inspiring author and the world lost a fine gentleman.

Any report of the period should not overlook mention of "The Shadow." During October, November and the first half of December, 1935, a number of services (Army, Navy, aeronautical, commercial and amateur) reported serious interference with their communications. The QRM was caused by a rough unkeyed a.c. signal or cluster of signals, heard between 8 and 25 Mc.

Ross Hull.

but most frequently around 14 Mc. It was heard from coast to coast and in Europe, Africa and Asia. Its frequency would be relatively steady for a few minutes and then it might jump a few hundred kc. It was dubbed "The Shadow", after a popular radio program of the day, and in the January *QST* a plea went out for further reports on it.

From the start the Naval Communications Reserve, among many others, started to track it down. Oscillographic checks were made on modulation frequency and waveform, and it was eventually determined that not one but many Shadow signals existed. However, in Boston only one of these signals was identifiable as being supplied by Boston commercial power. Someone eventually suspected the brand-new "diathermy" machines, but a check of the Boston hospitals revealed none in use. However, one was found in a Boston athletic club, at about the same time ones were tracked down in Seattle and Charlotte, N. C. The Boston one was keyed with a CQ wheel and removed any doubt as to the origin of the mysterious "Shadow" signals. The machines were running a half kilowatt input to a self-rectified self-excited oscillator, and the 12 feet of insulated cable that was wrapped around the patient was enough antenna to put signals around the world!

The War Years

DURING 1940 advertising followed the pattern of the late thirties, but in the following year a few companies like Amperex, Bliley, Eimac, Hallicrafters, Hammarlund, National, talked of supplying the armed forces. Commencing with January of 1942, the *QST* containing the yellow WAR COMES notice, and continuing through most of 1945, the advertising pages of *QST* took on a different appearance.

In 1940 and 1941 new advertising included such well known names as Alsimag, Birnbach, Clarostat. Old friends continued to bring out new models. Hallicrafters: HT-9, HT-11, HT-12, S-29, SX-28, others. Hammarlund: Super Pro 200. National: NTX-30, NC-45.

Astatic, Eimac, Hammarlund, RCA, used DXers in testimonial ads during 1940 and 1941. How many calls can you identify, using these clues? A tennis champion; the first to make pre-war DXCC; a former ARRL director; "Doc"; a famous XYL. (There was no Ø Call Area — but why no W1s on the list?) W2AZ, W2GT, W2IXY,

From advertisement in June 1943 QST

Probably you have noticed that in the May and June issues of *QST* much less space is devoted to advertising than has been the case in previous recent issues. One might suspect that this is because we have been unable to sell as much space as heretofore. Quite the contrary; it is the effect of one of the finest pieces of coöperation we have ever seen.

Like all other magazines, *QST* is rationed. We must use less paper than we did last year. What with circulation growing, owing to the great new military interest in radio, any reduction in paper means considerable reduction in the number of pages. But as you have seen, and will continue to see in future months, *QST* has many important editorial jobs to do which are directly related to the war effort. Reducing the number of pages we could use for editorial material was a sad prospect.

So we put it up to the advertisers. We told them we needed to *cut in half* the number of pages we could devote to advertising if we were to continue an editorially adequate magazine. And then we told them, "... *but we must have the same number of dollars we have had in the past if QST is to operate at a profit so that the League will be financially able to undertake the job of post-war rehabilitation of Amateur Radio. In other words, we want you to use half the space at twice the rate!*"

Well, the rest of the story is short but very sweet. We doubled *QST's* advertising rates and rationed advertisers to approximately half the previous space they had been using. Almost without exception, *QST* advertisers said, "Okay, we'll go along with you." The result is that, in this and in the previous issue, twenty-five pages in each issue have been paid for by *QST* advertisers for editorial

QST is glad to announce, effective immediately with the November issue, a return to advertising rates on the pre-war basis. While the paper situation is not yet sufficiently clarified for us to know how much advertising we shall be able to carry in the immediate future, there seems to be good prospect that we can meet the most urgent needs for somewhat expanded schedules and for new schedules which we have been unable to accommodate during past months.

The enclosed new Rate Card establishes rates on the basis of circulation so far as predictable at this time. It returns to our pre-war basis, making provision for our present circulation increase of approximately 40% from the pre-war level; although it is probable that our circulation increase soon will greatly exceed that figure because we shall be able to improve upon our restricted distribution of the recent past and also be able to resume more normal solicitations of paid-in-advance circulation.

We are grateful indeed for the kind cooperation which QST advertisers have extended to the American Radio Relay [illegible] through the League, to the Amateur Radio [illegible] and believe that now we shall be able [illegible] much more satisfactory

From *QST* Adv. Dept. letter dated Sept. 15, 1945

W2UK, W3BD, W3EMM, W3EOZ, W4CYU, W4NG, W5CXH, W5G1K, W5VV, W6GRL, W6MQF, W6KQ, W6KW, W7HXU, W8CPC, W8CRA, W8OSL, W8OXO, W8RG, W8RHZ, W9GHW, W9J1D, KA1LZ.

RCA spoke of Amateur TV in 1940 and Johnson announced the purchase of Bassett's antenna and cable business. (In 1945 Johnson would start to manufacture certain Mallory-Yaxley components.) In 1941 Collins had an interesting series of ads featuring mythological characters like Perdix, Briareus, Argus. In February of 1941 the Zenith ad reproduced a letter from President McDonald which started with this question: "Frequency modulation is here — but where are the amateurs?"

As the United States began to recover from the shock of Pearl Harbor, electronic companies increased production facilities in an all-out effort to supply our fighting men. In the years 1942–1945 most *QST* advertisers explained that they were doing one or more of these:

1. Supplying equipment and components to the armed forces. It seemed that nearly all *QST* advertisers were in this category. Hallicrafters' red, white and blue ad in August 1942 started with a letter to the Army Signal Corps and Navy Communications calling attention to the excellent job done by distributors of electronic equipment for the armed forces. The letter was followed by 6 pages in an unusual layout listing 24 of these distributors. Hammarlund ran a series of ads in 1943 showing the SP-200 in six war theatres: Africa, Guadalcanal, Russia, Australia, Italy, China.

2. Supplying equipment and components for home defense. Abbott, Hammarlund, Newark, Wholesale, were representative.

3. Buying amateurs' equipment and meters for the armed forces. The well known Hs — Hallicrafters, Harrison, Harvey, Hammarlund, Henry — along with Raytheon, Triplett, Mallory, were examples.

4. Offering preparatory training in radio for the armed forces through schools or equipment. Meissner, McElroy, Ayers, Teleplex, displayed equipment and Melville, American Radio Institute, were among the schools. Candler offered a course. ARRL's Defense Edition of the *Handbook* was in great demand by all branches.

5. Asking for personnel to maintain essential production or urging amateurs to enlist. Philco, Westinghouse, Hammarlund, Hazeltine, Collins, Raytheon, advertised for civilians. Hallicrafters and G. E. recommended the Signal Corps, Terminal talked of the army. Taylor Tubes said that every branch needed men. Cinaudagraph emphasized the need for Waves and Spars. The September issue of *QST* carried an editorial section on the Signal Corps; Hallicrafters with several distributors including Terminal, Harvey, Sun, Sceli, Harrison, Wholesale, Henry, joined in the salute.

6. Promising better products for amateurs after the war. It is interesting to note that as early as 1942 Raytheon in a July ad prophecied that radar "may, for instance, be standard equipment on commercial aircraft after the war."

The Army-Navy E Award was won by Hallicrafters, Alsimag, Eimac, Clarostat, Bliley, Raytheon, Zenith, Burgess, Sickles, Amperex, Sprague, UTC, and many others, Hallicrafters making the first announcement in October of 1942 and reporting in January of 1945 on winning it five times.

The Electro-Voice ads on the differential microphone were particularly interesting to those who knew that the mike was invented by F. C. Beekley, then *QST*'s advertising manager.

Hallicrafters' letter-writing contest for hams in the service which started in November 1943 and ran for about a year and a half was stimulating.

As the country got deeper into the war the shortage of paper became acute. In a letter dated March 8, 1943 limitations on purchasing of paper were explained and it was pointed out that *QST*'s circulation could not be curtailed without interfering with important education, printing of recruiting ads and the obligation of holding amateur radio together. Advertisers were asked to pay twice as much for advertising space and to use less space, besides. This letter was sent to all advertisers and their agencies.

The response was a mighty demonstration of loyalty to *QST* and faith in ARRL.

War Time rate card No. 11 went into effect with the May 1943 issue of *QST*. Rates were doubled: a page cost $480 instead of $240. ARRL agreed to set aside one half of *QST*'s net advertising revenue to be used for post-war rehabilitation of amateur radio.

Pages of advertising were comparatively few for a couple of years. However, as the war and 1945 neared the end, some manufacturers said they would soon have new amateur equipment; more made definite offers. Coto Coil said, "We can plan on that new rig now and be ready." Jensen promised that new products were coming. RME announced the post-war RME-45 receiver, Collins offered the (1939) 32RA to civilians, Hallicrafters announced in October the availability to hams of receivers with ads on certain models by Henry, Radio Shack, McElroy, Newark, Harrison. Hammarlund came out with the HQ-129X. National advised that production would be concentrated on the HRO, NC-240C and NC-46. New tubes were offered by Eimac, Hytron, G. E., Taylor, Raytheon.

New advertisers included Allied, Amphenol, Andrew, Bell Tel Labs, Burlington Instrument, Concord (Lafayette), Hallicrafters as RFC agent, Jennings, Marion, New York Transformer.

In November, Taylor Tubes and Crystal Research Labs announced contests.

QST began to look like its pre-war self and the good news that war time advertising rates were no longer necessary was given in a letter dated September 15, 1945 to all advertisers and agencies. Circulation had increased to approximately 65,000 and rate card No. 12, which went into effect with the November 1945 issue of *QST*, gave the cost of a page of advertising as $325. QST

MORE BANDS!

U.S.A. and Canada on November 15th Open 10 and 5-Meter Bands and Four Microwave Bands; 2½ Shifted; International DX Restored

JUST as this issue of *QST* is ready for the bindery, and with barely time enough for us to slip in this extra sheet, the Federal Communications Commission for the United States and the Department of Transport for Canada on November 9th have simultaneously announced important actions restoring amateur radio on frequencies above 28 Mc. The actions are effective at 3 A.M., E.S.T., on November 15th.

The FCC action is covered by its Order 130 and replaces the temporary authorization of last August under which we operated until Nov. 15th. While it is expected that by early December FCC will be able to set up the machinery to issue new station licenses (and begin the renewal and modification of old ones), such facilities are not yet available. The only action possible at the moment is therefore to continue a temporary authorization to those of us already licensed. Station licenses that were valid at any time between Dec. 7, 1941, and Sept. 15, 1942, are validated for another six months — until 3 A.M., E.S.T., May 15th. (During that time there will be FCC instructions on how to apply for renewals.) Such stations are then authorized to operate on a newly-stated group of frequency bands. The action applies to all areas under FCC jurisdiction except the central, southern and western Pacific areas. Unfortunately, at the time of releasing the order military clearance had not been completed for Hawaii and the U.S. island possessions in the Pacific, and they are excluded. (The prohibition is but temporary and it is possible that it will be lif[illegible] even before Nov. 15th. K6 amateurs should keep themselves informed by [illegible] to W1AW's broadcasts. Here are our new frequency bands after Nov [illegible]

TEN METERS

The postwar band 28–29.7 Mc. is opened in its [illegible] to 29.5 is available for a.m. 'phone (A-3), whi[illegible] 29.7 Mc. The 'phone figures are reported[illegible] and do not represent ARRL sugg[illegible] should observe them carefull[illegible]

We open [illegible] a.m. [illegible]

ARRL—Postwar Readjustment

IN 1918 the dawn of peace had shed its first uncertain rays on an amateur radio which was nearly defunct. The League had been closed up since the enlistment of its Secretary some fifteen months earlier. It had no funds: its "official organ" was privately published by the Secretary, and it owed much more than it owned.

In contrast, when peace arrived after World War II, ARRL was a stronger institution than at the start of the war — because of the intense loyalty of members and advertisers alike, and the success of its publications as training manuals. Truth to tell, much of the groundwork for re-establishment of amateur radio was already done by V-J Day: four days afterward, the military released most of the 2½-meter band to FCC and it, in turn, to amateurs. Licenses which had expired since 1941 were reactivated by a series of extensions, and amateur radio was back in business.

Postwar allocations planning — both for domestic usage and looking toward an eventual international radio conference — had begun in 1943. By 1945, the Interdepartment Radio Advisory Committee (the agency which regulates government use of radio) and FCC had agreed on an allocations table: the amateur service was constantly represented by ARRL during the planning stages. The new Loran service spelled doom for the old 160-meter band (though sharing arrangements were later worked out by the League with the Coast Guard): a new 21-Mc. band was proposed: ten meters was clipped 300 kc. at the top edge to provide a "diathermy" band at 27 Mc. (also later temporarily shared by amateurs): v.h.f. bands were shifted to accommodate TV, f.m. broadcasting and aviation requirements: and a number of microwave bands for amateurs newly appeared in the table.

As the military shrank to peacetime dimensions, it gradually — and always with ARRL prodding — released bands for amateur use. W1AW in November 1945 commenced transmissions on 80-, 40- and 20-meter spot frequencies with bulletins of regulatory developments. The ten-, five- and new two-meter bands and the microwave frequencies above 2300 Mc. were released early in November; the 2½-meter band was withdrawn. In January 1946 the 420-430-Mc. (later expanded to 420–450) and 1215–1295-Mc. segments were made available. In February the new six-meter band was opened and the historic 5-meter band became TV Channel 2. In March amateurs were assigned shared use of the "diathermy" band and temporary use of 235-240 Mc. while arrangements were being made for the withdrawal of an aviation device from 220-225 Mc. The 80-meter band was returned earlier than scheduled after monitoring and subsequent pressure by ARRL: 3625-4000 kc. was cleared for April 1, the remainder by May 1. The top halves of the 40- and 20-meter bands were opened to amateurs in June of 1946, and the job completed in November with the release of the

remaining halves. All these measures were joint Canadian-U.S. moves, coordinated with other allies as well.

The original basis of U.S. amateur call areas had been the nine radio inspection districts of the Commerce Department. These districts had long since lost their meaning; in addition, some were very much heavier-loaded than others. Accordingly, ARRL drew up and furnished to FCC a plan for redistricting which would not split any states. The plan — under which we still operate — was adopted by FCC and went into effect with new calls issued after October 15, 1945. W3s in New Jersey, W6 Arizonans, W8s in Pennsylvania and New York, and W9s west of Illinois and Wisconsin continued to operate under their prewar calls until they applied for modification or renewal. Counterpart calls were given to these amateurs wherever possible, and later, for a time, to other amateurs who moved from one district to another. In 1946 the FCC decided to permit former holders of two-letter calls to apply for any unassigned two-letter calls as long as there were some available in the appropriate call area. Distinctive two-letter prefixes appeared in the possessions, and for the first time civilians were permitted to ham in the Canal Zone.

In Canada, too, the prewar calls were outgrown. VE4 lost Saskatchewan and Alberta, henceforth to cover only Manitoba. VE5, which prewar had included British Columbia, Yukon and the Northwest Territories, was assigned to Saskatchewan. Alberta became VE6-land and British Columbians got VE7 calls.

The new zero calls seemed overly long to some, who signed with the long-dash zero. FCC said this would not be permitted, and then did relent for a three-month test period, after which the long dash was permanently barred in call signs. Five-year license terms were adopted when licensing resumed in October 1945. Wartime measures, such as proving citizenship and registering transmitter equipment, were abandoned soon after the war ended. Amateurs no longer had to show possession of station equipment before being granted a station license and call sign, effective in July 1946. The requirement that the code test be written in longhand was changed at League request on behalf of the thousands who had learned to copy in block printing for Uncle Sam. Geographical names used to help identify an amateur call on phone were barred in 1946, but again permitted, at League request, since August of 1946.

The informal working relationship between ARRL and FCC was permanently altered with the adoption by Congress of the Administrative Procedure Act in 1946. Theretofore, an ARRL proposal for amateur rules change would be checked out with the FCC engineering and legal departments and, if no objections arose, the change would be promptly made. The new act required much more formal relationships between FCC (and all other alphabet agencies created by Congress) and those under their regulatory jurisdiction, including public notice of any proposed change and ample time for anyone interested in the matter to file comment. The first question to be stacked up behind the necessarily-slower procedures was the division of bands by mode, the first round of a battle — primarily between phone and c.w. groups — to be fought later. In the interest of unity for the forthcoming Atlantic City radio conference, the ARRL Board of Directors withdrew its request for increased phone privileges, as well as a proposal for a no-code license for frequencies above 200 Mc., thus postponing the ruckus which will be reviewed in these pages next month.

In 1947, W3DF was appointed Chief Engineer of FCC, and later that year was named a Commissioner; George Sterling thus became the only amateur to hold that office. A special department was newly established in FCC to handle expanding amateur regulatory matters.

There was a considerable and growing problem with TVI, both due to harmonics and to poorly-built sets. The problem was not restricted to the amateur, either; in June of 1948 the Commission held a general meeting of communications people to discuss harmonics. The League ran a story by Phil Rand, W1DBM, in May of 1948, and later cooperated in tests of i.f. and harmonic problems conducted by W1DBM with TV equipment borrowed from RCA, GE and Hallicrafters. In September that year FCC started using a form letter to complainants which was eminently fair to the amateur. A bulletin of the RCA Service Company to its affiliates further pointed out that amateurs were not the major cause of TVI.

By late in 1948, the Office of Civil Defense Planning had developed the basic concept of a national scheme building up from municipal level. Amateurs figured in these plans, at all levels, as an important alternate communications system. Meanwhile, cooperation between the amateurs and Red Cross was strengthened by a

This cartoon, used to illustrate announcement of the first postwar contest, the Band Warming Party, succinctly states the amateurs' view toward the all-too-deliberate process of postwar reopening.

Midway through the Atlantic City allocations conference ARRL gave a dinner for all licensed amateurs registered with the conference. Sixteen countries were represented by the thirty-three amateurs present.

plan for handling Red Cross traffic developed jointly by the agency and ARRL, announced in January 1949.

In March of 1949, after years of behind-the-scenes maneuvering, needling, prodding and so forth by ARRL's "traveling salesmen" in Washington and Ottawa, an arrangement was devised for amateurs in the U.S. and Canada to use parts of the 1.8-2.0 Mc. band, divided roughly east and west, sharing with the Loran service.

International

An international administrative radio conference had met at Cairo in 1938, and had made a date for 1942 at Rome. For obvious reasons, this meeting was never held. In the meantime, aviation, both commercial and military, had grown to many times its prewar size. Radar, Loran, distance-measuring equipment, radio altimeters, radiosonde, and other "black boxes" had been invented, had proved themselves, and were now in need of permanent frequency space. For a decade before the war, commercial television had been "just around the corner"; technology developed during wartime helped the TV industry finally to turn it. A wonderful world of music had become practical, as commercial v.h.f.-f.m. broadcasting also burst upon the scene. The alignment of nations was altered by events, and postwar, the jockeying for a better world position continued among nations, though perhaps with a different lineup: all of this would have to be reported to the citizens of the world, and international broadcasting must therefore be continued and spread. Radio — nay, electronics, for radio was now too restrictive a term — would not be the same again.

Thus, the great relief felt by amateurs in once again getting on the air was tempered — in the minds of serious hams, at least — with concern that the tremendous pressures brought by wartime developments against a non-elastic spectrum might be dangerous to preservation of amateur radio.

It is the Department of State which officially represents the U.S. at international conferences. In 1946 it was also the Department of State which was operating the nation's propaganda broadcasting transmitters. The combination almost raised a serious threat to the carefully-prepared plans of FCC and IRAC; there was a move inside State to expand the U.S. recommendations for the international broadcasting service. The reaction from other government and private users of radio was immediate, sharp — and successful: the move died in the making. There was also a brief flurry of activity connected with TV and f.m. broadcasting, both of which services were not altogether happy with their planned allocations, but the decision which moved amateurs from 56-60 Mc. to 50-54 Mc., placing TV next above, and f.m. starting at 88 Mc. was reaffirmed.

Meanwhile, the U.S. position pretty much firm, the U.S. undertook to explain its viewpoints to other nations — at the Third Inter-American Radio Conference held at Rio de Janeiro, September 3 through 27, 1945; at an Anglo-American communications conference in Bermuda in November; and at Moscow from September 30 to October 21, 1946 among telecommunications representatives of China, France, the U.S.S.R., the United Kingdom and the U.S. W1BUD was present at all three of these meetings, at Rio and Moscow representing the amateur service through ARRL, and at Bermuda representing the Coast Guard.

There was some disagreement about the venue and the opening date of the world conferences, but finally Atlantic City, New Jersey, was chosen as the site and the Administrative Radio Conference got under way in May 1947.

Before the conference ended, 20 weeks and 10,000 pages of mineograph paper later, delegates knew they'd been in a fight! As one example, the camel of international broadcasting, having gotten its head in the amateur 7-Mc. tent at Cairo, tried to get shoulders and hump in there, too. The Cairo Convention had assigned the band to amateurs, worldwide, but then permitted sharing of 7.2–7.3 Mc. by international broadcasting outside the Western Hemisphere. At Atlantic City, the American republics, under the energetic guidance of Canada and the U.S., attempted to preserve the band as exclusively amateur. Other nations, chiefly in Europe and Asia, were equally determined that the international broadcasting service should have at least 150 kc. of the segment on an exclusive basis. Finally, the conflict was resolved on a political rather than engineering basis: the whole band remained exclusively amateur in the Americas, but in the rest of the world the ham segment was only 7.0–7.1, with 7.1–7.15 shared, the rest being allocated only to broadcasting.

The 80-meter band was properly handled on a regional basis, with the Americas again being more generous to amateurs. Here the band stayed

Sidelights, 1945-1948

A sprightly column, called "The Crystal Ball" made its first appearance in *QST* for September, 1945; short letters from members described the gear amateurs expected or hoped to see in their postwar shacks. . . . At League request, FCC adopted a policy of issuing advisory notices to amateurs heard with correctable violations of technical rules; previously, FCC had only a formal citation to be issued for violation, regardless of how minor or how serious a violation was. . . . The terms "Radio Engineer" and "District Engineer-in-Charge" replaced the terms "Radio Inspector" and "District Inspector-In-Charge" for FCC's field personnel. . . . At the Moscow five-power conference, the U.S. was permitted to bring only five industry people, one of whom was ARRL's Budlong. . . . The first mainland K calls were issued in the fall of 1946, to military recreation stations connected with the Naval Reserve. . . . The League and the Netherlands society, VERON, jointly sponsored a program under which U.S. and Canadian hams could "adopt" a PAØ amateur and send him components with which to rebuild his amateur station. . . . When a B-29 made a record-setting distance run from Honolulu to Cairo non-stop in October 1946, radio amateurs provided the backup communications. W3QR was communication officer aboard the *Pacusan Dreamboat*. . . . First transoceanic work on six meters occurred when W1HDQ worked two Gs crossband on ten, in November 1946. . . . The Society of American Radio Amateurs was formed in November 1946, to organize the opposition to any expansion of phone bands. . . . "Incentive Licensing" was adopted in Canada effective April 1, 1947. Under the rules still in effect no phone is permitted below 30 Mc. for the first six months, after which operators may use the phone portions of the 10- and 11- meter bands. After a year, amateurs may try for the Advanced Amateur certificate, requiring a theory and regulations exam and a 15 w.p.m. code test, to acquire phone privileges on the bands below 25 Mc. . . . A special meeting of the Board was held on March 14, 1947, to cope with pre-Atlantic City jitters, and to assure directors and members that proper preparation for the conference had been accomplished. . . . The Board of Directors in May 1947 appropriated $25,000 and granted "Committee of One" powers to ARRL President Bailey to be used as necessary in the defense of amateur radio. The action came just days before the opening of the Atlantic City Conference. . . . Rules for amateur remote control were spelled out in a December 1947, FCC action. . . . Single sideband articles in *QST* were attracting attention; early in 1948 Secretary Warner predicted that "s.s.s.c." as it was called then would come along rapidly in the amateur field and that it would eventually have a material effect upon our allocations problems. . . . It was suggested in February that year that any phone allocations on the new 15-meter band might be restricted to s.s.s.c. . . . The Canadian phone bands were expanded to read 3.75-4.0 and 14.15-14.35 Mc. effective with the renewal of licenses on April 1, 1948. . . . In May the formation of the National Amateur Radio Council, Inc., was announced, to oppose an ARRL request for a Class A code speed requirement of 16 w.p.m. and for the continuation of 40 meters as a c.w.-only band. . . . ARRL's Budlong was one member of a three-man government committee which drafted a proposed new Inter-American communications agreement in advance of the Fourth Inter-American Radio Conference. . . . The familiar U.S. form of amateur license paper, with all information on both the station and operator licenses typed on one side, was put into use in July, 1948. . . . The Canadian and U.S. amateur rules were changed to permit mobile operation on all bands. . . . A. L. Budlong was appointed Acting Secretary after the death of K. B. Warner (see text). . . .

at 3.5–4.0 Mc. shared with the fixed and mobile services, precisely as it had since the high frequency pie was first cut up in 1927. In Europe and Africa (or more properly, ITU Region I) the band emerged as 3.5–3.8, shared with fixed and mobile and in the remainder of the world (ITU Region III) 3.5-3.9 Mc. Further details in the western hemisphere were left for a later regional conference.

The 20-meter band, with heavy fixed and broadcasting pressures against it at various times, emerged with 50 kc. chopped off the top end (14.0–14.35 instead of 14.0–14.4 Mc. as it had been under the Cairo table), but still carrying the label "exclusively amateur." The ten meter band suffered only minor surgery, with 300 kc. out of 2,000 disappearing; the final result was 28.0–29.7 Mc., exclusively amateur.

On the credit side of the ledger was an entirely new entry — 21.0–21.45 Mc., exclusively amateur, worldwide, harmonically related to our 7-Mc. band, and having great potential for DX much of the time. Amateurs had never been legally entitled to this band prior to the Atlantic City conference.

Although the 1.8–2.0 and 26.96–27.23 Mc. bands could not be regarded as amateur, the conference approved sharing arrangements for 160 meters and in Region II for 11 meters. A few additional countries adopted one or the other by footnote.

Through all of this, the amateur service was most active. ARRL Secretary Warner, General

The Marconi Memorial Service Award was presented to the League by the Veteran Wireless Operators Association on February 16, 1946. The plaque was awarded "to the radio amateurs of America in recognition of their outstanding contributuons to the successful prosecution of World War II."

The ARRL booth at the Fifth National ARRL Convention, Milwaukee, September 4–6, 1948, with members of the Milwaukee Radio Amateurs Club on duty. From the left: W9DOS, W9NAV, W9DWI, W9PYM.

Counsel Segal, Assistant Secretary Budlong and Technical Director Grammer were members of the U.S. delegation. The International Amateur Radio Union observer group included W2KH, VE2BE, YV5AP, CX1CC, G6LJ, C1KT and LA1GA. All told, 41 amateurs from 20 countries were in attendance at the conference.

On October 2, 1947, the conference was over. In this business, however, one rarely gets a breather it seems — in November, Secretary Warner told the directors that planning for the Fourth Inter-American Radio Conference had gotten under way!

Organizational Matters

The high level of business which the League had reached during the war was exceeded in the two years following. It was necessary during this time to occupy the whole building at LaSalle Road, including the basement. The staff was raised from 45 at V-J Day to 60 employees 14 months later. A new lease was signed for LaSalle Road in 1945, covering the years 1947–1952. In 1947 the Board raised the dues from the rate of $2.50 set in 1926 to $3.00 in the U.S. and from $3.00 to $3.50 in Canada. Yet only a year later it was necessary to raise the dues again, to $4 and $4.50 respectively, so great had been the post-war inflationary pressures. Similarly, the *Handbook*, all its previous life a $1 book, was raised in 1947 to $1.25, and the 1948 edition sold for $2.00.

The Board considered, in 1946, a move to cut the number of League divisions in the U.S. from 14 to 10, the new ones to coincide with FCC call areas. However, the plan was defeated, mostly on the grounds that the directors would lose much contact with the members in the larger divisions. As a partial answer to unbalanced divisions — particularly the Central — a new Great Lakes Division was created in 1946, to comprise Michigan, Ohio, and Kentucky.

Charles Blalack, W6GG, who had been vice-president of the League since 1940, joined Silent Keys on December 7, 1945. The 1946 Board, after spirited politicking, elected J. Lincoln McCargar, W6EY, as vice president on the third ballot.

Kenneth B. Warner, W1EH, the first career employee of the League — secretary, general manager since 1919 and much of that time editor of *QST* as well — died suddenly early in the morning of September 2, 1948 of a coronary thrombosis. What his career had meant to the League was eloquently summarized in these words from the November 1948 issue of *QST*:

"For if it was Maxim who conceived our League, it was Warner who breathed into it life and energy and vitality, whose balanced judgment and clear vision ensured its growth and success." Warner's death came without warning. The day before he had put in a full day at the office, and had finished the speech he was to have delivered at the ARRL National Convention, September 4-6 in Milwaukee. The speech "The ARRL — Your Organization" was read to the assembly instead by Vice President McCargar. An era had come to a close.

Post-War Amateur Operating

Post-war on-the-air amateur activity paralleled the return of frequencies. First came the Aug. 21 sharing of 112 to 115.5 Mc. with the WERS. Thereafter each new band-opening order attracted a large initial occupancy. The League's Emergency Corps, also the appointments for and services to Official Bulletin Stations (OBS) were activated without delay. An ARRL *Band Warming Party*, in February 1946, was the first official spot activity. In this the ten-meter band was "a squirming mass of signals from one end to the other." Here was operating at fever pitch! Eleven meters was in use by March, but no part of 3.5, 7 or 14 Mc. became available until the order to permit 3625-4000 kc. operation starting April 1. Domestic traffic handling then resumed on a more normal scale and provision for emergency communications requiring h.f.'s could now go forward. The fraternal side was further emphasized in September by an ARRL *Get Acquainted Party*. The LSIH's (Licensed Since Pearl Harbor) were invited to get on the air and work the Pre-War Actives. Besides the customary exchanges of name and signal report, the ages and date-of-license gave data of interest: RCC was another objective. The point leader, WØEHR/3, had 47 15-minute (or longer) contacts and a 68,000 pt. total.

Expedition work: DXpeditions had not yet been reduced to mere statistics of the numbers of contacts. Amateurs then active may well recall the first post-war expedition — a B-29 "*Dreamboat*" flight, Hawaii to Cairo, W3QR operator, in Oct. '46. Then MacMillan's *Bowdoin* once more in June '46 left Boothbay Harbor, Maine for one of those voyages to the Arctic. KLPO, with W1KKS

W1AW returns to the air! Communications Manager, W1BDI, is here pictured at the ARRL Headquarters Station on October 31, when the first post-war transmissions of information "to all radio amateurs" was made.

as operator, was given FCC clearance to work two-way to handle its communications through amateurs. In April 1947, Expedition *Kon-Tiki*, LI2B, attempted to reach Tuomotu from Peru by ocean currents and a 45-foot balsa raft. W6EVM, W6AOA and others established 20-meter contacts and handled vital communications even though the raft equipment was a 10-watter with 2E30 tubes.

With the v.h.f.s assuming ever more importance, a new post, that of Official Experimental Station, was announced and met immediate acceptance. The Code Proficiency Program of certifications was resumed. This enjoyed great success in the latter nine months of '46. There were that year all the usual expected CD activities except the DX competition. The first 2,000 post-war RCC (Rag Chewer's Club) matchings were made. To examine band occupancy as soon as things became stabilized an Operating Interest survey card was inserted in January '47 *QST*. Ten-phone topped all bands for voice interest. Forty c.w. had about 20% of all operating interest with 80 and 20 rated at about 11% and 14%. The three major voice bands were 10, 75, and 20 meters, 25% 11% and 9% of all interest recorded. V.h.f. activity on 6 meters (1%) was about half its pre-war stature, (in view of the adjustment to a new frequency region) while 2-meter work rose to ten times the '41 occupancy representing 5% of total interest. A *VHF Marathon* was an 8-month feature for v.h.f. workers in 1946. Most-States VHF Contests also were held in '46 and '47. As well as points for mileage, the "marathons" encouraged (by band multipliers) versatile use of the different v.h.f. bands. The 11-month Marathon in '47 was the last: a new type *VHF Relay and QSO Party* held in May was successful and a more practical activity to administer with the tremendous increases now recorded in v.h.f. operating.

In '47 propagation conditions were at the top of the 11-year sun spot cycle. The high m.u.f. allowed transoceanic communication on all bands, even including 50 Mc. ARRL section nets and post-war trunk lines now got rolling on 80 meters in dependable fashion. Awards in all categories were in great demand, and contest activities reached new highs. The first ARRL Member Party in six years was held with 66 sections represented and the Field Day the biggest (up to then) in League history. Appointment lists swelled; still all SCMs together had but 673 Emergency Coordinators. Northern and Southern Minnesota Sections were put back together again to form one *good* ARRL section. Some 88 nets and seven trunk lines were functioning by the end of the year — a far cry, however, from our net registrations and NTS activity today!

In 1948 *QST* started an "on the air with single sideband" column; the mode was making progress. The list of ECs was now 1,000 strong. The results of the "First VHF Sweepstakes" appeared in July *QST*. It was a lively contest for the v.h.f. supremacy of each ARRL section; sixteen clubs competed for the gavel award.

Two other developments set the pattern for post-war operating progress. One was evolutionary, the planned interconnection of state level nets to form a true National Traffic System. Also for the growing numbers of clubs a new Training Aids Program was inaugurated by the League. Starting with seven 16-mm. sound movies covering radio principles, and nine film strips, available only to affiliated clubs, the library of aids was expanded as rapidly as possible. Quiz-type items were added in '48 and by this time hundreds of clubs were making loan-bookings. A National Emergency Coordinator was added to the League staff, and in '48 a National Emergency Net was implemented. Close ties were maintained with the American National Red Cross in line with a cooperative understanding worked out before the war between the two organizations. ARRL published a *DX Operating Code* as an operating aid, after coordination with a large number of DXCC award holders and receipt of favorable comments on the draft from foreign societies. There were close to 500 *active* club affiliates by early '48, a number that was to triple and increase steadily over the following years.

Commander Brad Martin, USNR, XU1YV/W3QV, shown in his mobile communications van in Tangku, China, from where he made over 200 contacts on 28 Mc. from February 6 to April 6, 1946.

Oscar Sandoz, VE1QZ, Halifax, Nova Scotia, who (with VE1QY at Yarmouth) provided the first VE1 contacts on 50 Mc.

It was also in '48 that amateur radio teletype started to attract more amateur interest. Users in the New York area formed an a.f.s.k. net on 147.96 Mc. Interest was catching on in some other developments. Seventy-two clubs reported n.f.m. users; only twenty three reported having s.s.b. voice equipment demonstrations or use within their memberships at the time. The s.s.b. operation was however, destined to outdistance other operations in popularity. F.s.k.-RTTY nets also were shortly to come into being.

A Simulated Emergency Test, second such since the war, was conducted in October '48. Three thousand messages were delivered to ARRL and the ARC. Much favorable publicity resulted for the amateur. The FD, SS and DX contests remained ARRL's "top three" events in operating. A fifth ARRL Governors'-President Relay was held in January '49. Messages were delivered from thirty-nine governors and four territorial governors. In all, forty-one states were heard from. There were many general amateur activities in this period: state QSO parties, amateur radio use in reporting the course of boating events, regattas and motorcycle races, also use for monitoring parades, exchanging results of inter-city matches and college competitions.

The post-war development of a new national traffic plan seems, in retrospect, the greatest "operating pattern" improvement of the area. Announced in September '49 *QST*, the National Traffic System (NTS), utilizing the fact that about every ARRL section had traffic nets, established a firmly functioning, systematic means to interconnect these to provide for traffic flow daily between all points in the nation. The NTS was not designed to replace specialized systems. However, it helped at once to take care of the fast-increasing post-war traffic. Twelve newly set up NTS regional nets with the four area nets were first active in the '49–'50 operating season. By the following year it was apparent that here was a system providing for participation at will by any amateur. It gave more universal coverage for routing traffic than ever before. However, regional or independent systems serving special purposes did not have to be abandoned. These too could tie in where thought advantageous for traffic exchange — with 100% integration of all systems a long term goal. The NTS with its known pattern for routing represented tremendous improvement from those earlier days of "hitchhiking" of traffic through a multiplicity of individual-station schedules. Four or five trunk lines of those reactivated after WW II were gradually supplanted by the NTS provisions.

There were still "firsts" in operational work. One was reported in March '49 *QST*, when for the first time two-way RTTY was employed for a *transcontinental* traffic exchange. W6PSW and W1AW used 11-meter a.f.s.k. for this. *QST* that year also recorded the first amateur *transocean* RTTY QSOs. This historical work involved operating by W6ITH, W7JCU and JA3RO. In January '49 a Ten-Meter WAS Party livened up this band. This success was followed by another in December '50 and helped many of the 10-meter gang progress to "all states" status. Working with British amateurs again, a series of 160-meter transatlantic tests was announced in late '50 for early the following year with staggered time periods for W/VE and overseas calling.

The major spot activities and all ARRL awards gained in popularity with each passing year. By 1950 the award issuances for DXCC and WAS ran 479 and 513 a year. By the end of 1950 the leading c.w. and phone contender had a total of 236 countries c.w. and phone and 195 phone only. There were about 1087 amateurs with "over 100" countries, three hundred with phone certifications, all in post-war DXCC. About 12,000 different amateurs held Code Proficiency Certificates, and in all 2,000 amateurs . . . had been issued the Worked All States Award since WW II.

Emergency Communications

THE ashes of war were still smouldering when Communications Manager Handy announced the reactivation of the ARRL Emergency Corps and the creation of a new appointee post, that of Section Emergency Coordinator. The latter was to be appointed by the SCM and serve as his right-hand man in all emergency matters. Not a great deal of progress was possible during the remainder of 1945, when amateurs were sharing the 2½-meter band with WERS and there was some tendency on the part of WERS licensees to "hang on" to their prerogatives.

But WERS was terminated by FCC late in the year, and amateur operation took over. At first it was just rag-chewing and getting re-acquainted, but once the "feel" of unrestricted operating was restored, the amateurs started looking around for something useful to do. ARRL supplied this

in a series of articles by the Communications Department regarding AEC programs and progress; W2OHE, EC for Brooklyn, N.Y., reported the first AEC drill on two meters. The York, Pa., AREC conducted a comprehensive simulated emergency test under EC W3AQN in March of 1946. The first post-war report of amateur emergency work appeared in August 1946 *QST*, an Alaskan earthquake (sound familiar?) which occurred on April 1, 1946, reported by K7FFG (yes, *K7* was Alaska then). No mention is made of the band used, but some low-frequency bands where then available.

Simulated Emergency Test was scheduled for October of 1946, the first of these annual tests designed to give the ARRL's Emergency Corps an annual "dry run." The "SET" has since become a fixture, like the Field Day.

Meanwhile, amateurs started participating in more emergencies. In late May it was a Susquehanna River flood, under Regional EC W3UA; this activity was conducted on 75-meter phone. In mid-September a Belgian plane crashed in Newfoundland and VO2RM handled traffic on 75. In October a Florida hurricane brought amateurs into action by the score, and in November amateur radio was responsible for the rescue of 300 motorists stranded by a blinding snowstorm on a New Mexico highway. In mid-November a snow and ice storm in Idaho and Washington brought amateurs into action. Other 1946 highlights were operation in connection with an Atlanta hotel fire and a dramatic rescue of a party stranded on an ice floe in Quebec. Accounts of these and other operations were scattered through the "Operating News" section of *QST*, and continued in 1947, '48 and part of '49 before they started being collected under a single column.

The big emergency in 1947 was the Texas City explosions which occurred in April of that year. *QST* sent an assistant editor, W1CEG, to the scene of this and a nearby tornado emergency at Woodward, Okla., resulting in a feature article in the July, 1947, issue of *QST*. The Texas City explosion is still often cited as a classic example of a man-made catastrophe which could occur in nearly any industrialized area.

The other big emergency in 1947 was a Gulf Coast hurricane which struck hardest at Louisiana and Mississippi in September. ARRL's new National Emergency Coordinator visited the scene before the wind stopped blowing and prepared a report for December *QST*.

There were 28 other emergencies reported in issues of *QST* that year, and at its annual meeting in May the ARRL Board of Directors recognized the increasing importance of emergency work by authorizing "expansion of the personnel of the Communications Department . . . for on-the-scene assistance wherever disasters may take place," and "expanded training . . . of the personnel of existing . . . establishments." Pursuant to this mandate, a National Emergency Coordinator was added to the staff late in 1947 in the person of Albert E. Hayes, W3LVY, and immediately went to work. Close working relationships were formed with the Red Cross and Western Union, some of the trunk lines were called upon to serve in emergencies, and amateurs in areas of imminent disaster were alerted and instructed by the NEC.

One of the biggest news stories in 1947 was the Texas City explosion. Amateurs covered themselves with glory in their achievements during and following this man-made catastrophe.

During 1948, strong efforts were made to weed deadwood out of the AEC, make new EC appointments, and establish emergency procedures. An article detailing collaboration between ARRL and Western Union appeared in the June issue. The first Simulated Emergency Test report appeared in the February issue, indicating participation by 54 AEC groups. A National Emergency Net was formed with a definite roster of stations to appear on certain designated frequencies whenever an emergency occurred anywhere, and the first box listing the "National Emergency Frequencies" appeared in November *QST*. The first net directory also appeared in this issue, listing 94 nets, about a tenth of them exclusively for emergency purposes. In June the first "With the AEC" column appeared in "Operating News." In August, QRRR replaced the traditional QRR as the amateur distress call.

Outstanding emergencies in 1948 included the famous Vanport (Wash.) dike break, a Louisiana

A broken dike on the Columbia River flooded Vanport, Wash., enabled a well-prepared ARRL Emergency Corps under EC W7DIS to render effective assistance. Here is W7AEF, transmitting by walkie-talkie from the dike.

When the Red River of the North went on a rampage in May of 1950, Winnipeg was almost completely submerged. VE4ML and VE4RM (on roof) stayed behind, when other residents were evacuated, to maintain communications.

tornado and violent midwest blizzards in January and November. These were in addition to the run-of-the-mill emergencies which were written up from time to time in "Operating News."

Much less happened among emergency lines in 1949. The report of the 1948 SET, appearing in March '49 *QST*, showed 93 AEC groups in action. For the first time a complete list of section emergency coordinators was published (in the Feb. issue), showing all but 15 sections having such appointees to centralize emergency operating activities within their sections. The only emergency of note was the earthquake in Ecuador, which involved Ecuadorian and Canal Zone amateurs — although of course the AEC was kept busy with smaller emergencies which regularly were reported under "With the AEC."

In the late summer of 1949 the NEC post became vacant, and later in the year it was assumed by W1NJM, already a ten-year staff member, as an additional duty.

The flood of the Red River in the north and the consequent inundation of the city of Winnipeg was the only big emergency story of 1950, although the usual assortment of smaller and localized emergencies were reported in *QST*'s "With the AEC" column, now reduced to six-point to accommodate more text. Of greater significance, this was the year of the re-emergence of civil defense as a part of the amateur emergency communications picture, a situation which was summarized excellently by an editorial in December 1950 *QST*. But let's start with this subject next month.

Technical Progress

GETTING back on the air after the war was a scrambling, piecemeal operation. Many hams had sold their receivers to the Signal Corps at the start of the war, so receivers had to be resurrected or hurriedly built from pre-war junk-box parts. The bands were returned one by one, starting with 28 Mc. on Nov. 15, 1945, and followed by part of 80 meters in April, 1946. Working overtime to sort out the services, in late 1945 the FCC announced the new f.m. band at 88 to 108 Mc., TV Channels 1 through 6, a relocated 56-Mc. band at 50 to 54 Mc., and a number of microwave assignments for amateurs. The effect of the TV assignments on amateur radio were not appreciated at the time.

On the h.f. bands available during 1946, there was little if any technical progress. Commercial and homemade gear followed the general lines of pre-war design. Commercial receivers used metal tubes and 455-kc. i.f. amplifiers with a single-crystal filter for selectivity. Homemade receivers either followed old designs or were conversions of war-surplus receivers. ("Conversion" meant adapting a 400-cycle or 28-volt unit to 60-cycle 115-volt operation.) Homemade transmitters were built on metal or wood in the familiar open style, although there were attempts to house them in suitable cabinets. The big commercial push on f.m. (and, later, TV) made 300-ohm Twinlead readily available, and it was used for amateur purposes until some of its shortcomings became apparent. War-surplus coaxial line (some of it pretty bad) was also on the market, and many an amateur changed over to using it for its neatness and convenience. With no means for measuring s.w.r., no one worried much about it until the line failed. The flexible coaxial line made feeding a rotatable beam much easier, and the war-surplus "selsyn" indicators were utilized as direction indicators. Surplus "prop-pitch" (propeller pitch drive) motors were the standard 10- and 20-meter beam rotators. The combination of old equipment, old techniques and old habits resulted in signals so bad that the *QST* editorial for November made a plea for cleaning them up. Hurry to get back on the air, widespread use of poorly-engineered VFOs and lack of pride were blamed for the situation. Harmonic radiation from amateur transmitters falling outside of amateur bands and interfering with other services was getting to be a serious problem and the cause for many FCC tickets.

On the credit side of the ledger, some of the hams who consider everything below 30 Mc. the "d.c. bands" were busy opening up the new microwave bands. Work on 2400 Mc. was reported in July of 1946, and the August *QST* told of working on 24,000 Mc. While it is true that the "amateur" work often meant moving lab or commercial gear to a rooftop after hours and working similar gear at a distance, the accounts of the work introduced many readers to the war-developed reflex klystrons and wave-guide techniques.

The editorial in the August, 1946, *QST* speculated on "transceiver" operation in the r.f. bands, pointing out the convenience and the saving in spectrum usage.

The first truly exciting technical development came early in 1947, when M. C. Jones described the "Micromatch," an absolutely magical instrument for *instantaneously* measuring the s.w.r. on a transmission line! Previously s.w.r. measurement involved the tedious sampling of the voltage (or current) along the line for at least a quarter wavelength, a quite impractical procedure at most commonly-used amateur frequencies. Although followed by several other devices that could measure the s.w.r. but at low power levels, the Micromatch had the big advantage that it could be left in the line all of the time. In October another bit of magic showed up in the form of the "Twinlamp," an amazingly-simple device for indicating reflected and forward power on 300-ohm Twinlead.

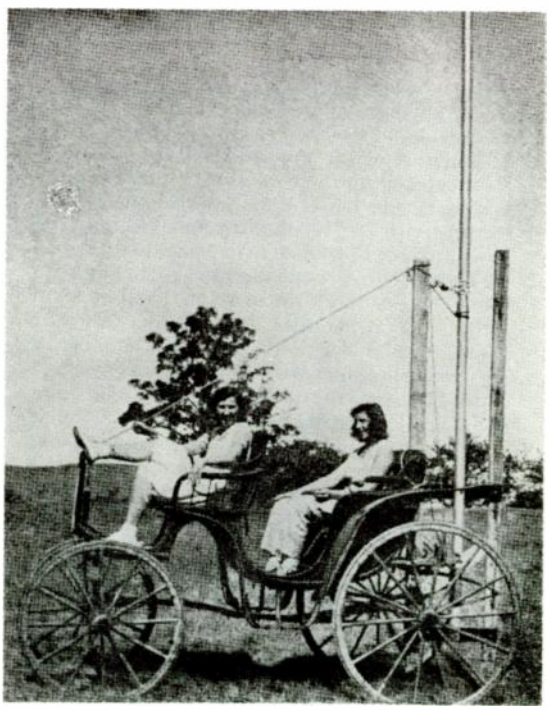
Narrow-band f.m. on 75 and 20 meters was proposed as an alternative to a.m., and with special permission W2GDG and W1AW carried out tests in the 75-meter band. As a result of these tests, which showed that n.f.m. didn't increase the QRM and did alleviate BCI, the regulations were changed to permit its use. N.f.m. was always under a terrific handicap because the usual receiver was not engineered to receive it advantageously, and all too few amateurs acquired adapters that demonstrated the advantage of n.f.m.

But in the bright days of new developments, the skies were getting very dark in two areas. Around New York and Chicago the ogre of TVI was chasing amateurs off the air by the hundreds. These were the days of relatively low-powered TV transmitters, and high-gain antennas at heights of 80 to 150 feet were installed at taverns and some homes to get a snowy picture from 50 to 100 miles away. It was bad enough to live near the transmitter: pity the poor ham who lived in the "fringe" areas of the day. During 1947 a few plagued amateurs refused to be chased off the air and did their best to solve the problems, and the major contributions were probably made by Mack Seybold, W2RYI, and George Grammer, W1DF, followed by Phil Rand, W1DBM, in 1948. This triumvirate throughly sifted through the possible cause and prevention techniques to clarify the problem and to offer workable solutions. It should be borne in mind that at the end of 1947, however, TVI affected only the areas mentioned. To the average amateur around the country, TVI might be another abbreviation for a government agency, for all that it affected him.

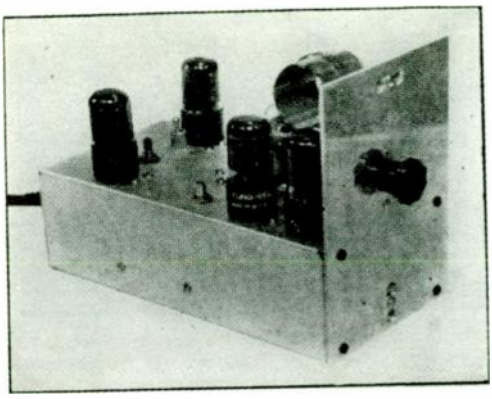
In 1947 the 6-meter men of the day were arguing for vertical or horizontal polarization, depending upon their location in the U.S. The New Englanders favored vertical and the rest of the country went for horizontal.

On the receiving front, a *QST* article in September introduced the war-developed "noise figure" concept of rating the sensitivity of a receiver, in contrast to the traditional "sensitivity" figures that were in reality overall-gain measurements and not really what an amateur has in mind when he speaks of "sensitivity." J. J. McLaughlin described in October his "selectable-sideband" reception method. It had appeared in the June, 1941, *QST* and had been of considerable help to the FCC and OSS during their wartime monitoring work. And in December Phil Rand described his "Q5-er," a low-frequency selective i.f. amplifier to follow the 455-kc. i.f. of the average receiver. Used with a war-surplus BC-312 as the "front end," it boasted a selectivity of 1½ kc. at −6 db. and 7½ kc. at −60. The following month a "Technical Topic" in *QST* told how the surplus BC-453 could be used as a "Lazy Man's Q5-er" to give a −6 db. bandwidth of 2 kc. and a −60 db. width of 6½ kc. These selectivities were considerably better than anything available from the contemporary commercial "communications receivers."

But while the January, 1948, *QST* included such practical articles as the use of the BC-453, the editorial staff went off its rocker with three articles plus an editorial, plus a cover on, of all things, single-sideband radiotelephony! This much space devoted to a single apparently-incomprehensible subject was unheard of, and some of the readers were not reluctant to point it



Bill Hoisington, W2BAV/1, described in February, 1948, his experiments with directional 75-meter antennas. The caption accompanying this picture read: "To make a movable parasitic element, one of the (70-foot) 'whip' antennas was mounted on a buggy and wheeled into place. The buggy was obtained locally."



The one-band phasing exciter described by Bill Rust, W2UNJ, started many an early sideband experimenter on his way. Receiving tubes were used throughout.

out. The splash was brought about by the appearance on 14 Mc. in October, 1947, of W6YX (Stanford University) with a 400-watt single-sideband signal. Art Nichols, WØTQK, was so enthralled by the possibilities that he literally threw together a sideband rig in one week, starting from scratch (and a filter borrowed from the telephone company). The QSOs between the two stations were copied by *QST* staff members and prompted the articles in the January issue.

In late 1933 *R9* magazine had carried a series of three articles by Robert Moore, W6DEI, describing his filter-type single-sideband transmitter, and a few amateurs made transmitters and contacts. However, s.s.b. was unknown to the great majority of amateurs. In the 30s receivers were not stable enough to hold s.s.b. signals directly, there wasn't as much 'phone interest, or as much QRM. The phasing method

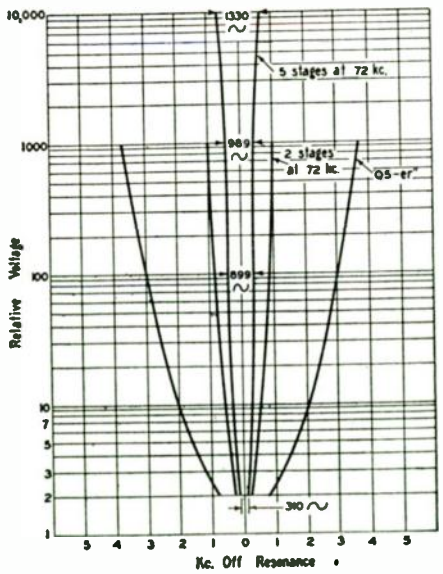


Fig. 1 — Curves of the selectivity of the W9AEH receiver when using 2 and 5 stages of 72-kc. i.f. amplification, compared with a typical Q5-er selectivity characteristic.

of s.s.b. generation was known in theory, but no one knew how to obtain the essential 90-degree audio phase shift. In the December, 1946, *Electronics*, R. B. Dome disclosed a method for obtaining the long sought-for audio phase shift, and this triggered the Stanford work, headed by O. G. Villard Jr., W6QYT.

K. B. Warner's editorial in the January issue started out: "Several articles in this issue of our magazine point the way toward the most significant development that has ever occurred in amateur radiotelephony: carrierless single-sideband emission. After years of fearing that our receivers weren't stable enough to permit the use of s.s.s.c. — as we're calling it — the adventitious appearance on the air of an experimental station with this method of emission has shown that it isn't so difficult after all and that its merits are waiting for all of us. And so immense are these advantages that we are convinced that a speedy revolution in our equipment and our operating practices is imminent and certain." Not all of the amateurs of the day agreed with this analysis, however, as some of them may recall.

But for those who did agree, or were just curious about something relatively new, 1948 was an exciting year. Don Norgaard, W2KUJ, was another "father" of the phasing method of generating and receiving s.s.b. signals, and his series of *QST* articles and his "SSB Jr" (which appeared in *G.E. Ham News*) did much for those interested in the new technique. In an effort to encourage others, an s.s.b. column was started in *QST* (July), devoted to recording the birth and gear of new stations and the listing of such records as might be set. Before the year was out, about 20 or 25 amateurs had built filter or phasing rigs and were active on 75, 20 and 10 meters. During the next two years the number increased to about 150, and a close comraderie had developed among these "pioneers," through their common new interest. A practically universal observation was, "Getting on the air with s.s.b. was my biggest thrill since my first QSO . . . years ago." These were not all engineers or physicists; many were typical amateurs inspired by what they read and heard. It was amateur radio at its best.

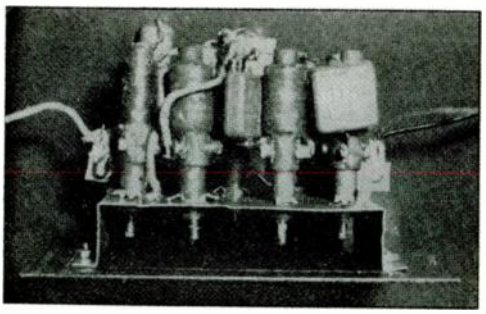
A.m. (or "ancient modulation" as the sidebanders called it, in defense of their own "Donald Duck" transmissions) got a big boost when the mobile regulations were revised in the middle of 1948 to include operation on all amateur bands. This brought renewed interest in loaded antennas (for 3.9-Mc. operation), and the surplus PE-103 generator. Low-powered mobile installations used vibrator power supplies. Controlled-carrier a.m. made another try in April, 1950, by changing its name to "constant modulation" and met with the same general lack of acceptance that it always had.

Although during this period Yagi antenna dimensions were investigated by a number of amateurs (all in search of the correct magical combination), and more and more the constructional direction was toward the all-metal "plumb-

er's delight," the big subject of conversation was the "Cubical Quad" antenna (*QST*, November, 1948). Designed at HCJB in Ecuador to solve a corona problem at the high altitude, it was simple to construct and did show gain somewhat out of proportion for its size.

On the receiver front, panoramic reception had been described in March, 1946, but despite its obvious value and some commercial push it never received the acceptance it merited. Many of the early sidebanders used it to spot a new s.s.b. signal showing up in the band More interest was displayed in receiver "skirt" selectivity, and the August, 1948, description by T. A. Githens, W9AEH, of his "Super-Selective C.W. Receiver" continued the trend of the earlier Q5-er. During 1950 i.f. amplifiers with variable selectivity (to accommodate 'phone or c.w. signals) were described, as well as the two-crystal filter, which had been known and used in England for a number of years. Commercial receivers still offered single-crystal filters and sometimes an audio-frequency rejection-notch filter.

For the man who "talked with his hands," differential keying was offered in March, 1948, as one answer to the c.w.-break-in-with-no-chirps problem. Another solution to the same problem was the "silent VFO" (continuously-running oscillator) described by Dick Smith, W1FTX, in February, 1950. The Clapp oscillator (series-tuned Colpitts) circuit came in for attention during 1948 and was soon accepted as a better way to obtain stability. And in September, 1948, John Paddon of the *QST* staff described the first of many versions of the "Monitone," a c.w.



Dave Mann, W3MBY, designed a sideband filter for a 10-kc. suppressed carrier signal, using TV linearity coils. This is the filter. Two heterodyning operations put the signal in the 3.9-Mc. band.

adjunct that was intended to promote better sending without punctured ear drums. Band-switching exciters with built-in VFOs were beginning to show up among the constructional articles. Previous exciters were based on crystal control, and the VFO was nearly always a separate unit.

At the end of 1950 the most important technical fact was TVI. Although more and more was being learned about its prevention and cure, the one most encouraging factor was the FCC's policy of not taking the easy way out and siding with the viewer in all TVI cases. Instead, an amateur who went to work and cleaned up his rig knew he wouldn't be put off the air by the FCC. What his neighbors might do to him, however, was a different story! They were not easy times for many amateurs.

S.S.B. and TVI

DURING the next five years of 1946 through 1950 most of the advertisers in *QST* were firms that came back strong after World War II, although several new companies appeared. Two new subjects, distantly related to each other, began to attain prominence — one good, one bad, and both extremely important. They were single-sideband suppressed-carrier transmission and interference by amateurs to television reception. Now we can look back with pride and say that the good guy — we now familiarly call him s.s.b. — has triumphed and the bad guy, TVI, has been beaten, but for quite a while the a.m. enemies of s.s.b. fought grimly while cries for help arose from hams creating TVI.

The Bell Telephone Labs/W.E. ad in August of 1948, although describing commercial equipment, was strong support for s.s.b. In November both G.E. and Millen advertised Single Sideband Selectors for amateur use.

On the other hand, the first ad to call attention to the dangers of TVI and to offer a partial solution was National's in the July 1948 issue of *QST*.

Single sideband equipment was slow in coming on the market. During 1949 the only ads were National's in June on a filter "for maximum sideband attenuation," Canoga's in September and Millen's in December, each on a phase shift network. In April 1950 National gave pointers on tuning in S.S.S.C., as s.s.b. was called. In June Collins said that the 75A-1 was the "SSSC Receiver of the Year".

In 1949 the TVI situation was rapidly becoming critical. National and Radio Transceiver Labs discussed cures in April. National offered an i.f. kit for TV receivers in June. Collins offered the 35-1 low pass filter in August, Drake both low pass and high pass filters in September. In December Collins gave tips on eliminating TVI and Harrison offered a TVI Chaser Package. Eldico TVI filters were announced in Harvey's January 1950 ad. Mallory told how to build wave traps for TV receivers in March, Collins mentioned a shielded cabinet for the 32V-2 in May, Barker & Williamson brought out a low pass filter in the same month. Eimac's campaign on the use of tetrodes to cut down TVI ran for the last half of 1950.

Advertising on TV receivers started a little ahead of advertisers' advice on how to combat TVI. In June 1948 Hallicrafters announced the

T-54; Newark and Harvey showed Tech Master in the fall; the Hallicrafters projection model receiver was in the October Newark ad: advertisements on Television Assembly and Philmore appeared. The first National TV receiver was introduced in October.

The next year, 1949, saw additional TV receiver ads by Hallicrafters and National with Hallicrafters' dual focus, a plan of switching between a circular and rectangular picture, explained in April. TV antennas and feed-lines were advertised by CML, Federal Tel and Radio, Arrow, Newark. National brought out a 16" TV receiver in April 1950.

Let's leave these subjects now and take a look at other advertising pages in *QST*:

Several new receivers were introduced during the five years. In January of 1946 National announced the HRO-5TA. February saw Hammarlund's Super Pro 400 and the Hallicrafters S-40. The RME-84 was first advertised in March, the Cardwell 54 in July, the Pierson KP-81 in August. The first Waterproof Electric (now Gonset) ad came out in September. Collins showed the 75-A in October. The SX-42 which had been introduced by Hallicrafters in October had forty pages devoted to it in the December issue! New models in 1947 included the SP-44 Panoramic and SX-43 by Hallicrafters and the NC-173, HRO-7, NC-57 and NC-183 by National. The years of 1948, 1949 and 1950 saw the introduction of National's NC-33, NC-108, HFS, HRO-50, NC-125 and of the Hallicrafters S-53, S-77. The Collins 51J-1 came out in November of 1949 and the 75A-2 in July 1950.

The Collins 30K and 32V-1 transmitters were advertised in 1946 with the 30K-1 following the next year, the 32V-2 in 1950. In 1946 the 310A appeared; other models in the 310 series came out in 1947 and 1949. The KW-1 was introduced in October of 1950.

Hammarlund's Four 20 and Four 11 appeared in May 1947; the Hallicrafters HT-17 and HT-18 in July.

In October of 1949 E.F. Johnson announced the Viking I transmitter kit. As we have seen, the kit idea was not new, but the Viking I with its punched chassis and good wiring instructions was immediately popular. It may be said to have paved the way for a succession of good amateur kits, still coming to us from several companies.

Hunter's first ad was in October of 1948, the same month that saw the HT-19 from Hallicrafters. B&W started advertising complete transmitters in 1949 and Millen announced an r.f. amplifier, a transmitter and a v.f.o. in that year.

Globe, a name well known but presently inactive, first appeared in June of the same year. Meck and Supreme, 1946; Kaar, Electro Mechanical, Decimeter, 1947; El Tronics and Telvar, 1948: all of these are no longer with us.

Vacuum tube manufacturers were busy with new designs, both transmitting and receiving. Amperex, Eimac, H&K, Hytron, Lewis, RCA, G.E./Kenrad, Raytheon, Sylvania, Taylor, United, were steady advertisers.

Two keys, new in 1948, were especially interesting. The Mon-Key, in January, was the first electronic keyer to be advertised in *QST*. Six months later, in June, the Melehan Valiant appeared. It made both dots and dashes mechanically.

Other new developments were National's Select-O-Ject in December 1949, Centralab's printed circuits for hams in August of 1950, Eldico's electronic key in September 1950. RCA announced the new Ham Tips in June of that year.

Evidence of increased mobile operation was shown by Harrison's offer in June 1949 of a mobile trophy and in 1950 by the ads of Mallory, Master Mobile, Premax, Ward, National, Subraco.

Wire recorders were sold for use in amateur stations, with both Webster and Air King featuring that kind. However, Amplifier Corp. advertised a tape recorder in September 1948 and Knight offered both types in the Allied ad for June 1949.

Schools and code teachers remained active with American Radio Institute, Cleveland Institute, CREI, Commercial, Mass Radio, Milwaukee School, Port Arthur, YMCA Trade & Tech; Candler, Gardiner, Instructograph, Teleplex.

The Gatti-Hallicrafters expedition, a forerunner of DXpeditions of today, was announced in May 1947. National talked about Kon Tiki in September.

1946–1950

Can you match the calls with the faces?

WØCXX W9LIP WØGFQ W2RID W9DAX W2AVA WØARA

Contests were sponsored by Sun and Sylvania in 1946 and by Telex in 1947.

Antenna, rotator and tower advertising, commonplace today, was coming to the fore with manufacturers like Amphenol, Andrew, Brach, Electronic Indicator, Hy Lite, Johnson, Kytoon, UHF Resonator, Workshop Associates: Alliance, Gordon, Munger; Sky Lane, Trylon, Vesto, Western Coil, Wind Turbine.

Manufacturers, some of them new, advertising during 1946-1950 included: Astatic, E-V, Shure, Turner, Burlington, Marion, Simpson, Triplett, Mallory, with emphasis on the three Inductuners announced in 1948, 1949 and 1950, Ohmite, Bliley, Clark, Crystal Research, General Electronics, James Knights, Petersen, Scientific, Valpey, Chicago, Kenyon, Peerless, Thordarson, UTC, General Radio, Condenser Products, Sangamo, Sprague, Advance Relay, Ward Leonard, Par-Metal, Gates, Gross, Lettine, Meissner, Motorola, Silver, Wilcox, Cardwell, M.C. Jones, Clippard, Browning, Chicago Industrial, Eico, Lambda, Measurements, Precision, Waterman, Jensen, Vibroplex, Insuline, Belden, Cornish Wire.

Most of the distributors advertising in *QST* during those years are still with us, although the day of deserting ham radio for television by many radio stores was not far off.

The east was represented by such firms as Arrow, Electronic Marketers, Harrison, Harvey, Hudson, Leeds, Peerless, Terminal in the New York City area: De Mambro and Radio Shack in Boston; Hatry & Young, Sceli in Hartford; Almo, Herbach & Rademan, Radio Electric Service in Philadelphia; Sun in Washington; Wholesale in Baltimore.

The west, north and south did not furnish many companies, although Brill in Oakland, Radio Products Sales in Los Angeles, Lew Bonn in Minneapolis, Radio Parts in Norfolk and Universal in Louisville were advertising. The central United States showed activity with Allied, Concord and Newark in Chicago: Mytronic and Steinberg's in Cincinnati; Srepco in Dayton: Cameradio in Pittsburgh: Ashe in St. Louis; B-A in Kansas City; and Henry in Butler; Van Sickle in Indianapolis: Wholesale in Council Bluffs. The circulation of *QST* at the end of 1950 was 63,400. Advertising rates were the same as at the end of 1945 — the cost of one page was $325.

QST

ARRL 1949–1953 Sideband, TVI — and Regulatory Battles

THE BATTLE between phone men and those who prefer the key has been long, sporadic and — for the most part — under the surface. The years under discussion, 1949–1953, constitute one period when the fire broke loose and the flames were clearly visible.

It started after World War II when the ARRL Board proposed some increase in subbands for radiotelephone. The proposals were later set aside, to await the conclusion of the international conferences at Atlantic City. In the meantime, however, a group of ardent disciples of Morse — determined to prevent the spread of A-3 operation — formed themselves into the Society of American Radio Amateurs, with headquarters in Washington, D.C.

The Atlantic City conference over, the League's Board — after long and thorough discussion of postwar amateur radio by a special planning committee — asked in 1948 that FCC change the rules to require new Class A applicants to pass a test in the code at 16 w.p.m. and to prohibit new Class B and Class C operators from using phone on bands below 30 Mc. during the first year of their licenses. The Board also asked the Commission to widen the 75-meter phone band by 50 kc., so it would then read 3800–4000 kc. and to continue the 40-meter band as c.w. only.

The proposals were duly made to FCC. Shortly thereafter the formation of the National Amateur Radio Council was announced, made up of amateurs who felt that the 1948 Board actions were not the will of the membership generally and were grossly unfair to phone operators.

Within a few months, NARC had made its own filing with FCC, asking for expansion of 20 phone to 14,200-14,400 kc.; expansion of 75 phone to 3,750–4,000 kc.; denial of the League's request for a 16 w.p.m. Class A code test and denial of the League's request for a restriction on Class B and Class C licenses during the first year of such licenses.

The SARA petitioned FCC for rulemaking, too, requesting that the 75-meter band be held at 3850–4000 kc. and that no expansion of phone be made in 20 or 10 meters. It asked that s.s.b. be permitted to share all phone bands, and that segments be set aside for sideband-only at 3850–3875, 14,285–14,300 and 28,500–28,525 kc. The SARA endorsed the League's idea for a Class A code test, but thought it should be at 20 w.p.m. and should also be required for Class A renewals. The Society also thought that all licensees should be required to spend a year on c.w., and that two years' experience should be required before permitting a Class B/C amateur to attempt the Class A exam. It also proposed a new temporary license (six months to a year) with relaxed code and written requirements, nonrenewable, code-only on 3.7–3.8, 7.2–7.3 and 145–148 Mc., crystal control required.

Thus we see that ardent exponents of both voice and code were simultaneously dissatisfied with the League's "mainstream" actions, and set up their own specialized organizations, each moving diametrically opposed to the other.

In the meantime, an FCC reorganization had placed amateur affairs for the first time in a virtually-autonomous branch of the Safety and Special Service Bureau. Unhampered by pressures from other duties, therefore, Amateur Branch personnel devoted a great deal of time to their own study and evaluation of amateur radio and what they saw as its problems. The result was that, when the Commission did announce a Notice of Proposed Rulemaking, it hit amateur radio like a bombshell. Borrowing from all three proposals, the FCC suggested:

A new Basis and Purpose section, implying if not stating a degree of FCC control over the future course of amateur radio.

Creation of three new classes — Amateur Extra, Technician, and Novice — and renaming Classes A, B and C as Advanced, General and Conditional respectively.

Providing for the elimination, after a certain date in the future, of Class A (Advanced Class) licenses, either by voluntary testing and promotion thereby to Extra Class or by renewing these licenses as Class B (General Class).

A new section of 75 phone, 3800–3850 kc, on which bandwidth would be limited to 3 kc.; a bandwidth limit of 6 kc. for the remainder of 75 and all of the 20-meter phone band, both bands limited to holders of Advanced and the new Amateur Extra Class license.

An RTTY band on 10 meters, a 10-kc. bandwidth for phone in most of the band, and 6 kc. bandwidth at the high end.

A new renewal procedure specifying 50 hours of operation within the license term or ten hours in the final six months and an affirmation of ability to copy code at 20, 13 or five w.p.m. depending upon class of license.

A new rule requiring a net control station in any communication involving more than two stations at a time.

Amateurs were greatly alarmed at various parts of the Docket, depending in part on their own individual interests. The League reacted most strongly to the general principle implied by the docket that henceforth new trends, new courses, new goals in amateur radio would come from the Commission staff rather than from spontaneous generation in the field, with later competition against other ideas and selection by the freely-elected representatives of amateurs. In addition, some of the concrete proposals, such as washing out the Class A in favor of the Extra, imposing a compulsory bandwidth and requiring that all round tables be formalized — were thought to be contrary to amateur history and needs, and were thus unacceptable to ARRL. Subsequently, the League withdrew its proposals of 1948 and filed its opposition to Docket 9295 on the grounds that the philosophy behind the changes was all wrong — even though, in some cases, the concrete proposals were close to those the Board had made a year earlier.

The SARA accepted most of Docket 9295, opposing only expansion of phone bands. The NARC supported most of Docket 9295, though opposing the Extra Class license-upgrading proposals.

A preliminary meeting with FCC personnel in July set the stage for an informal engineering conference held on October 10, 1949. A special meeting of the Board held the 8th in Washington authorized a shift in ARRL position: if the philosophy were to be written out of the rules, ARRL could accept most of the "nuts and bolts" of the change. Its officers even came up with a Basis and Purpose section close to that proposed by FCC, but with phraseology less offensive to those who felt the amateur should steer his own ship. The conference was marked by great harmony of purpose, and a common set of objectives was adopted by ARRL, SARA and NARC with FCC officials at the October 10 meeting. The "Great Compromise" was widely acclaimed by all amateurs.

In November the Commission released its "Further Notice of Proposes Rulemaking" in Docket 9295 embodying many of the compromise decisions. Thus it was now proposed to keep 40 and 20 as they were, to provide 50 kc. additional phone in 80, to allow n.f.m. permanently in the 20 and 80 meter bands and to provide for RTTY on 10. The new classes were to be adopted, and the name changes were considered acceptable. The Advanced Class was proposed to be continued for present licensees; it would not be available to new applicants after December 31, 1951. The renewal proposal was carried forward, but in scaled-down form; the November version called for two hours operating time in the last three months or five hours in the last year of the license term.

The League's suggested language for a Basis and Purpose section was adopted — except that a few more words had been added. The result was that this section still expressed a philosophy of government direction and control unacceptable to the Board. Thus, ARRL continued to fight Docket 9295, insisting on an Oral Argument on principle. The other two groups accepted the revised proposals, and even filed statements applauding the work, and chiding the League for its failure to accept a document they said was very little different in substance from that which had been approved at the October 10 meeting. SARA moved for immediate adoption of the November document, while NARC wanted a formal hearing and a poll by FCC, which presumably would have showed the amateurs in favor of the FCC plan except for its Extra Class proposal, on which results were not predicted though NARC agreed to abide by these results. FCC turned down both the request for hearing and the request for a poll, but accepted the request for oral argument, which was held, after delays, on June 2, 1950. The ARRL oral arguments (on the philosophy only, since the "nuts and bolts" were acceptable) convinced only two of the Commissioners: on January 31, 1951, the majority of the Commission adopted the revised Docket 9295 substantially as issued in November, 1949.

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While Docket 9295 occupied center stage, other changes in domestic rules went on. In April 1949, the Canadian DOT and the FCC jointly authorized operation in the 160-meter band for the first time since the war. The rules differed only in detail from the rules presently in force, under which the Loran system has priority and is protected from interference by amateurs. The Canadians also authorized narrow-band f.m. on all phone frequencies about the same time. U.S. action in this respect did not come until 1952. The Citizens' Radio Service was created effective June 1, 1949, with frequencies in the band 460–470 Mc.

A "ban list" of countries objecting to international communications by their amateurs was released by FCC in November 1950 containing eight names — Indonesia, Japan, Indochina, Iran, Lebanon, Netherlands Antilles, Thailand and Austria; FCC backed up the list by issuing advisory notices to amateurs heard in violation.

Looking at the call letter license plates issued in Florida in 1950 are C. Ralph Dawson (left), and Senator Lloyd F. Boyle, W4IMJ, sponsor of the legislation.

The Korean War posed some slight threats to the U.S. amateur service, but government-amateur liaison in Washington proved to be good enough to solve all the problems without forcing amateurs off the air or subjecting them to restrictions. At League request, G.I.s were permitted to renew their licenses without fulfilling the "proof of use" requirements. In 1951, the press reported that amateur operations had interferred with tank communications in Korea. It turned out that the Army was using some ten-meter frequencies: when the band opened up, State-side hams could be heard. Prompt action by the League counteracted the potentially-bad public reaction; the Army, of course, adjusted its Korean operating frequencies to prevent recurrance and publicly supported the amateurs.

Much discussion went on about new rules to protect aviation from high radio towers. The original proposals were too broad to be applied to amateurs, and the proposed form, too complicated. After considerable effort by ARRL, the

Ross Bateman, W4AO (left) and Bill Smith, W3GKP, shown working on *Project Moonbeam.*

rules as concerned amateurs were simplified, and the Form 401-A streamlined. The biggest gain was a provision that an antenna which was added to an existing structure and did not increase its height by more than twenty feet was exempt from regulation, regardless of its location.

One of the outstanding examples of amateur self-policing occurred during August and September 1951, wherein amateurs East of the Mississippi voluntarily abstained from nighttime operation in the frequencies 3700–3900 kc. to provide extra frequencies to the Army for war games in the Southeast states. The amateur cooperation wasn't haphazard, however: there were three advance warnings in *QST*; special bulletins were mailed to dealers, to ARRL appointees, to net control stations and to official observers East of the Mississippi. In addition, eastern official bulletin stations transmitted a sunset warning message and headquarters amateurs maintained a listening watch.

FCC in December, 1951, proposed that persons holding or able to qualify for a General license be granted the Extra Class license without further examination if they could show that they had been licensed prior to April 12, 1917. Only two weeks was allowed for comment, and shortly thereafter, in January 1952, the "grandfather clause" became effective.

Several additional rules changes came up in early 1952. The segment 14.35–14.4 Mc. was withdrawn from amateur use in accordance with the Atlantic City allocation, and the 15-meter band became available for the first time. F-1 was proposed for the c.w. portions of 80, 40 and 20, and later 15 was added. Phone privileges were added on frequencies 7.2–7.3 Mc. Novices secured frequencies 7175–7200 kc. Again the League asked that Class A be continued (as Advanced Class) both for present and new holders. The Commission again refused, but instead, offered to do away with restricted phone bands altogether! Though amateur comments in the docket ran more than 8 to 1 against the FCC idea, the proposal was adopted effective in February 1953 — and was destined to have repurcussions ten years later in the current incentive-licensing discussions.

In the summer of 1952, FCC proposed calling and emergency channels within the amateur bands, to be unavailable for other purposes. The League opposed the proposal in strong terms, pointing out that the Commission had not had to use its policing powers in 25 major and 133 minor emergencies reported in *QST* in the previous eight years. The ARRL filing also contained an alternate proposal to modernize the Commission's emergency powers where needed; this proposal was accepted by the FCC and is the essence of our Section 97.107 today. Canadian amateurs secured their 15-meter phone subband, 21.2-21.45 Mc. in July 1952, and their 40-meter phone band, 7.2-7.3 Mc. in January, 1953. The 15-meter phone band, 15-meter Novice band and RTTY privileges all became effective for U. S. amateurs early in 1953. The 11-meter Novice band was withdrawn at that time. Discussions were started looking toward Conelrad observance by amateurs. FCC also proposed that the 125-mile "license by mail" circle be reduced to 50 miles, that Novice and Technician exams be given only by mail, and that maritime mobile operation on the high seas be permitted within the 15-meter band. All were eventually adopted except that the circle was reduced only to 75 miles.

League Affairs

After a very thorough study of every conceivable angle, the Board of Directors in 1949 decided to buy the property at 38 LaSalle Road, West Hartford; the League had leased the building as its headquarters since 1931.

A. L. Budlong was elected as Secretary and General Manager in 1949, replacing the late K. B. Warner. The elections for president and vice president in 1950, however, were spirited: After three ballots, W. M. "Soupy" Groves, W5NW,

Sidelights, 1949–1953

The Citizens Radio Service was established in June, 1949, with frequencies in the 460–470 Mc. band. . . . The U. S. House of Representatives passed the Coudert resolution commending amateurs for their emergency services. . . . The ARRL Board created the position of Assistant Communications Manager, Phone: Lewis G. McCoy, WØICP, came east to fill it. . . . The Board asked for a Commemorative Stamp featuring amateur radio. . . . Florida provided call letter license plates in a bill ramrodded through the legislature by W4IMJ, a State Senator. . . . The radio program, "This is Your Life" on January 4, 1950 featured Robert Gunderson, W2HO, editor of the *Braille Technical Press*. . . . A National ARRL Convention was held at Seattle July 27–29, 1951. . . . Amateurs reported having trouble getting photocopies of licenses; ARRL secured an amendment to the FCC rules making it clear that photocopying is permissable. . . . FCC shifted the grading of license tests back to its field offices. . . . Early in 1951 ARRL produced a booklet, "Getting Publicity for Your Club and Amateur Radio". . . . The Disaster Radio Service was created, effective March 21, 1951. The DRS, which operates on 1750–1800 kc., is a meeting-ground for emergency operations by licensees of varied radio services, including amateur. . . . U. S. publishers were barred in 1951 from sending technical literature to "Iron Curtain" countries; this included all League publications. . . . The ARRL Board authorized the start of a *QST* column for YLs, on a regular basis with a paid contributing editor. . . . A pamphlet to interest the general public in amateur radio, "You Can Be There", was published by the League. . . . F. E. Handy, W1BDI, was elected a vice president under the 1951 Articles of Association which permitted up to three VPs. . . . FCC adopted automatic extension of license terms where timely application for renewal has been filed. This removed a hardship on amateurs in those periods when the Commission had a backlog of applications. . . . Radio parts were scarce at times during the Korean action; amateurs were granted a priority rating by the National Production Authority. . . . Captain Kurt Carlsen, W2ZXM, brought fame to the amateur service when he stayed aboard the sinking *Flying Enterprise* and used his ham radio equipment when the ship's gear failed. . . . FCC Form 405-A was to be used for 'straight' renewals of amateur licenses after April 15, 1952. . . . Cooperation between FCC staff and the League resulted in provision for "Special Temporary Authority" for qualified amateurs to do propagation studies, atmospheric soundings and the like not ordinarily provided for in the rules. . . . The Board in 1953 created The ARRL Merit Award to be presented annually to an amateur for technical achievement. . . . Another National Convention was held in Houston July 10–12, 1953. . . . Three 1953 candidates for League office, declared ineligible for lack of membership continuity, tested the 1951 Articles in court; the court upheld the League and its Executive Committee on each count in a decision announced early in 1954. . . . W1AW damaged by fire, but no schedules had to be cancelled; damage was confined by fire-stop construction and other safety features to a small area under the tape perforator.

defeated J. L. McCargar, W6EY to become vice president. The fight for the presidency was even tougher: after an 8 to 8 tie for 13 ballots, G. L. Dosland WØTSN withdrew and George W. Bailey, W2KH, was then reelected. Two years later, Mr. Dosland won the rematch and became president.

A committee appointed in 1950 to revise the League Constitution brought in the text of the present Articles of Association which were then adopted by the 1951 Board. The next year, a new set of By-Laws in consonance with the new Articles was adopted by the Board.

Throughout this period, the General Counsel was active in local legal matters. Two historic cases were won by the amateurs and the League, *Wright v. Vogt* in the Supreme Court of New Jersey and the *Appeal of Lord* in the Supreme Court of Pennsylvania, both affirming amateurs' right to an antenna structure in connection with an amateur station as a use customarily incidental to residential use of property.

After three years of League effort on both sides of the border, a treaty between the U.S. and Canada was signed and ratified by the respective governments permitting the amateurs of one country to operate their amateur stations while visiting in the other country. The treaty also dealt with other radio services, such as taxicabs, and went into effect in the summer of 1952.

On the international front, the Fourth Inter American Regional Conference and Region II Radio Conference (within the framework of the International Telecommunications Union) were held simultaneously in Washington, D. C. As is customary, the League had been involved in all preparations for the conference, and had representatives on the American delegation. The big struggle of the conferences was the desire of the U. S. and Canada to have 3.5-4.0 Mcs. exclusively amateur in this hemisphere, as against the wishes of other countries, with small amateur populations, to use the band for fixed and mobile services as well (as is permitted internationally under every Convention since the first at Washington in 1927). The matter was settled in theory by an allocation table assigning the band to amateurs, but permitting fixed and mobile services on a noninterference basis. In practice, nothing was settled at all, for six countries took reservations, and one — Argentina — in so doing declared that the allocation violated the Atlantic City agreement and therefore was unacceptable.

In 1951, at an Extraordinary Administrative Radio Conference, the 80-meter matter which had been glossed over at Washington erupted again; the U. S. delegation asked for Secretary Budlong to come to Geneva. Lots of time was spent behind the scenes, and finally a resolution was adopted which said that each country would make its own assignment in the band, and would accept unavoidable interference from other countries.

The period of 1949–1953 can be summarized as one with a minimum of threats to the amateur service from without, and a good deal of turbulence within. All the same, it saw our amateur regulations modernized in many respects, saw the reduction of TVI as a major threat to amateurs, saw the establishment of legal barriers to the indiscriminate action of municipalities against hams, and saw the nation involved in a military emergency of considerable magnitude, without having to discontinue amateur operation.

Operating in the Fifties

THERE were many good v.h.f. openings in '50. However, a definite deterioration was setting in in the 10-meter range and conditions on other bands were becoming increasingly spotty. The National Traffic System was constantly becoming more useful in handling our relay traffic. Mobile work was coming to the fore. The WAS and DXCC awards were highly popular for those times, though there were not as many amateurs and issuances were at about half the present rates. RTTY and s.s.b. continued on the increase.

As a new service W1AW added low-speed code practice ranges, extending such operations to all seven days of the week. Code Proficiency Certifications were now issued starting for the first time at speeds as low as 10 w.p.m. The traffic interest of amateurs had moved steadily forward in the period '46 to '49. It now halted on a plateau in '51 to '52; then it moved on up to new heights in the next three and four years.

The League's Code Proficiency Program now embraced the Novice requirements and in '52 it commanded an increasing interest while continuing to cover the higher achievement speeds. The year saw CP Certifications hit a level 70% above previous annual records. The 21-Mc. band, opened in May, commanded high attention from operators; it was a "hot" DX band and widely acclaimed. The Field Day hit a new high.

As a result of League efforts we now had registered with ARRL Emergency Coordinators some 32,000 AREC members. A survey to look at the potential for communications indicated that 43% of these were able to operate mobile. Unfortunately the government was slow in getting the RACES rules out, following their '51 adoption. As a consequence interest waned somewhat. When finally published the first FCC-RACES authorizations were to W3PWB, W3NL and W3ECP.

A seventh Governors'-President Relay was an outstanding success. Forty-eight states reported,

W1KOO, the Control Center Station in Chittenden and Grand Isle Counties, Vt., during the SET of 1958.

Mae Burke, W3CUL, shown here in 1950, made BPL every month of that year.

forty-seven were heard from by radio and forty-six of the Governor's sent messages. Also in '53 the Official Observer activity hit a pace of 2000 advisory notices sent for the first time. RCC kept its top position of popularity among the various awards. The number of RTTY users had constantly increased. For the first time W6AEE's *RTTY* carried an announcement of a radioteletype Sweepstakes. The general pattern was similar to ARRL's November Sweepstakes and this activity got off to a fine start.

W3GKP and W4AO in January 1953 bounced their two-meter signals off the moon. This success followed a long series of trials and was an exacting proposition using 20-wavelength rhombics.

Under the chairmanship of W2JZX a cross-country net set up was organized for a special purpose. With many cooperating operators and the help of the Los Angeles YLRL, the communications for participants in the Seventh Annual All-Women's Transcontinental Air Race was a success! In this era ARRL Section and state-wide QSO parties were increasingly popular. Several different ARRL Sections (Conn., N.H., Ohio, Ontario, Va., Vt., and W. Va.) had such radio get togethers with fine fraternal success and the Rocky Mountain Division made its activity a division-wide party.

The Novice Roundup, a new activity that had been started in '52, continued a helpful and popular activity. It helped unite old timers and newcomers and was a step in contributing to the skill of the latter. In 1953 more DX tests were held by the 160-meter gang; another 10-meter WAS Contest was scheduled and turned out a fair success but conditions were erratic. The leading station, W7PUM, however, worked some forty-two states. VS5ELA Planned an "expedition to Brunei". This had a "new DX" appeal; he made some 232 contacts, over half with W-stations. Easter Island was put on the air in August 1953 when CE3AG setup as CEØAA. In about seventy hours on-the-air he made 1538 QSOs with fifty-three countries! Still another

highlight in DXpeditioning is fully recounted in the *QST* story of FO8AJ, detailing the WØNWX operation from Clipperton Island.

Relaying came into its own again. This time it was a culmination of many earlier partial routings looking to the success of a *coast-to-coast v.h.f. relay*. An all two-meter circuit was proved adequate for the job. Operators dedicated to keeping hourly schedules around the clock, mimeographed listings of potential routes and high enthusiasm made this Memorial Day week-end of '53 go down in history for a new first in relaying.

The League's Board in '54 directed provisions for a Traffic Medallion to recognize continuing interest and consistent BPL size totals in public service message handling efforts. This recognition is available to any W/VE amateur after his third BPL-size total, reported to his SCM.

Civil defense organizing steadily gained ground in this period. Hundreds of RACES plans were filed. State and national civil defense tests now embraced amateur communications, both RACES and RACES with AREC helping.

Operation Alert in June '54 was made a special exercise for ARRL Emergency Coordinators. Hundreds of ECs reported the participation of thousand of amateurs and the operation of over 1700 stations (738 portable and 63 hand-carried among these) in the nation-wide test. The performance turned in by amateurs was given due credit and recognition by c.d. administrators.

By early '55 the propagation cycle was in a fast upswing. 2600 had now qualified post-war for DXCC. Field Days (June) were progressively bigger. On v.h.f. there was new excitement. The 10,000 MC. line-of-sight DX record was set and broken three different times in the year, ending up at 109 miles. RACES's plans continued to pile up. Amateurs in the civil defense regions were formulating recommendations for systematic use of frequencies, making necessary area provisions to minimize interference and get the most from the v.h.f. and h.f. frequencies earmarked for RACES. Applications for the leading awards, WAS and DXCC, were in a pronounced upswing. S.s.b. operation was becoming more popular. Half the ARRL clubs now indicated having some s.s.b. users. There were but 883 active affiliated clubs on the League's lists. Our

Luis Desmaras, CE3AG, was the highest South American c.w. scorer in the 19th ARRL DX Contest. He also put Easter Island on the air in August 1953, using the call CEØAA.

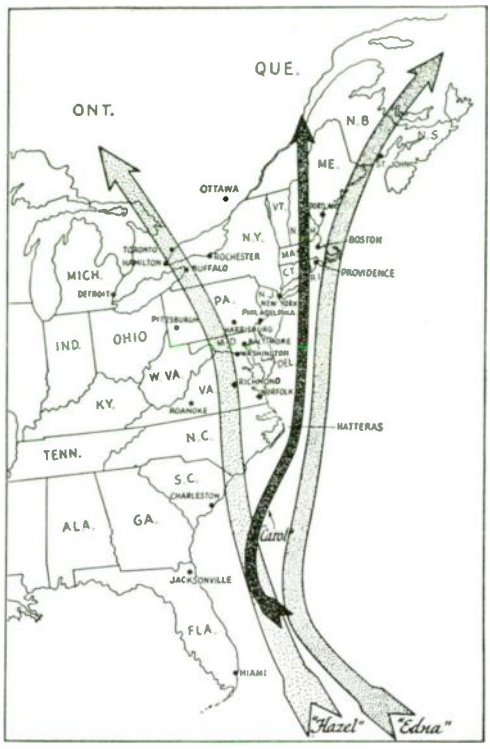
21st annual ARRL DX conpetition in '55 showed gains in participation for the *fourth straight year*. The 22nd ARRL Sweepstakes (up 5%) broke all previous participation records. The Novice Roundup (fourth one) showed a 250% increase from the first one. The v.h.f.-SS was up 22%. All in all, this operating of twenty years ago was highly attractive, even as today.

Also reminiscent of earlier two-way work with KJTY-WHEW in the Byrd Antarctic Expedition of '34 was the 1955 departure of seven Navy ships to establish several bases in the Antartic. Operation *Deepfreeze* and the operations at KC4USA and KC4USV were in preparation for the International Geophysical Year and scientific work over the next four or five years. Bud Waite, W2ZK, was leader of a Signal Corps group. In connection with the larger Antarctic program Commander Snay, K4GFR, reported thirty to forty amateurs included in this expedition's roster! Work with the KC4s was assured, and bound to be glamorous and interesting — and public service for the many men isolated from their homes in the long winter night.

Emergency Communications

THE re-emergence of civil defense on the national scene was brought about by international events, particularly the unveiling of an atomic "device" by an unfriendly Russia. U. S. government officials predicted this as early as a year or two following VJ Day, and already had started studies on c.d. subjects. ARRL was associated with these from the very start, first with the so-called Hopley c.d. planning group, then with the c.d. plan of the National Security Resources Board, and finally with the newly-created Federal Civil Defense Administration and, as always, the FCC.

An excellently-written editorial in *QST* for December, 1950, clearly delineated the problem. Its summary of background and prospects for utilization of amateurs in the future for this type of emergency communication (i.e., civil defense) is useful reading even today. "Remember," concludes this editorial, "that we now have two jobs on our hands — civil defense communications and peacetime emergency communications. The requirements are not the same, the frequencies required are not the same — and for peacetime emergency work there is no question of security or availability to argue against



A hurricane every month was the story in 1954 when these three whirlers roared up the Atlantic Coast in August, September and October.

use of any of our frequency bands. Preparation for one, therefore, is not necessarily adequate preparation for the other. From now on, we must prepare for both."

With this in mind, discussions were begun at government (FCC and FCDA) working levels looking toward a new amateur service aimed at civil defense communications. The League's General Manager, Communications Manager and National Emergency Coordinator were all involved, the two latter spending a full week taking a course in basic civil defense with emphasis on communications and another week at a c.d. communications conference. Prior to and subsequent to this, very close contact was maintained with FCDA communications officials. In the early months of 1952 the new service was unveiled, the Radio Amateur Civil Emergency Services, RACES.

The period from 1950 to 1955 might be described as "the RACES boom years." Motivated partly by nervous agitation, partly by patriotic fervor, the nation's amateurs rallied to RACES and the call to national defense which it implied. The AREC was dedicated to the origination and implementation of the RACES program at local levels. ARRL headquarters officials were invited to sit in at conferences of FCDA communications officials all over the country, and few such invitations were turned down. QST's table of contents reflected the trend in this direction as well. W2BGO, c.d. radio officer for New York State, organized the Northeastern States Civil Defense Amateur Radio Alliance, which later became the U.S.C.D.A.R.A., and the League was a participating observer. This group put out a complete RACES Operating Manual which was printed at the behest of FCDA by the Government Printing Office, and later was instrumental in fostering a master plan for frequency allocations in RACES.

Meanwhile, QST carried articles on RACES organizational and technical subjects, and the League put out bulletins to its leadership officials outlining policies and procedures and giving facts and figures. During these near-frantic years of preparation which fortunately did not prove required as soon as our national leaders had feared, it was even proposed by many that the League abandon its own AREC and rely entirely on RACES for amateur radio emergency communication, both in peace and war.

While we were all busily preparing for man-made disaster, Mother Nature continued her occasional manifestations of fury. In November of 1950 the north Atlantic coast was visited by a "land hurricane" which extended far inland. In January, an ice storm hit hard in the Ohio and Mississippi River Valleys. Again in late January and early February freezing rain, sleet and snow created communications problems in the near and mid-south. In June unprecedented floods hit the Kansas City area, resulting in an operation so extensive as to merit up-front *QST* mention.[1] In January of 1952 another Ohio River flood took place. In March a series of tornadoes leveled communications facilities in large areas of Arkansas and Tennessee. In April severe flooding hit the north midwest. In July an earthquake struck the Tehachapi, Calif., area. In late November a severe snowstorm hit large areas of Va., Tenn. and Ky., and later large areas of

[1] "Water in the Dust Bowl," Nov. '51 *QST*.

A little shaken up but still game are W2TII and W6LYF after having observed an atomic bomb explosion from 10,000 feet in Nevada during the joint AEC/FCDA "Operation Cue." An ARRL observer was also present to observe communications problems.

Kansas were snowbound. In May of '53 it was tornadoes in Texas, and in June twin tornadoes leveled areas of Flint, Mich., and Worcester, Mass.

A period of relative calm followed — that is, there were no really devastating emergencies. Then, in August, September and October of 1954, three hurricanes formed in the Caribbean and headed northward, all three missing Florida but striking inland at various points to the north. And to wind up 1955 with a bang, we had "The Great Flood of 1955," a deluge from dying Hurricane Diane which completely inundated the northeastern states causing unprecedented damage and death. Amateurs were vital in all these and other disasters during the first half of the decade.

Both the AREC and RACES participated in most of these activities, sometimes together, sometimes separate, often one without the other. Where RACES was organized, it usually superseded AREC; where it was not, AREC did very well without it. In a few places, the two organizations, separate yet overlapping, worked together ideally as they were intended to do.

We have one more historical installment. After that, events can better be labeled "recent activities" and perhaps we can take a look into the crystal ball.

Technical Progress

IN early 1950 the single biggest fact facing most of the U.S. amateurs was TVI. Literally thousands of amateurs around the country were becoming aware of this threat to their previous relative freedom if not to their very existence. Every month *QST* carried one or more articles on TVI reduction and elimination, but all of the solutions involved work, not a single magic panacea as some hoped for. Articles covering low-pass filter design, the proper use of bypass capacitors and of shielding, and the advantages of the pi-network tank circuit drew the most attention. Mack Seybold, W2RYI, discussed his long-term investigation of stray rectification and won an annual award for his thorough efforts.

Phil Rand, W1DBM, lectured on and actually demonstrated the various causes of and solutions to TVI before a number of ham gatherings during 1953. His sometime assistant, Lew McCoy of ARRL Headquarters, carried on the work with the "League TVI demonstration" before serviceman and amateur groups. The largest group was 1200 interested spectators, in Chicago. This work was done at League expense, with excellent cooperation from RCA and the FCC. During '53 and '54, over 50 cities were visited, by air and by station wagon. The demonstrations served to inspire many amateurs to tackle and lick the problem, and they also helped to show that TVI was a two-way responsibility, shared by the set owner and the amateur.

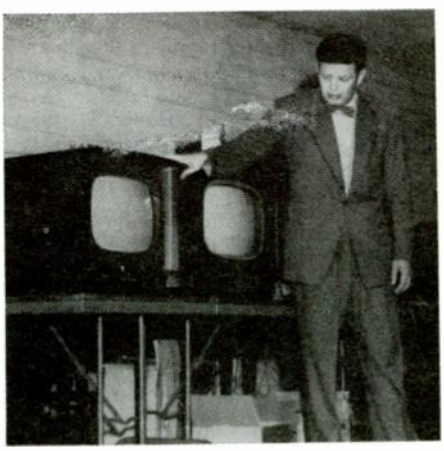
In 1954 F. E. Ladd, W2IDZ, told of his experiences in licking one of the worst TVI problems: 50-Mc. operation in a Channel-2 area. By the end of 1955 the TVI solution had been fairly well defined by the triumvirate of Grammer, Rand and Seybold, with assists from countless others.

Receivers

In 1950 commercial "communications" receivers were following the old line of a single crystal filter at 455 kc., although r.f. image rejection was being improved through the use of double conversion. A few amateurs, sensing the need for better adjacent-channel selectivity, had described high-selectivity receivers in the late '40s, and a symposium of a number of homemade receivers in the January, 1951, *QST* showed the definite trend.

The ultimate in skirt selectivity was described by John Kaye in "One Db. per Cycle!" in November, 1951. This super-selective receiver used a third i.f. at 20 kc., following i.f. amplifiers at 6.0 and 0.455 Mc. The 20-kc. amplifier used 12 tuned circuits: the bandwidth at −6 db. was 235 cycles, increasing to 395 cycles at −90 db.! A multigrid conversion detector was used (after a 1948 Villard article) without the benefit of the "product detector" designation that was to dignify the same detector in the late '50s and give it great commercial value.

Receiver manufacturers finally took notice of the desire for more selectivity, and receivers began to appear with more sophisticated selectivity than a single crystal filter. The "mechanical filter" became commercially available in 1953, although its construction had been described by Adler in *Electronics* some five years earlier. The "Collins" mechanical filter gave selectivity a boost at 455 kc., in contrast to that furnished at lower frequencies by cascaded tuned circuits.



Lew McCoy, W1ICP, helping to make the world safe for Kukla, Fran and Ollie and "Hello test!"

In April, 1953, Bob Ehrlich, W2NJR, described a rather sophisticated homemade receiver designed expressly for s.s.b. reception. It featured an 8-crystal double-lattice crystal filter

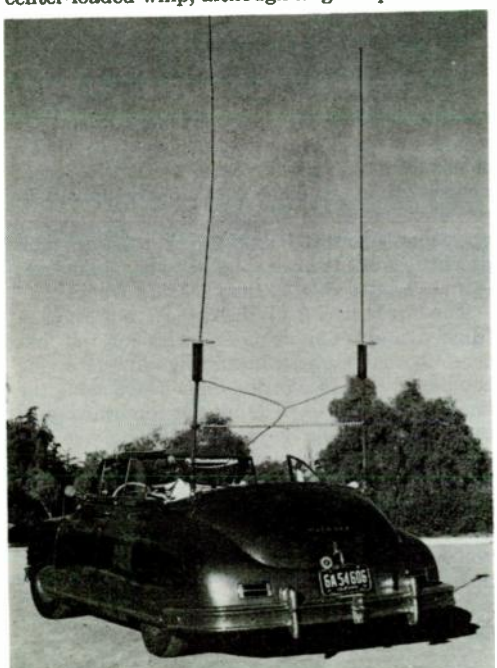
and "selectable sideband" that shifted the high-frequency oscillator and the b.f.o. simultaneously by the same number of cycles. This variation of the McLaughlin principle was a considerable simplification.

The rapidly-increasing signal density in the more popular bands made "cross modulation" a growing source of interference generated *within* the receiver, and attention was drawn to it by an article in January, 1955.

The interference levels in the amateur bands increased rapidly during the early and mid '50s, undoubtedly helped by the introduction of the Novice license in 1951 and the subsequent modification of the regulations to permit more licensed amateurs to conduct the examinations.

Mobile

Interest in mobile operation ran high during 1950 through '55, for two reasons. The revised regulations permitting mobile operation on any band were relatively new, so there was the thrill and fun of investigating a different field. The second reason was not as readily admissible, but mobile operation was one way to run away from the problem of TVI. Whatever the motive, however, a number of good portable designs were completed during the period, with power supplies using vibrators or war-surplus generators. Low-frequency antenna work concentrated on the center-loaded whip, although large loops came in for considerable investigation. The desire for multiband operation led to tapped coils and also to two-band tuned networks (Pichitino, June, 1953). The ultimate, however, was a mobile antenna described by Hargrave in May, 1955, that adjusted itself *automatically*, using a motor-driven capacitor and a phase-sensitive detector.



In a January, 1952, article entitled "75-Meter Mobile, California Style," W6ZV entertained the reader with his account of personal problems and solutions encountered with a mobile kilowatt. One of the problems was antenna corona and loading-coil disintegration, solved by using ball tips and two antennas. The caption read: "The high-power mobile antenna of W6ZV is a potent putter-outer and a real attention-getter."

Antennas and Propagation

Two minor trends in 20-meter beam antennas started in 1954 and 1955. Compact 20-meter beams (center-loaded and end-loaded) were described in 1954 and in March, 1955, the multiband "trap" beam was described by Buchanan, W3DZZ. During the same period, v.h.f. beams moved in the logical direction: more and more elements, and "flopover" arrays for observing polarization effects.

Reporting on work done at Stanford University in 1952, O.G. Villard described the "scatter-sounding" experiments that permitting telling in which directions a band was open even when no amateur signals were coming through! The following year he told of confirmed "meteor scatter" propagation on 14 and 21 Mc.

Keys and Phone

Development in c.w. techniques continued in the line of better electronic automatic keys. Bartlett, Brann and Turrin made worthwhile contributions in improving the consistency of operation and in circuit simplification. In February, 1953, John Kaye described the first of several "Ultimatic" keys, the "key with a memory." This electronic marvel was actually capable of storing in its memory a dot (or a dash), even though a dash (or a dot) was being sent at the instant of storage. Kaye worked out techniques that permitted smoother and more perfect code to be sent with this principle and a two-bladed paddle. Later models were all-electronic the first used *six* relays) and transistorized.

Power supplies received some attention when George Grammer expounded the principle of the "economy" power supply (November, 1952), pointing out that most supplies were not being used at full capacity. And during the early part of the same year "Rothman Modulation" was described. Surrounded by a slight amount of mumbo-jumbo during its first demonstration at a national convention, it was nevertheless, a simple and excellent form of controlled-carrier a.m. However, it suffered the fate of all previous controlled-carrier a.m. systems. Its feature was the use of rectified output r.f. to furnish the d.c. screen power of a screen-modulated amplifier stage; the audio power was furnished by a low-powered modulator.

V.H.F.

In the v.h.f. field, the use of overtone crystals for frequency control was gradually becoming standard. Commercial crystals ground for good overtone operation became available, eliminating the need for the special circuits of the late '40s. Interest in amateur TV (on 420 Mc.) was be-

ginning to appear. V.h.f. equipment was becoming more refined, making use of new tubes and techniques. External-anode transmitting tubes were available, and they lent themselves well to designs using coaxial tank circuits.

Although terrestrial DX records were being made only to be broken, perhaps the outstanding achievement was the 144-Mc. "moonbounce" work of Ross Bateman, W4AO, and Bill Smith, W3GKP. After *three* years of work improving antenna gain, receiver noise figure, and frequency accuracy, on January 27, 1953, they recorded a long string of pulses *reflected* by the moon. Although this was not the first time the feat had been accomplished (the Signal Corps had done it in 1946 on 110 Mc.), it was the first amateur success with amateur gear and a kilowatt power limit.

Single Sideband

On the sideband front, things progressed slowly and not necessarily smoothly. Millen brought out a commercial audio phase-shift network in early 1951 that gave a boost to the homemade phasing-type exciter. By the end of 1952 most of the sideband rigs were homemade phasing rigs, or filter units based on a 455-kc. crystal design of Edmunds, W1JEO, or one of several lower-frequency *LC* filter designs.

The first commercial sideband unit, the Central Electronics 10A, was finding acceptance. The success of the 10A can be attributed to its realistic pricing and to the leg work of Wes Schum, W9DYV. Starting out as a basement operation, Central Electronics grew to a sizeable company during the next six or eight years. But it was Schum himself, visiting radio clubs and conventions, who "sold the medicine."

In May, 1951, Ed Nowak, W1FAJ, described "Voice-Controlled Break-In — with a Loudspeaker!" and ham radio was never to be the same again (although it took a few years). In June and August, 1951, a pair of articles by Weaver and Brown described a straightforward approach to 455-kc. crystal-lattice filters, to sound the death knell of any lower frequency filters. In August, 1952, Dick Long, W3ASW, an early and loyal sideband pioneer, described the remote-tuned v.f.o., to introduce a technique that could be applied for frequency control of any kind of transmitter. Some of the mystery of linear-amplifier adjustment was cleared away by a well-illustrated article by Bob Ehrlich, W2NJR, in May, 1952. The many photographs showed what 'scope patterns should — and should not — look like. Electronic t.r. switches were being refined and improved during this period, and the Crosby "product detector" was duly noted in the May, 1952, "On the Air With Single Sideband" column.

The "Budget 7-Mc. Vertical Antenna" described in November, 1955, was a tongue-in-cheek but nevertheless practical description of a beer-can vertical. The caption to this illustration read, "Here W2JTJ is touching up a spot on his antenna he missed with the aluminum paint the first time around. A lot of thought and libation went into the construction of this vertical."

At the start of 1953 there were about 300 active sideband stations, but even in 1954 there were letters to *QST*'s editor complaining that "sideband is being shoved down our throats." It was not a valid criticism; early in 1954 *QST*'s sideband column was discontinued because it was believed that the mode had already proved itself and needed no encouragement. Few if any operators who tried s.s.b. went back to a.m. except to work their old buddies who had not yet learned how to tune in the "Donald Ducks."

The tide turned in 1954. At the Trade Show in May, a number of manufacturers for the first time showed s.s.b. transmitting and receiving equipment and accessories. Somewhere along the line a rumor was started, but not confirmed until early the following year, that Collins was *discontinuing* high-level plate-modulated a.m. equipment and concentrating on single-sideband transmission, with or without carrier. A decision like this by a leader *must* be sound, it was reasoned, and the sheep followed faithfully, although perhaps a little reluctantly.

S.S.B. Comes of Age

From 1951 through 1955 the good guy s.s.b. tucked in his sideband and got to work while the bad guy TVI was taking a bigger beating each year.

The hero's helpers included McLaughlin's Signal Splitter, 1952; Gonset's Signal Slicer, 1953; the Burnell filter and the B&W 51SB, 1954; Lakeshore's Signal Splitter and B&W's 370 Adapter, 1955. However, Central Electronics is generally credited with giving the initial push that got s.s.b. off the ground. The ad on the 10A appeared in September of 1952; it was the first on a complete piece of s.s.b. transmitting equipment.

Through 1953, 1954 and 1955, s.s.b. advertising increased substantially. For the last three

months of 1954 the Collins ads were devoted to technical talks on the subject. In February of 1955 one more talk appeared and in March the company gave s.s.b. the second big boost it needed — Collins practically abandoned a.m. with the announcement of the 32W-1 and the KWS-1.

Central Electronics brought out the 20A and the 10B in December 1953. The "Why Fight It?" ad in July 1954 was indeed prophetic. It declared that "single sideband is here to stay!" The word *single* was to attain prominence again. In the thirties it had been single signal; now it was single sideband.

Lakeshore introduced the Phasemaster Jr. and the P-500 in 1954, Elenco the 400-T3. In 1955 Petersen showed crystals for s.s.b. Hallicrafters announced the SX-96 receiver and the HT-31 linear amplifier. Linears were also brought out by Adams, Eldico, Transitron, Eldico offering the SSB-100 transmitter, too.

TVI troubles still existed, but as Drake said in February of 1952: "TVI is on the run!" Advertisements on transmitters like WRL's Globe King and Globe Champion, the Collins 32V-3 and KW-1 the Hallicrafters HT-20, Eldico's TR-1TV, Johnson's Viking II, the Sonar SRT-120, emphasized TVI suppression. B&W advertised Farady shielded links; Eimac continued to feature tetrodes; RCA listed six beam power tubes; low-pass filters were shown by Collins, Johnson, Sonar; high-pass filters by Bud and Regency; Drake and Ameco offered both types.

Amateurs of 1951-1955 could choose from a great assortment of equipment. New receivers included no fewer than three from Hammarlund, seven from National and ten from Hallicrafters. Hallicrafters' SX-88, SX-96, SX-99, SX-100, were among the ten. So was the SX-73 with its twenty-four "A Gibraltar of Stability" ads in May 1952, every one at first having the name of the famous rock spelled incorrectly, causing shame-faced last minute scurrying by *QST*'s advertising department to make the correction. In spite of several proof readings the misspelling almost got by — just like the one in this sentense.

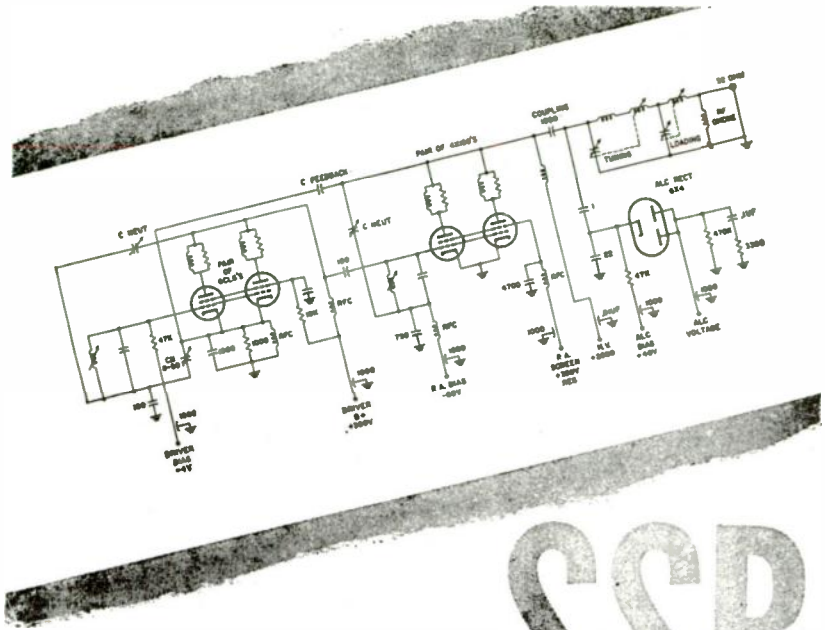
National's seven included the NC-183D, HRO-60, NC-300; Hammarlund's the HQ-140-X, the Pro-310. Collins offered the 75A-3 in 1952 and the 75A-4 in 1955. Gonset's receivers took in the Commanders, the Super Six, the G-66. Harvey-Wells introduced the R-9. Both Heath and Technical Materiel started advertising in *QST* during this period. Heath's first receiver was the AR-2 kit in 1953 and TMC's was the GPR-90 in 1955.

The selection of transmitters was as wide as the variety of receivers. In 1952 Johnson offered a new kit, the Viking II, and in 1954 kits for the Ranger and Adventurer; the Viking Kilowatt amplifier came out in 1955. The Collins 32V-3 appeared in 1951, the 32W-1 and the KWS-1 in 1955. Hallicrafters' HT-30 was announced in 1954 and was followed by the HT-31 linear in the next year. Heath's first transmitter kit ad was on the AT-1 in 1953; the DX-100 came out in 1955. WRL offered the Globe King, Champion and Scout; B&W the 5100 and 5100 B; Gonset a couple of linears; Morrow the SBR and the MB-560; Elmac the AF-67; Harvey-Wells the T-90. The Central Electroncs 600L linear appeared in 1955. V.f.o. kits included the Johnson Viking, the Knights, the Heath VF-1. The Rothman system of modulation was first advertised in 1952 and Ultra Modulation in 1955.

Advertising was growing in several categories that sometimes overlapped, particularly mobile, Civil Defense, antennas. Converters, receivers, antennas and accessories for mobile use, which often included CD, were advertised by RME, Gonset, Morrow, KW Eng, S&W, Elmac, Palco, Babcock, Johnson, Columbia Products, Webster, Vaaro, Bassett, Plasticles, James Vibrapowr. Civil Defense was stressed by Hammarlund, Harvey, Harrison, Eldico, National, Johnson, Lysco, Radio Shack, Premax, Ward, G.E., Sonar, Kaar, H&K (later Robert Dollar), Electro Comm.

New antennas were brought out by Calamar and Telrex in 1952; by Gotham, Gonset, Trio, Johnson, in 1953; Buchan, Radcliff's, Trylon, Tennalab, Antenna Eng, Halliday-Moede in 1954; Universal Products, UHF Resonator, Kreco, General Crystal, Radio Specialties, Lysco, Western Gear in 1955.

Advertising on v.h.f. equipment and on beams for both v.h.f. and the lower frequencies began the growth that was to increase right up to the present time. The Gonset Communicator was the



DISTORTION FREE SSB

at its finest *Collins* KWS-1

first 2-meter station in one package to be advertised in *QST* — July 1952. It was responsible for a surge in two-meter operation. Twenty-and fifteen-meter beams of dimensions small enough for conventional back yards enabled many amateurs to abandon the wire from house to tree. Coils for the Vest Pocket Beam were first advertised in June of 1954. In July Mosley announced the taking over of their manufacture and in September advertised the complete beam.

Four other manufacturers brought out beams of less than full size. The trade names were Bantam, Pygmy, Shortbeam, Mini-Beam. Do you remember which companies they were?

Multiband beams were shown by Halliday-Moede in 1954; by Radio Specialties, Mosley, Telrex in 1955. Tele Vue, Aermotor, Alpar started their tower advertising in 1953; Kuehne, E-Z Way, Communication Products in 1955.

Jobs in electronics seemed plentiful during the five years. More than thirty-five companies ran Personnel Wanted ads, the firms' names varying from those obviously electronic like Bell Telephone Labs and Raytheon to those sounding as if they were outside the profession like United Geophysical and American Arabian Oil Co.

Testimonial ads using ham calls were especially popular. Eimac, Collins, Sylvania, Ward, Wincharger, WRL, National, Hammarlund, Hallicrafters, Winpower, Mosley, Adams, used them — in fact, fifty-one calls were published. The fourth call area led with ten: next was the second with nine; W/K8 and W/KØ followed with six each, while the others furnished the remainder with five scattered among VE, KP4, etc., and with W/K3 having none.

Old friends developed new equipment. B&W brought out a frequency multiplier, a balun, the Matchmaster, coax switches. Johnson advertised the Match Box, the Bi Net; Harvey-Wells the Z Match; International Crystal the FO-1 printed circuit oscillator: Heath the AC-1 antenna coupler: Dow Key a selection of relays. New advertisers numbered more than sixty. Those still with us include Mosley, Heath, 1951; Adirondack, Ameco, Penta, 1952: Tecraft, Bird, Communications Co., IRE (now IEEE), Terado, 1953; Groth, 1954; Alltronics Howard, 1955.

In April of 1952 Eldico offered the Private Tutor Course, designed to teach blind persons to become amateurs. Codetrol, Dow, Go Devil were new keys. Contests were run by Hallicrafters, Raytheon, National. The Edison Award was announced by G.E. in October 1952. *QST* for December 1960 carried the last ad.

The net paid circulation of *QST* at the end of 1955 was between 87,000 and 88,000. Rate card #13, which had gone into effect with the March 1952 issue, still applied. The cost of one page of advertising was $357.50. QST

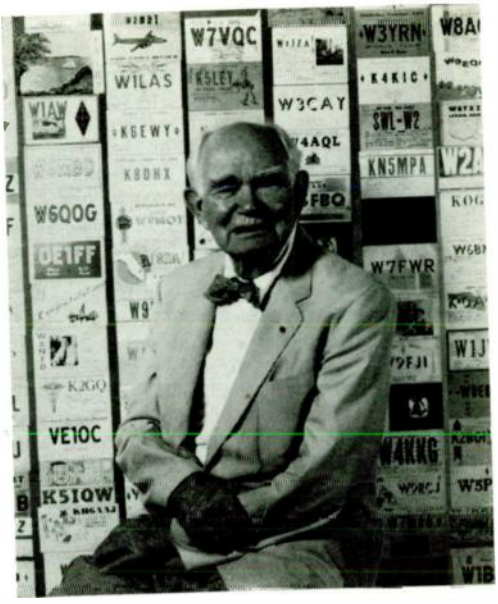
ARRL, 1954-1964 — Growth and Stability

AFTER the regulatory confusion and intermural strife had died down, after NARC and SARA had faded away and the completed Docket 9295 was filed in the archives, amateur radio and the League entered a period of relative calm and tremendous growth. In the years 1954–1959, the U.S. amateur ranks grew 78% from 115,000 to 205,000 and the League's voting membership increased 79%, from 43,000 to 77,000. Part of the growth was a result of the Novice and Technician licenses, part of it was stimulated by League action. For instance, a quarter million copies of *You Can Be There*, a pamphlet capitalizing on the publicity surrounding the *Kon Tiki* expedition, were distributed at fairs, hobby shows, and so on.

A suit against the League and its Executive Committee by three candidates for director and vice director who challenged the Committee's interpretation of the Articles of Association was decided in favor of the League in Connecticut Superior Court. The 40th anniversary of the League was marked by special material in the May 1954 issue of *QST*, by publication of the "Foreward to *QST* Index" by WØCO (in effect a history of *QST*'s first five years), and by an attempt to secure a commemorative stamp honoring amateurs. Five commissioners and several key staff members of FCC paid a visit to ARRL headquarters.

The League Board of Directors held its 1954 meeting at Denver. WØTSN was re-elected as president, and W5NW, W1BDI and W1BVR were elected as vice presidents, the first time the full quota permitted under the 1951 Articles was chosen. Awards for the three best *QST* articles were established: the first, for 1953, went to W2RYI for his January article on harmonic radiation, to W6QYT and W6POH for their meteor scatter story in April, and to VE3BLW for his description of short antennas for mobile operation which appeared in September. A medallion award was established by the Board for those who qualify for Brass Pounders' League on three occasions. With ARRL help W3LOE won a Baltimore County court case involving a 60-foot antenna tower. The judge had harsh words for an excess of community planning and concluded, "The public safety, health, morals or welfare will in no wise be affected by the erection of the tower among the trees in Mr. Cheek's backyard. His home is still his castle within the narrow limits set by law as approved by the courts."

FCC news in 1954 was confined to specialized actions, including authorization for maritime mobile operation on 15 meters, A-Ø on 6, Novice and Technician licenses by mail only, phone questions added to the General Class, and — over



Dr. Lee DeForest, famed radio inventor, received greetings from thousands of amateurs on his 85th birthday in 1958.

League reluctance — the Conditional Class exam circle shrunk from 125 to 75 miles. The FCC denied segregation of s.s.b. and separate subbands for special interests such as mobile operation; Novices on 6; expansion of 10 and 20 phone, special calls for Extra Class and two-letter calls for the former holders of Certificates of Skill before the days of licensing. License fees were proposed by FCC, but later held in abeyance by request of Congress. Conelrad regulations were approved in principle in 1954: as concerns amateurs, Conelrad compliance became voluntary in 1955 and mandatory in 1957.

Technicians were permitted to operate on six meters after April 1955. Shortly thereafter, the Novice 40-meter band was doubled, both actions having the full support of the League.

In December 1955 *QST* reached the ripe age of 40; the event was celebrated by reprinting *QST*, for December, 1915, and binding it into the regular copy of *QST*, cover and all. This year of 1955 was also the first in which the League grossed more than a million dollars. A new publication, the *Mobile Manual for Radio Amateurs*, was brought out, following by a year the book, *Single Sideband for the Radio Amateur*.

In 1956 the League began its two-year propagation research project, a part of the International Geophysical Year studies, under contract with the Air Force. W1VLH, a well-known young v.h.f. experimenter, headed up the special staff. New rules for amateur RTTY permitted any shift less than 900 c.p.s. Misunderstandings about the use of A-2 code practice in A-3 bands occurred from time to time: at League request a new rule was adopted in 1956 making it clear that this code practice is permitted. The Loran system was expanded: consequently amateurs in the Southeastern states lost their operating privileges on 160-meters.

The next year was one of wide-open bands. Everyone's DX dreams seemed to come true — even those of 6-meter men, when it finally became possible to make WAC on that band. To keep up with its burgeoning membership, the League installed new addressing machinery. *QST* disappeared from the newsstands; instead, it became available (other than by mail) only at radio parts stores, a policy still followed.

Even the sky was not the limit in 1957, for that was the year Sputnik I achieved orbit; amateurs became the local authorities on satellites in hundreds of communities through monitoring the device on 20.005 Mc. Many amateurs and clubs were ready and waiting for the first American satellite as well; initial reports from hams were of great assistance to the scientists in establishing orbits.

As a reflection of 1957 conditions, WAC issuances the following year hit an all time high of 2425. WA prefixes appeared in the second and sixth call areas. Portable/mobile notification rules were simplified, making it necessary to report only annually or when data previously filed was changed. In May, 1958, another expansion of Loran occurred, and U.S. amateurs lost their privileges 1875–1925 kc.

The space-age having arrived, the Government needed to assure itself of ample space for its myriad "little black boxes." Quite a bit of shifting was done in u.h.f. allocations of a number of radio services; amateurs didn't lose any actual space, but notice was served on the amateur that henceforth his bands were shared with the "radiopositioning" service.

QST continued to grow, and its net paid circulation for the year went over the 100-K mark for the first time. The three-millionth *Handbook* rolled off the presses early in 1958.

Over vigorous protests of the League and virtually the whole of hamdon, shared amateur use of the i.s.m. band at eleven meters was terminated in the U.S., and the band made available to the Class D Citizens' Radio Service.

In 1959 negotiations between the military and the civil defense people led to assignment by FCC of frequencies in the 40 and 20 meter bands and additional frequencies in the 80-meter band for long-haul RACES circuits. Technicians were granted privileges in 145–147 Mc.; the League's filing had asked for the full band. FCC published a Notice of Inquiry asking what incentives could be tacked on to the Extra Class license, but ruled out in advance all suggestions which had previously been denied by FCC. Though thousands of comments were filed, no action has ever been taken by FCC following the closing date for comment in this docket.

Sidelights 1954-1959

James Lamb, former Technical Editor of *QST*, was made a Fellow of the Institute of Radio Engineers, the citation making mention of his leadership in amateur technical matters . . . October 1954 *QST* reported that W6ZH had been appointed Undersecretary of State by President Eisenhower . . . A story in *Parent's Magazine* by K6ATX did such a good job of explaining amateur radio to the public that the League had it reprinted as a giveaway for public gatherings; about 100,000 copies have been distributed since . . . Denmark permitted the U.S. to issue KG1 licenses to its military amateurs in Greenland . . . KAs, U.S. amateurs in Japan, lost the privilege of handling third-party messages, but have been able to continue operating under the Status of Forces agreements between the U.S. and Japan . . . An insistent inquiry from an individual amateur about the 50-watt peak power limit on 420-450 Mc. led FCC to change the limit to 50 watts input, actually a reduction of permissible power — again underscoring the desirability of raising questions about regulations through the League rather than direct to the Commission . . . A ham station, W3WTE, operated from aboard the Presidential train during the 1956 national election campaign, two-way work being carried out even when the train was standing in an underground terminal . . . Technicians flocked to six meters early in 1957 as the band became available to them; strangely enough, Technician operation on 220 and 420 Mc. also picked up strongly . . . A separate office was opened in Wethersfield, Connecticut for the ARRL/IGY Propagation Research Project . . . National Convention fever seemed to strike the land, with flings at San Francisco in 1956, Chicago in 1957, Washingtin in 1958 and Galveston in 1959 . . .

International

The Administrative Radio Conference held at Geneva in 1959 dominated the international scene during the time under discussion. The decision to hold the conference in 1959 was reached in 1956, when a majority of member-nations of the International Telecommunications Union over-ruled the wishes of the U.S., Canada and a few other countries. Our people felt that no new conference should be held until after completion of a full sunspot cycle under the Atlantic City allocations. Since final switches in assignments had not occurred until 1952 even though the treaty was signed in 1947, the effect would have been to delay the conference until 1962 or 1963. Nevertheless, once the date had been set, the U.S. (and the League!) went right to work preparing for it. FCC inquired into present domestic allocations and future needs in two major

Amateurs held top positions at the Telecommunications Conference, Geneva, 1959—VE3AC (center) presided over the conference; HB9IA (ex-W3GG) was elected conference secretary and later secretary-general of ITU and, at right, LU9DL, was one of two vice-chairmen.

dockets, one covering 25 to 890 Mc., and the other above 890 Mc. The now-customary preparatory committee was established by the Department of State; the League, as always, was the only consistent voice of the amateur on this committee, although others had been invited to participate. It was early established that the U. S. would strive to hold the line below 30 Mc., for *all* services, not just the amateur. After the v.h.f. and u.h.f. studies were completed, the U.S. proposed keeping all amateur bands about the same size, though it proposed shifting two of the u.h.f. bands higher — the 3300-3500 Mc. band to 3500–3700 and the 21,000 Mc. band to 22,000 Mc. — and sharing almost all the bands above 220 Mc. between the amateur service and the government radiopositioning service.

In addition to being a member of the team drawing up U.S. proposals, the League sent representatives to international amateur meetings, notably at Mexico City and two meetings of European members of the International Amateur Radio Union at Stresa, Italy in 1956 and Bad Godesberg, Germany, in 1958. At each, the U.S. and the League positions were carefully explained. Amateur societies were again urged to take part in their own governments, preparations for the Conference, to attempt to insure proposals favorable to amateurs by their administrations, and to get one or more amateurs appointed to the advisory group of the country's delegates to the conference.

Final technical preparations for the 1959 Conference for the majority of nations took place at the Plenary Meeting of the International Radio Consultative Committee at Los Angeles early in the year. Delegates got a good look at amateur radio through the operations of special-events station K6USA; a few temporary arrangements were made legalizing third-party traffic for delegates and the station handled some messages for conferees. The U.S. Government also permitted delegates who were hams to operate the station — an unprecedented goodwill gesture.

The Geneva Radio Conference got under way on August 17, 1959, and lasted until December 21. Canadian Director Alex Reid was a member of the Canadian delegation. President Dosland, General Manager Budlong, General Counsel Segal, and Assistant General Manager Huntoon were all members of the U.S. delegation, Messrs. Budlong and Huntoon spending four and three months respectively, at the conference.

The greatest pressure on the amateur bands came from the international broadcasting service and was lodged chiefly against the 7-Mc. band, already fragmented by the Atlantic City table — 7000–7100 amateur, world wide; 7100–7150 shared, amateur and broadcasting, Regions I & III; 7150–7300 broadcasting, Regions I & III; 7100–7300 amateur, Region II. At least a dozen nations proposed either that the Atlantic City allocation for Region I & III be adapted world wide, or, worse yet, that the world wide allocation be to amateur 7000–7100 and to broadcasting 7100–7300. Finally, after weeks of maneuvering, with the Americas remaining adamant in support of the amateurs on this band, the matter was settled with the full 300 kc., for amateurs in the Western Hemisphere. Amateurs in the rest of the world lost their shared 50 kc., the allocation in Region I & III emerging as 7100–7300 exclusively "propaganda" broadcasting.

There was also a threat that the general sharing arrangement at 80 meters between fixed, mobile and amateur services (which has existed since the first allocations table was adopted at Washington in 1927) might be washed out in favor of some division of the band, one proposal being for 3500–3750 amateur, 3750-4000 fixed and mobile. The Atlantic City allocation was eventually continued with support coming both from those who didn't want *any* exclusive amateur space and those who would prefer no fixed and mobile operation in the band (*e.g.*, the U.S. and Canada).

Another fixed-and-mobile threat appeared at ten meters, where a few countries wanted some low-power stuff in the top half and there was also a troublesome radiosonde threat at the low end. At one point in the conference it seemed certain that at least a half dozen countries would insist on footnote authority, at least, for fixed-and-mobile in the 10-meter band, but the maneuvering and tea-cupping continued, and at the last minute the footnotes were withdrawn. The band stayed exclusively amateur, 28.0–29.7 Mc.

Throughout it all, our representatives were full members of the U.S. team, tackling any problem assigned by the delegation's chairman, whether an amateur matter or not. Similarly, those on the U.S. group representing other services pitched in whole-heartedly on amateur matters when it became necessary. The net effect was to preserve amateur bands *in toto* for the Western Hemisphere, and to hold cuts elsewhere to the barest minimum.

FCC at W1AW in 1954—commissioner W1AE/W3DF at the mike; left to right, ARRL president WØTSN, ARRL president; FCC Chairman Hyde; Commissioners Webster and Bartley; Safety and Special chief White, and Field Engineering chief W3AP.

A FEW people thought amateur radio had reached the peak of its growth. The National Traffic System (NTS) was performing well for the whole fraternity. Operationally 2600 had qualified post-war for DXCC. The sunspot cycle had turned upward; DXers were feeling out 21 Mc. hopefully. The January '54 VHF-SS attracted some 600 logs, and 747 took part and reported in the 8th one in '55. The ARRL Field Day and the Sweepstakes were top attractions for June and November even as today, the 22nd annual SS in '55 netting 1880 logs. Other events adding zest to operating were the European DX Contest (WAE), one put on by *Labre* (Brazil) and the annual VK-ZL contest. Traffic was going great guns, this well demonstrated by a growing BPL. "CD" Parties for ARRL appointees were as now, outstanding opportunities for station testing and fraternal contact. A sixth YL-OM contest was held in December. The annual nation-wide test of civil defense communications in which RACES and AREC had workouts showed amateurs willing and able when given a welcoming hand and appropriate local indoctrination. The 10,000 Mc. v.h.f. record had been broken in '54; determined vhf-ers were looking expectantly for new fields to conquer. We regret that space permits giving only some highlights of this whole grand period of amateur operating.

In '56 ten meters was really open for about the first time since 1950. Twenty was a gold mine and fifteen very good. The 22nd annual ARRL DX contest as a consequence made a sixth consecutive increase in participation. Fifteen stations worked over 100 countries in the test. One chap worked 118 countries on 20 c.w. W3DGM/3 with 804 contacts (320 multiplier) made a 771,000 score. Phone records fell too with W2SKE/2 making 842 QSOs, 632,000 points. There were 36 disqualifications. ARRL Observer cooperative notices were running but five or six thousand a year. Hidden Transmitter Hunting was popular with the clubs. Traffickers were examining the need to zero frequency (QNZ) closely with NCS. Newcomers were finding out that without antenna couplers or transmatches they might get many an FCC notice from harmonic radiations falling outside amateur territory!

Now the rising curve of the sunspot cycle brought new six meter DX. JA6FR (Kyushu) worked LU9MA (Mendoza) and LU2EW and LU3EX, B.A. 11,400 miles. Also in '56 F2-DX was part of the general order of things. Western amateurs were frequently able to work J's and KH's. DXpeditioners were rapidly coming into the limelight with W3LEZ/VE1, Navassa, FS7RT, PJ2MC, LU2ZY, XE4A and DL1CR/LUX to be worked. New DXCC's went to 513 amateurs in '56 compared to only 326 the previous year.

Brasspounder W6TT made second-high W6 score and won NCDXC and East Bay ARRL DX competition certificates in 1956.

Mae Burke, W3CUL, a top-notch brasspounder, got the Edison Award in '57 for her unmatched morale service (message handling) for GIs. W1BCR and W2KCR got the Navy's Public Service Award for their Antarctic work supporting *Deepfreeze* personnel. More DXpeditions: Aves Id. YVØAB, Seychelles, VQ4GU, Crete SVØWQ, Samoa W6UOU/KS6. Scores in contests now broke all earlier records. They ran 30% or more above '56, a big year in itself. Six meters went hog wild late in the year, QRM as bad as on '75! Daylight bands stayed open in the night. On the serious side some 1200 amateurs, all v.h.f. enthusiasts, cooperated in the ARRL-IGY propagation research project. Amateurs listened and reported on the sputniks. New vistas of operational electronics seemed almost within reach. Following some eight months of tests and preparation, a new world's record was made on 144 Mc. by KH6UK and W6NLZ . . . solid two-way communication July 8th and again Aug. 18th over a distance of 2450 miles.

Traffic was hitting its stride. In '58 the reported message handlings rose to a post-war peak. There were again new firsts in v.h.f.-u.h.f. transmission records — 1296-Mc. contacts by W6MMU/6 in July, 225 miles with W6DQJ/6, then 270 miles in Sept. with K6AXN/6. As a result of the good conditions both WAS and DXCC issuances were up substantially.

Now "by act of Congress" two new states were created, the first such changes in many years. With statehood for Alaska Jan. 3, '59 and Hawaii August 21, '59 this automatically established new horizons for the League's Worked-All States award. W8GNY and K2YGI worked KL7CEE and KL7CXN on the date of Statehood and were first to get their cards in for a 49-state WAS. W6PJL, Whittier, California made a 14-Mc. s.s.b. contact with KH6BB Aug. 22nd at 2020 HST, this one then became the first Hawaiian QSL card to be processed for a 50-state WAS. In the period 1955 to 1959 RACES had advanced from having about 300

approved plans to 1400 operational plans throughout the nation. The RACES rules now received some extended earmarkings of h.f. amateur band segments for a possible wartime need; f.s.k. additionally to be permitted in RACES six meter segments. Message traffic volume was stepped up again in 1959 to almost double that of the previous year. Also '59 marked the making of four new records in the v.h.f. field: In June SM6ANR-G3KEQ 650 miles on 420 Mc., also W6DQJ/6-K6AXN/6 400 miles on 1215 Mc. Then in July, W6NLZ-KH6UK 2540 miles on 220 Mc., also W7JIP/7-W7LHL/7 187 miles on 10,000 Mc.

Work with the amateur stations in the Antarctic with the Navy had continued successful with a number of amateurs backing up personal message operations by their consistent skeds. K2KGJ had topped off this kind of service, totalling over 12,000 messages. In '59 this came to public attention through his receiving the Edison Award. This was the year of the Socarro Is. expedition, XE4B . . . also the year will be remembered by some operators as the first in which FCC suspended an operator license for exceeding the one kw. power input rules in a contest. Rag Chewers' Club "matchings" completed by The Old Sock, an index of fraternal activity, topped 6,000 per year in 1959. W9IOP broke earlier records with a 1336 contact 73-section 243,056 score in the Sweepstakes that year. With 10- and 15-bands good most all scores were up; 93 reporters worked all 73 sections. To meet a limited demand for code speed runs above the general program, W1NJM acting for the Conn. Wireless Ass'n inaugurated some High Speed runs. Thirty-one amateurs qualified for the CWA certificates. Seven of these made it at 55 w.p.m. and 12 at 60 w.p.m.

In the five years '55 to '60 the total number of different amateurs certified at *some* level of code proficiency in the ARRL Program rose from 25,600 to 37,000. Annual submissions including failures as well as papers submitted for endorsements ran 3849 for '60. The friendly Observer admonitions sent to help fellow hams in this same five-year period went up year by year from 5300 to 24,000 notices. Interest in the VHF-SS *doubled*. The number of nets registered for traffic or Public Service steadily climbed, from 414 to 580. Our November '58 "SS" hit a peak of 2383 logs returned, the most recorded in any contest up to this time. The Field Organization grew in capabilities through NTS and in the number of Official Station SCM-appointments. Sideband in these years made telling progress toward its full acceptance for operational use by the fraternity in general. In an early '60 *QST*, the League recommended wider voluntary use of Greenwich Time by amateurs. This was a good move, in view of the continued and continuing influx of new operators and because much work was across time zones. A new Op. Aid (No. 10) was issued as a guide to reliable time conversions to and from GMT. The Amateur Radio Emergency Corps through this whole period continued its progress and its annual nationwide Simulated Emergency Tests each October, stressing the necessity for all amateurs to be prepared by registrations in AREC, advance planning, and self-training.

Paul Blum, W2KCR discussed work with KC4USA and KC4USV (W2TEB left, K2KID center).

The SET's of this period were made outstanding with Red Cross collection stations, the Office of Civil Defense Mobilization (OCDM) and ARRL working together. The '58 and '59 exercises were outstanding in their ability to develop accuracy, dependability and speed in communications filed during the test . . . also in the many advance contacts and understandings perfected and extended between amateurs and the agencies to be served at all levels, come disaster. Emphasizing the high value in outstanding local leadership, an ARRL Emergency Coordinator Walter Ermer, W8AEU, received the '59 Edison Award "for his work organizing amateurs for emergency communications preparedness in Cleveland." His 300-man voluntary radio communications corps had served his city in various ways on 23 occasions during 1959!

K2EHI, EC Putnam Co. (N. Y.) from this operating position directed the Simulated Emergency Test October 11th.

THE year 1956 started off with the West Coast recuperating from one of its worst floods in history, the equal of the Diane floods which hit the northeast in August of 1955. Thousands of amateurs up and down the coast participated. As in most modern-day emergency operations, there were very few individual heroes. The amateurs worked together in teams.

The rest of the year was comparatively quiet, with only what we have come to think of as run-of-the-mill emergencies. Not until December did the extensive Southern California fires bring out amateurs in great numbers, mostly in RACES. Shortly afterward a big bomber crash in Northern Maine, about as far away from Southern California as you can get and still be in the same country, provided a contrast both in type of emergency and in temperature. Actually, the bomber crashed in New Brunswick, Canada, just over the border.

Later in January, wide areas of Kentucky and Tennessee experienced flooding and resultant disruption of communications.

The first hurricane of the 1957 season, Audrey, started in the southern Gulf of Mexico and hit the southern Louisiana coast in June, causing extreme damage and much death and destruction in Cameron Parish. W5SKW, EC for Lake Charles, and W5BSR, ARRL director, led amateur communicators into the area and did an excellent job for several days.

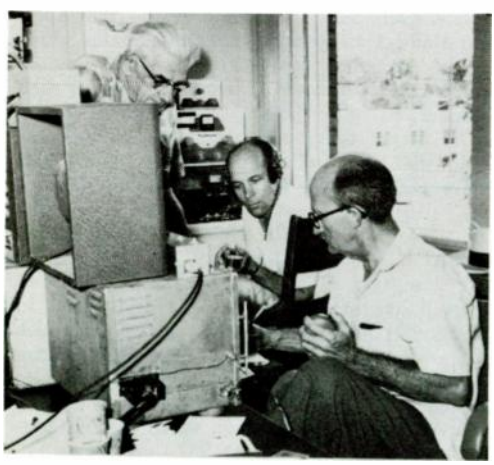
In April of 1958 extensive flooding in Central California and the Bay Area again brought out amateurs in great enough numbers to perform significantly in the public service. In October it was California again, this time more fires in the tinder-dry southern part of the state. Once again RACES carried the biggest part of the load in this highly-organized civil defense section.

In the Malibu-Topanga Canyon (Calif.) fires in December, '57, Deputy Chief Radio Officer W6QJW, operating under RACES tactical call of CPT19, controlled a net on 3995 kc.

In August of '59 the vicinity of Yellowstone Park in Montana, Idaho and Wyoming was shook by an earthquake causing a mountainside to fall into a canyon, burying a camp ground and killing many people. Amateurs in the three states were active in communications problems which resulted.

Minor emergencies, and some not so minor but not reported in full enough detail to rate "major" in our arbitrary classification system, were reported every month, and the coverage of the emergency page of *QST* grew bigger year by year. For example, in 1956 the emergency page reported 58 emergencies and 21 non-emergency activities. By the end of 1958 the same page was reporting 83 emergencies and 57 non-emergency activities. Quite a number of these were major enough in extent to receive up-front *QST* treatment but not enough details were reported to make this feasible.

The annual Simulated Emergency Tests and civil defense Operations Alert were reported annually in *QST*. By the late 50's, participation in civil defense activities by amateurs had dropped off, while AREC activity started to pick up speed again. Shortly after the turn of the decade, the federal government ceased staging a nationwide c.d. test each year, leaving our own annual Simulated Emergency Test as the sole nationwide test of amateur radio emergency communications facilities — not counting the Field Day, which had long since become a contest with negligible emergency connotation. The SET hit lows in 1955, 1956 and 1957, then started a rapid climb until by 1960 it was approaching pre-



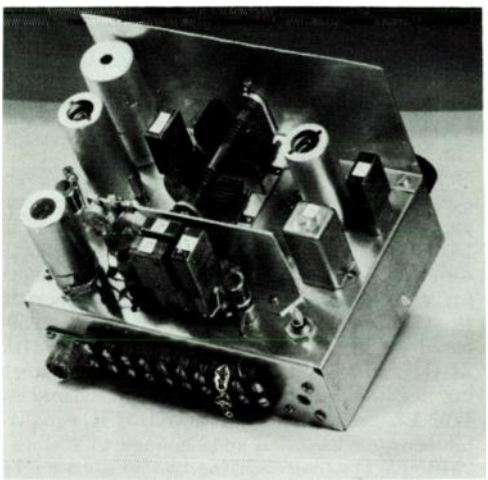
It isn't often that an ARRL director is involved in an emergency operation, but Delta Director Division W5BSR was in the Hurricane Audrey operation right up to his ears. That's Vic standing, while Lake Charles EC W5SKW (wearing earphones) directed the operation and W5KHC operated this rig at Lake Charles City Hall.

RACES highs and in 1961 surpassed them. Since then, the annual SET has assumed major proportions as an ARRL activity, surpassed only by the "big four" contests.

As our historical records go into the 60's, we start talking more about recent developments than about historical milestones; but much has happened in the past four years which needs to be reviewed, after which we can take a look into the crystal ball to see what the future holds for that most important of all amateur radio pursuits — public service communication.

Technical Progress

THE amateur-radio year 1956 was ushered in with talk about "Conelrad" and methods for complying (starting in 1957) with the requirement for monitoring a b.c. station during any ham-radio activity. Numerous ingenious devices for sounding the alarm were described in *QST*, ranging from visual indicators to interlocks that turned off the ham transmitter when the b.c. station left the air.



The three-tube 14-Mc. single-sideband transmitter of W4IMP. The variable capacitor "pulls" the crystal frequency and permits a frequency excursion of about 10 kc. The output stage is a 6CL6.

A significant change in the complexion of amateur radio was spotted in an April, 1956, editorial that, without using the expression, decried the growing "appliance operator" approach to ham radio. Exactly four years later the editorial pages treated the subject of "Those Mail-Order Exams" and the misuses and abuses of the system. The editorials weren't tied together at the time, but in retrospect they should have been. And it could have been pointed out that during this same four-year period more and more *QST* pages were devoted each month to "Recent Equipment" descriptions.

Single Sideband

This is not to suggest that no amateurs were developing the art. In the s.s.b. field, still a controversial area, Tony Vitale, W2EWL, made many a convert with his "Cheap and Easy S.S.B." (March, 1956), an ingenious phasing-type exciter built in and around a surplus BC-458 transmitter. Murray Crosby, W2CSY, described his "product detector" in May, 1956, and made it impossible for anyone during the following years to peddle a sideband receiver that didn't have *something* labeled a "product detector." In September, 1957, Howard Wright, W1PNB, one of the early sidebanders, described the "Third Method of S.S.B. Generation", a system primarily of academic interest. In 1960 the 7360 beam-deflection balanced-modulator tube was introduced, and in the same year Joe Galeski, W4IMP, described his *three*-tube complete filter-sideband transmitter, which certainly must have set some kind of a record for minimums. By 1960 the pattern of linear-amplifier design was firmly established: tetrodes operating AB_1 for high-sensitivity applications, or grounded-grid Class B triodes when 30 to 100 watts of drive was available.

New hope for a.m. glowed briefly in 1956 when "Ultramodulation" was described, an ingenious circuit that prevented negative-peak overmodulation and splatter.

Communications receivers came in for attention in January, 1957, when a (relatively) high-frequency i.f. amplifier was described using a pair of crystal-lattice filters designed by David Kosowsky. Kosowsky's paper a year later in the *I.R.E. Proceedings* practically started a new industry, and Ben Vester, W3TLN, boiled it down for *QST* readers in a January, 1959, "how-to-do-it" article. High-frequency crystal-lattice filters provided a big step toward getting the selectivity closer to the antenna, and they also made it possible to design a filter sideband transmitter with fewer frequency conversions. In 1957 an i.f.-derived "hang a.g.c." system (fast attack and slow decay) for s.s.b. and c.w. was described, followed later in the year by an audio-derived version of the same principle. And just when it was believed that home receiver construction and plug-in coils were in a class with the dodo bird Ted Crosby, W6TC, described the first of several "HBR-" receivers (July, 1957) and practically started an HBR cult. So popular and successful was the design that a small sporadic paper was published and circulated describing modifications and experiences. Improved reception in mobile operation was reported by Laird Campbell, W1CUT, in "Exit Ignition Noise" (May, 1959),

a description of the successful application of TVI "bottling" techniques to automobile ignition systems.

Antennas

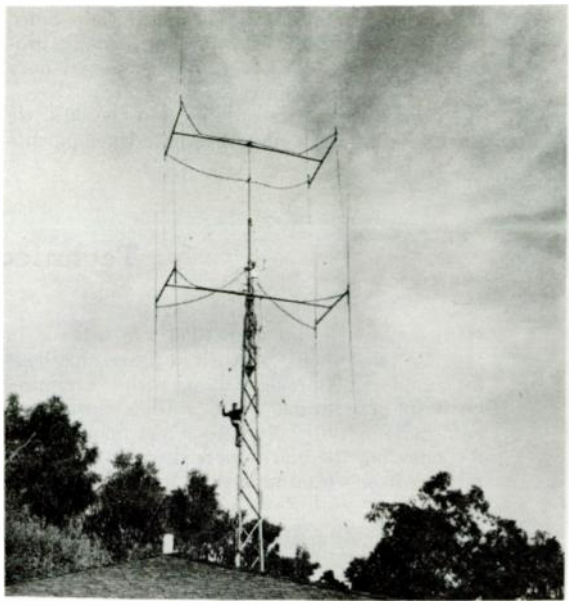
Antenna development inched along the path of refinements to existing designs and of multiband operation with a single "flat" transmission line. An extensive two-part article by Carl Greenblum (August-September, 1956) reported comprehensive measurements on multielement Yagi antennas, single and stacked. A dual "quad" antenna was first described earlier that year, and "trap" multiband wire antennas were described in 1956 and later. The ground-plane antenna went multiband in February, 1958. One of the most impressive of all multiband antennas was the "Driven Beast" (May, 1958), the result of much hard work by A. J. F. Clement, W6KPC. Utilizing all driven elements and a flat transmission line, the three-band unidirectional monster was an *8*-element antenna on 20 meters and a *16*-element bird trap on 10! In October, 1956, Lew McCoy, W1ICP, described the first of several "Monimatch" designs, a simple and inexpensive directional coupler useful for indicating relative power output and the state of match at the load end of the line.

Semiconductors

As the availability of semiconductor devices increased and their prices decreased, they found their way into more and more amateur gear. Sometimes it would be primarily for novelty value, as in a transistor speech amplifier or "grid-dip meter" or *Q* multiplier, but in 1958 transistorized power supplies for mobile operation started to supplant vibrator and generator supplies. Transistor modulators for mobile a.m. operation took over almost as quickly. The opportunity for the construction of compact sophisticated automatic keyers was demonstrated by transistorized versions of the "W9TO Keyer" (May, 1959) and the "Transistorized Ultimatic" (September, 1960). The "Magkee" (March, 1960) used transistors and magnetic cores to provide automatic dots and dashes. In the fields made possible only by semiconductors, one of the most useful devices is the "parametric amplifier", and it was explained by Bateman, W4AO, and Bain, W4LYU, in an extensive four-part article (December, 1958, through March, 1959).

Above 30 Mc.

Real progress was being made in the v.h.f. and u.h.f. region. In January,1956, Kmosko, W2NLY, and Johnson, W6QKI, pooled the results of their individual antenna measurements to describe the tricks required to maintain the gain of 17-element Yagi antennas, single and stacked. A crystal-controlled converter for 432-Mc. reception was described in *QST* for March, 1956. The same issue carried an account of v.h.f. ionospheric scatter propagation by Mark Moynahan, W2ALJ. Meteor shower propagation on 2 meters was described in April, 1957, following the publication



The top of W6KPC's "driven Beast" was 107 feet above the ground.

of a meteor-shower calendar in February. The possibilities for using tropospheric scatter techniques at 144 Mc. and higher were discussed by Dean Morgan, W2NNT, in March. Transequatorial propagation across the geomagnetic equator was described in a comprehensive report by R. G. Cracknell, ZE2JV (December, 1959), based on his work and that of F9BG, G4LX, ZC4IP and ZC4WR. On July 8, 1957, after working together almost a year, John Chambers, W6NLZ, and Ralph Thomas, KH6UK, caught a temperature inversion good enough to sustain a 2540-mile QSO between the two stations on 144 Mc. They repeated the feat on Aug. 18. Looking for new worlds to conquer, they made it on 220 Mc. in June of 1959, and in July, 1960, KH6UK was heard by W6NLZ on *432 Mc.!* This would have been a fairly substantial DX record if W1BU, Sam Harris and the Rhododendron Swamp V.H.F. Society and W6HB, the Eimac Radio Club, hadn't engineered a two-way QSO *via moon bounce* on 1296 Mc.! This fabulous feat on July 21, 1960, capped several years of effort by Harris and a spectacular crash program by the West-coast group.

Only a few years before, few *QST* readers appreciated that the space age was just around the corner. A May, 1956, article introduced many readers to the new field of radio astronomy, initiated nearly two decades earlier by Grote Reber, W9GFZ. During 1956 there were several articles preparing interested amateurs for tracking the proposed earth satellites to be launched during the International Geophysical Year of 1957. Plans called for tracking on 108 Mc., and when the U.S.S.R. put "Sputnik" into orbit on Oct. 4, 1957, there was much hurried revamping of gear to 20 and 40 Mc. And the space age had begun.

Signatures from 1956–1959 ads of beam, tower and rotor manufacturers who are in *QST* today

Stabilization

DURING the next four years of 1956 through 1959 *QST*'s advertising showed that s.s.b. was fully accepted; use of h.f. transceivers was beginning; transistor applications were developing; v.h.f. and mobile operating were picking up; small back yards were blossoming with towers and beams; new accessories were coming on the market; TVI was just about licked.

Performance on s.s.b. was stressed in most receiver and transmitter advertising. Hammarlund announced no fewer than eight receivers. Five new ones came from National; five from RME/E-V; four from Hallicrafters; three from Gonset; two each from Heath and Drake; one each from Collins, Morrow, Pierson (later Automation), Knight-kit, Geloso, TMC. S.s.b. receiving converters were brought out by Hammarlund, B&W, D&R, Crosby. International Crystal featured printed circuits.

Many transmitters included s.s.b. or provisions for adding s.s.b. excitation. Transmitters and linear amplifiers included seven units from Johnson; six from Gonset; five from TMC; five from Globe/WRL; four from Hallicrafters; four from Heath; three from Eldico; two from B&W; one each from Knight-kit, Geloso, Millen, P&K, Morrow, Eico, P&H, Lakeshore, Central Electronics, Elenco.

Although s.s.b. transceiver operation in the amateur bands from 3.5 to 29.7 Mc. was not to reach its peak until after 1959, three manufacturers pioneered with equipments. Collins, the company that had gone 100% for sideband, brought out the KWM-1 in May 1957 and followed with the KWM-2 in October 1959. Cosmos Industries announced the Cosmophone 35 in January 1958, the 50 in June of the next year and the 1000 three months later. The Hallicrafters transistorized FPM-200 was advertised in August of 1957. It was not a transceiver but was called a transmitter-receiver with dual v.f.o.s. The Collins 75S-1 and 32S-1, separate units, were designed to be connected for transceive operation. The first ad in *QST* explaining this use was in the March 1958 issue.

Sylvania and CBS-Hytron had advertised transistors for broadcast receivers and audio amplifiers, but Hallicrafters was the first advertiser, in September 1957, to point out that transistors effective up to 30 Mc. were moderately priced. This theme was developed in the May 1958 advertisement. In March of 1958 Digitrols offered a transistorized power supply kit; Universal Transistors announced a mobile power supply in June; Johnson Electronics brought one out in October. In 1959 RCA advertised the 2N307 as a natural for hams; during that year Cornell-Dubilier, Sunair, Kupfrian, Globe Industries, offered transistorized mobile power supplies.

Quite a selection of equipments, components and antennas was available for both v.h.f. and mobile operating, the two types of operations often being the same. The year 1956 saw ads for at least ten receivers or converters and four transmitters, including such well known names as Hallicrafters, International Crystal, E. F. Johnson; and new names like Clegg. In 1957, 1958 and 1959 the number of equipments increased to more than twenty, with a frequency range extending to 432 Mc., and included the Hallicrafters SR-34, a 2 and 6 meter transmitter-receiver; Ameco's 2 and 6 meter converters; International Crystal's printed circuit 6 meter converter kit; Tecraft's various 6 and 2 meter converters; Johnson's 6 and 2 meter transmitting set-up of the 6N2, the 6N2 VFO, converter, Thunderbolt; Clegg's 250-6C; WRL's 666 VFO; P&H's 600A and L-600-M; Heath's 2 and 6 meter Seneca transmitter and the Cheyenne and Comanche h.f. mobile transmitter and receiver.

V.h.f. and mobile antennas were advertised by most of the 20-odd antenna manufacturers such as Hy-Gain, Mosley, Antenna Specialists, Communication Products, Cushcraft, Master Mobile, Hi Par, Columbia.

In addition to v.h.f. antennas, *QST* carried advertising during 1956 through 1959 of more than twenty companies making h.f. beams, traps, coils.

A variety of accessories came out. The eight in the technical category ranged from the Mach Electronics motor driven gamma match for a beam to the B&W band-switching t.r. switch. Of the eleven operating aids and conveniences which took care of such widely varying needs as a fireproof ashtray (the Spico Dunking Station) and a frequency record (QRG Calibration Log) the time pieces by Pennwood Numechron are still with us. Seven companies advertised jewelry or call sign plates.

W1DBM's book, announced by Nelson Publishing Company in January 1958, supplemented *QST*'s articles and lectures and helped knock TVI down for the count of ten. The result was that TVI was seldom used as a subject in manufacturers' advertising copy.

Testimonial ads using ham calls continued to be popular. Fifteen companies listed a total of forty-nine U. S. calls with the sixth call area having eleven, the fifth call area two, and the remaining thirty six calls divided fairly equally among the other eight call areas.

The RCA campaign showing various manufacturers' equipment using RCA tubes, begun in 1955, continued. Transmitters and amplifiers by B&W, Collins, Gonset, Hallicrafters, Morrow, Johnson, Knight-kit, WRL, were featured. The Walter Ashe ads from September 1957 through January 1958 and those of Adirondack during March through November 1959 (and continuing into 1960) were novel enough to warrant reading now.

More than forty companies ran personnel wanted ads during the four years.

Notice of a satellite was first taken in *QST* advertising in January of 1958 with converters for 108 Mc. offered by Tecraft and Tapetone.

Contests were announced in 1956 by Mallory, in 1957 and 1958 by Hallicrafters, by Tapetone in 1958 and by Astatic in 1959.

For the first time in *QST*'s history circulation went over the 100,000 mark. The net paid was approximately 105,000 at the end of 1959. Rate card No. 15 (No. 14 had applied since March 1956) went into effect with the March 1959 issue. It gave the cost of a one page ad as $432. QST

ARRL, 1959-1964 ★

The Quickened Pace

A highlight of the ARRL's Golden Anniversary has been the receipt of a great many kind words of congratulations and good will, from members, from industry, from government agencies, and from foreign amateur societies. Two of our sister societies went beyond the message stage: The guest book shown here, now in use at headquarters, is a gift of the Radio Society of Great Britain while the Netherlands society, VERON, presented the League with a beautiful handmade plate of Delft china, designed by PAØUB.

IN THE LATE FIFTIES, ham radio presented a robust picture. Each year saw new highs in the amateur radio population, records in League membership and peaks in gross receipts. Radio conditions were good, though off a bit from the middle of the decade. Amateur representatives had just brought home the bacon from another world radio conference, preserving *status quo* for the western hemisphere's frequency allocations and holding adjustments elsewhere to the bare minimum.

Yet underneath this facade, was everything as sound as it appeared on the surface? Some serious observers thought not. For instance, only 1% of the amateur population had reached for the Extra Class license — a large part of that group doing so on the "grandfather clause," at that. There seemed to be more discourtesy, loud parties and profanity. Splatter, overmodulation, key clicks could be heard without much listening. After emergency communications had been performed, there were found as many examples of deplorable conduct and procedure as praiseworthy. Most of all, there seemed to be an air of stagnation.

By ones and twos, thoughtful amateurs separately reached the conclusion that, though amateur radio was still in excellent shape, it was headed in the wrong direction. Something must be done, they felt, to turn it about, and create a rebirth of the amateur spirit.

The League was made more responsive to democratic control in 1959 by allowing the election of three additional Directors to the Executive Committee, to insure that men directly elected by a portion of the membership were in the majority on the Executive Committee. At the same time, the Treasurer and Communications Manager became non-voting special members of the committee.

In July of 1962, the Executive Committee discussed at length the problems they saw coming upon the amateur radio service. As a first expression of their concern, the committee adopted a resolution calling for proper technical operation of equipment and asking that the Headquarters staff institute a program for better understanding of technical capabilities and limitations of equipment, and of operating techniques.

Again, in January 1963, the Executive Committee spoke out, calling on amateurs to choose the proper bands for the distance to be covered, to maintain equipment flexibility, to use minimum bandwidth, to use v.h.f. for local communications and to use minimum power necessary for the communications being undertaken.

In February *QST* appeared the now-famous editorial proposing a return to incentives through reactivation of the Advanced Class license (which had not been available to new licensees since 1952) and restoration of restricted phone bands. Members were invited to comment, and comment they did! About six thousand comments — evenly divided for and against — were received between the appearance of the February issue and the meeting of the Board in May and were forwarded to the appropriate division. After a great deal of discussion, much of it informal, the Board adopted an eight-point program: modernization of the exams, reinstatement of the Advanced Class license with restricted phone band privileges, expanded educational program through *QST* and within the affiliated clubs, a more effective official observer system, joining the AREC and NTS into a new Amateur Radio Public Service Corps, *QST* articles stating the accomplishments, goals and history of the League, and observance of its specified operating principles. The remaining point, to limit the term of Conditional licensees, was set aside when the Commission took a series of steps on its own to insure ethical administration of the test, and to limit the number of future amateurs eligible for it. Discussion continued, not all of it at a high level. Some 15,000 letters were written to the League. Petitions of other groups and of individuals for variations on the incentive licensing theme were filed with FCC in Washington.

While awaiting action on that point, the League went ahead with some of its others. A series of articles designed to fill in the technical background of the average amateur, written by *QST*'s erudite technical editor, George Grammer, W1DF, appeared under the masthead, "Basics for Beginners." This was followed by a series dealing with the use of an oscilloscope by the same author. Additional audio-visual training aids have been added to the League's lending file for use by affiliated clubs. The Amateur Radio Public Service Corps has united the National Traffic System and the Amateur Radio Emergency Corps, so that the "long-lines"

function of the NTS complements the local coverage of AREC nets without destroying the individuality of each. *QST*'s reports on these activities have been given a more prominent spot well forward in the magazine, and they have been supplemented by feature articles describing effective operating technique. The Simulated Emergency Test has provided an actual operating experience wherein the two main branches of ARPSC can work together.

The special section of which this article is a part has run all during the 50th anniversary year. It attempts to drive home the fact that the League is not merely the headquarters employees, nor again the Board, but rather that the League is the whole body of amateur radio working together for the preservation and improvement of the art.

Between 1959 and 1964, eight new directors were seated. In 1960, Percy C. Noble, W1BVR, resigned as vice president and Canadian Director Alex Reid moved up. A. L. Budlong, W1BUD, announced his own retirement at year-end; John Huntoon, W1LVQ, became Secretary and General Manager of the League, Secretary of the IARU and Editor of *QST* on January 1, 1961. In September, Robert M. Booth, Jr., W3PS, 1961 president of the Federal Communications Bar Association, was appointed General Counsel of the League. In 1962 Arthur K. Meen, VE3RX, was appointed Associate Counsel for Canada, a new post. In 1962 Goodwin L. Dosland, WØTSN, declined re-nomination as president because of the pressures of his law office. Herbert Hoover, Jr., W6ZH, a long-time amateur, engineer, geologist, businessman, diplomat and Undersecretary of State in the Eisenhower administration, was unanimously elected as League president.

An early clue that amateur radio may need some powerful preservatives in the coming decade appeared in 1963, at the Extraordinary Administrative Radio Conference on Space Communications held at Geneva. There was no anticipation of proposals involving the amateur service, and therefore the U.S. did not include an advisor on amateur matters when the delegation was made up. As a precautionary measure, however, the

Countdown for Oscar I, December 12, 1961: Capt. Turner, USAF; W6SAI, Project Oscar, Inc.; W6MLZ, ARRL; WØTSN, ARRL; K6LFH, Project Oscar, Inc.

Sidelights, 1959–1964

Phone bands in Canada were expanded to read: 7.15–7.3, 14.1–14.35, 21.1–21.45 and 28.1–29.7 Mc. In the States, the phone band on twenty became 14.2–14.35 Mc. . . . Portions of the U.S. 6- and 2-meter bands were set aside for "weak-signal" work with the restriction of 50.0–50.1 at ARRL request and 147.9–148.0 Mc. to A-1 emission. . . . The Canadian rules were changed to again permit the use of any modern language by VEs so long as the basic identification was given in either English or French. . . . The League requested that a stamp commemorating amateur radio be issued in 1964, in connection with the 50th Anniversary of ARRL. . . . The Cover Plaque Award, to the author of the month as determined by the directors, was begun; the actual printing plate of the *QST* cover, chromed and mounted on a plaque, forms the recognition presented to winners. . . . The Board adopted GMT as official time in all ARRL publications. . . . VEs lost half the eleven-meter band to the General Radio Service, equivalent to the U.S. Citizens Radio Service, in the spring of 1961. The remainder 26.96–27.0 Mc. has been preserved for amateur use which continues today. . . . FCC issued its notice of proposed rulemaking on license application fees early in 1962; the fees have been collected since March 17, 1964, but litigation continues. . . . Well over a thousand members qualified as ARRL Boosters in a special membership campaign, winning special lapel pins in the process. . . . A National ARRL Convention was held in Portland, Oregon in 1962 and in New York in 1964. . . . FCC denied requests of individuals for further expansion of the 20-meter phone band, for the right to play the Star-Spangled Banner twice a day at any amateur station, for Technician operating privileges in the 10-meter band and for extensive changes in the licensing structure. . . . Conelrad monitoring was deleted from the amateur rules in July 1962. . . . The Amateur and Citizens Division of FCC was created in a reorganization of the Safety and Special bureau. W3GD became chief of the division with W4GF as a branch chief. . . . The power limit of 50 watts on the 420–450 Mc. band was dropped at ARRL request, permitting a kw. in that band except within 200 miles of certain space centers. . . . ARRL officers and staff assisted the Senator Goldwater's office in rewriting the reciprocal operating bill, and spoke at hearings. The bill finally became law in 1964. . . . Mobile log-keeping was simplified by FCC along lines earlier proposed by ARRL. . . . A cumulative index covering twelve volumes of *QST* was published in 1963. . . . A question as to whether QSL shipments in bulk violated the "private express statutes" was resolved in the amateurs' favor, so long as the cards merely repeat information already exchanged on the air. . . . Several adjustments were made to the sharing arrangements between the amateur service and the Loran service in the 1.8–2.0 Mc. band, with amateurs in every state. New rules for the administration of Novice, Technicians and Conditional Class license examinations went into effect late in 1963. . . . The League's petition for rulemaking to reactivate the Advanced Class license was filed with FCC and assigned the file number RM-499. The first amateur license to be handled by automatic data processing equipment was issued in March 1964. . . . The 1964 Board meeting reaffirmed its support for RM-499 on a 14-to-1 vote. . . . The gift of equipment from K7LJA for W1AW by Mrs. Thorne Donnelley was gratefully accepted. . . . The Post Office announced in June, 1964, that a stamp commemorating radio amateurs would be issued during the year in recognition of the League's 50th anniversary and in recognition of amateur emergency work, such as in the Alaskan earthquake. . . . The reciprocal operating bill was signed May 28, 1964; first agreement under it was with Costa Rica, in August.

International Amateur Radio Union made up a strong team of observers, including IARU-ARRL Secretary Huntoon, Bill Orr, W6SAI, of Project Oscar, Inc., and ARRL General Counsel Booth. Our representatives initially expected to return in a week or ten days, but ended up staying for the whole conference period when a serious hassle developed. The United Kingdom presented a proposal that amateur earth satellites be permitted to operate on 144–146 Mc. The United States view had been that no action was required, the Geneva regulations being broad enough to accommodate amateur satellite operation. The U.S.S.R. felt that amateurs had no business in satellite operations at all. The amateur service finally emerged with a clean authorization for amateur satellites operating in the 2-meter band, but at the same time this implied that satellites could not operate in other international amateur bands.

Prior to the space conference there had been a "Panel of Experts" study of congestion on the radio spectrum between 4 and 27 Mc. Captain Paul Miles of the United States was one of the experts; he went to the meetings armed with extensive information about each radio service prepared by a "Panel of Experts Advisory Committee" on which W1BUD and W1LVQ represented the amateur service. Fortunately, the work of the panel stayed on matters other than allocations and thus did not affect amateurs.

In 1964 it was announced that the International Telecommunications Union would hold a Plenipotentiary Conference in Montreaux, Switzerland, beginning on September 14, 1965. While the "plenipots" has the right to conduct any phase of ITU business, the major nations normally will not be prepared to talk about frequency allocations or service requirements. Instead, diplomats rather than technicians will be present to pick a new ITU secretary (to replace HB9IA/W3GG who will be retiring), to act on admission of new members, to alter arrangements for support of ITU by its members and so on.

ARRL has begun some studies in preparation for the next allocations bash, whenever it occurs, a good guess being 1968 or 1969. Morever, the Board of Directors has earmarked the sum of $100,000 for the defense of amateur frequencies.

Awareness of amateur radio as an international art increased sharply during this period. The U.S.S.R. was among several countries whose national amateur societies joined the IARU. An International Amateur Radio Club was formed with 4U1ITU as its headquarters station. IARU Region I conferences were held at Folkestone, England, in 1960 and at Malmo, Sweden, in 1963. League President Hoover and other officials have made visits to several European societies since 1962. In 1964, the Region II societies organized a division within IARU under the name Inter-American Union of Radio Amateurs, with help from IARU Region I officials and IARU Headquarters. Official delegates from the League, WØNWX for the U.S. and VE3CJ for Canada, attended the formative meeting in Mexico City in April. Antonio Pita, XE1CCP, became president of the IAURA. Both ARRL delegates were chosen for membership on the regional executive committee, with VE3CJ becoming international treasurer as well.

Countdown for new headquarters building, March 28, 1962: members of the Executive, Finance and Housing Committees approved the final plans, and set May 10 as the date for receipt of contractors' bids.

Other big news of the period included the conception, organization and development of the amateur satellite program by Project Oscar, Inc. and launching of its first two beacon satellites. A more sophisticated transponder satellite was virtually ready for launch late in 1964.

In 1958 the Board set up a Building Committee looking toward a new headquarters. The group first examined a possible move of the headquarters to the center of the U.S. It was once again concluded that business and personnel problems it would entail far outweighed possible benefits.

After extensive examination, the decision was made to construct a new building to the League's own specification, on the seven-acre W1AW plot in Newington. Members were asked in an editorial whether the League should use its reserves or conduct a building fund drive. Letter response was overwhelmingly in favor of the fund drive, and the Board authorized action along those lines. Although the campaign has been very low-pressure compared to the campaigns carried on by other institutions, in less than three years more than 90% of the goal has been reached in actual money, not merely pledges. In the summer of 1962 construction began, and was completed by the end of June, 1963.

The ARRL has emerged from the shadow of a local radio club in 1914 to a position of strength and leadership in 1964.

With a membership aware of long-term and continuing problems, with an alert and vigorous Board, supervising the activities of a knowledgeable and experienced staff, and with a building adequate for a lot of future growth, there is every indication that the second fifty years of the League will write a record even more impressive than the first.

Operating, '60-'64

THE popularity of the different bands underwent very considerable changes after World War II. The changes were due to some changes in regulations, some in technique, and of course with the changes in propagation due to the sun spot cycle. In a decade v.h.f. work had increased from about 6% to 13% of all amateur operating.

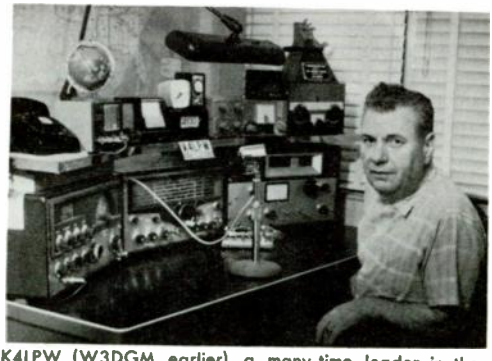
The IGY Project had terminated in '59 with praise for the amateurs taking part from the National Academy of Sciences as well as from the USAF Research and Development Command. Based on the operational v.h.f. experience of a thousand or more enrolled amateurs, data was collected on all the more unusual forms of radio wave propagation. As a 'new frontier' in operating, new v.h.f. results were now very much in the spotlight. W6NLZ and KH6UK got the League's '60 Merit Award based on their pioneering work on tropospheric propagation in '59 and '60. This was recognized by their receiving the Edison Award the following year. In July '60 W6HB and W1BU completed the first recorded two-way contacts (on 1296 Mc.) by moon bounce. The 10,000 Mc. record was extended to 265 mile two-way work that same month by W7JIP/7 and W7LHL/7. Another survey of amateur operating interest was made (by *QST* card) and the results published in 1960 showed that ten meter operation which had represented a quarter of all amateur operating in '47 was now of the order of only 12% . . . and that 75% of all operation continued in the 15- to 160-meter h.f. bands.

The 'new' 15-meter band held a well divided, c.w. and phone interest. In 1960 this amounted to about 13% of all operating interest. The twenty, forty and eighty bands held almost 60% of our operating. Phone operation by 1960 was approximately 50:50 s.s.b. and a.m. operation (80 and 40) with almost 70% of the 14 Mc. voice work by s.s.b. These three bands held almost equal interest and use by amateurs with 20 popular for DXing and 80 for traffic.

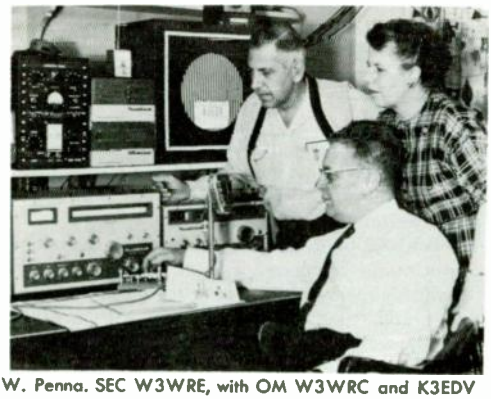
The National Traffic System continued to make performance gains. The net schedules tied together in NTS provided a systematic means by which any individual amateur might communicate for himself or others, by placing a formal message on his section net, this to be relayed through regional and area stations. "Grass roots" net operation, with League encouragement was expanded in many ARRL Sections as to the number of net sessions. Where possible these were made *daily*, instead of on a once a week basis to further the maintenance of a real message service. The number of nets registered in the ARRL Net Directory advanced from 580 in '60 to 788 in the latest (Dec. '64) directory. In this recent five year period total individual message handlings have constantly run between 1.7 and 2 million per year.

In 1961 the hospital ship SS *Hope* made its way around the world. W8OLJ/MM developed and maintained hundreds of contacts with USA, handling morale and personal traffic. But the shining highlight for '61 was the finalizing of technical and operational plans for our earth orbiting satelite. Oscar I was put in orbit December 12, '61, and Oscar II successfully orbited June 2, '62, beeping its fraternal "hi" to the world. This marked a new milestone in amateur attainment and the Project Oscar Association was awarded the '62 ARRL Merit Award.

Amateur interest in all operating contests has been extensive in recent years. The reports have been fully detailed in *QST*. Stressing emergency preparations, the annual ARRL Field Day (June) has consistently embraced the testing of more and more equipment for more and more operators. With something like 15,000 operators afield a new high was achieved in '63 with 3815 receiver-transmitter setups in operation reported for this FD weekend! The 29th annual Sweepstakes in '62 brought an all time high in the number of logs with scores almost beyond belief. ARRL International DX Contests even under the spell of the unfavorable propagation conditions seldom bring less than 1500 logs from participants. The "SS" all time record score was posted in the '62 "SS". W5WZQ scored 290,000 with 1600 QSO's in 73 sections.



K4LPW (W3DGM earlier), a many-time leader in the November "SS" and in CD Parties rolled up 141,000 phone points for Tennessee in the 1960 "SS"



W. Penna. SEC W3WRE, with OM W3WRC and K3EDV at the key of Cambria County RACES set up.

The v.h.f. Sweepstakes has come up to be one of the "big four" in ARRL contests with June and September V.H.F. QSO Parties a close second in commanding popular operating attention by v.h.f. operators. Many thousands of v.h.f.ers have made it a point never to miss these chances to pick up more states and roll up new DX records with their transmitters. Between 1500 and 1600 competing logs are received after a January v.h.f. "SS". Operation from the mountain tops is popular in the June and September activity with versatility on several bands aiding multipliers.

The Novice Roundup in this five-year period has commanded increased interest. Even though the number of new FCC licensees is substantially constant each year, current reports show a 33% increase.

In the award field, between 6500 and 7500 qualify as new members of the Rag Chewers Club with each passing year. There has been no fall off in the number of annual applications for WAS certification, even with the addition of two states to the Union. The peak year for WAS was probably '62 with 1011 issuances.

Since 1962 there has been a continuing crusade for good operating and clean signals, reminiscent of the period that followed the institution of government requirements for the use of pure d.c. plate supplies and stabilized transmitters in the early thirties.

In '63 and more recently, numerous DXpeditions put new countries within the grasp of DXers. We had the announcement of new excursions by Don Miller, V. C. Harvey-Brain, and by Gus Browning. The following DXpedition's calls will bring these to mind: FR7ZC/T FR7ZC/G, FR7ZC/J, AC5A/AC4, AC7A, W9WNV/KG6, VQ8BFA, just to name a few.

The 27th ARRL Field Day was held in 1963 and produced a brand-new high in the number of logs, the number of units afield and the scores . . . 3815 transmitters tested and representing about 5% increase from the highest previous showing on any FD.

The operating news these last twelve months records all the customary zest for operating achievement, for organized activities, contests and awards. A summary of recent developments must include that:

(1) ARRL and the Red Cross, long partners in disaster work, have renewed and updated a cooperative agreement or understanding to assist in communications planning for emergencies.

(2) The popular ARRL code practice sessions have been expanded to give *two* tape sent runs each day over a wide variety of speeds.

(3) To promote good operating procedures listings of Operator of the Month have been introduced.

(4) The current year's Simulated Emergency Test was a combined AREC-NTS test. Results show the degree to which the Boards' combining of the Amateur Radio Public Service Corps (to have Amateur Radio Emergency Corps and National Traffic System divisions) has been bearing fruit. Progress is exemplified also in Section level exercises such as the joint NNJ AREC-NTS Test sponsored by K2ZFI, W2QNL, W2CVW as a Public Service Corps drill. The SET score ratings have steadily advanced from '57 to the present time.

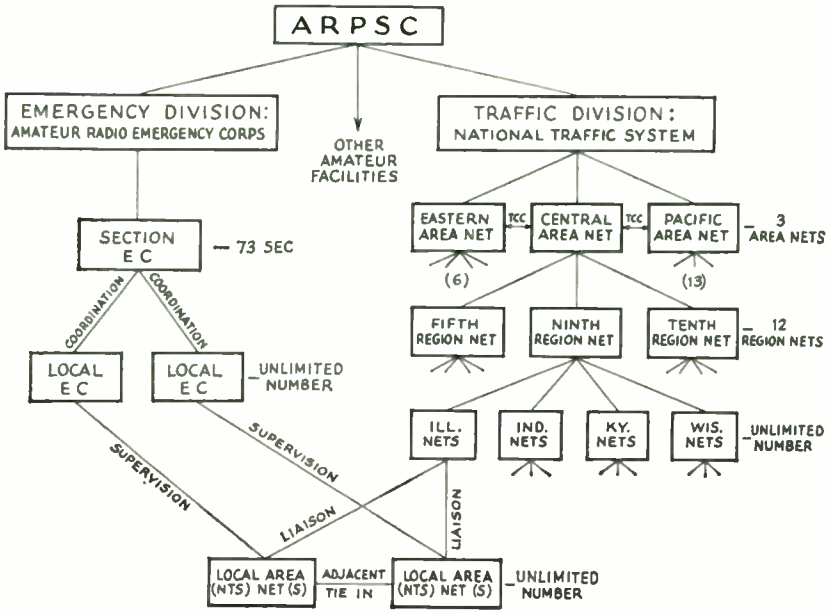
(5) Our account must mention in conclusion that as '64 comes to a close there are thousands of v.h.f. operators and members awaiting the word that Oscar III, our *relay* satelite is to be orbited . . . *new* fields to conquer. With stations of every mode and frequency band participating widely in *organized* amateur operating, there's no limit to the practical communications capabilities the Amateur can boast.

Fifty Years Emergency Communications

DURING the past semi-decade an increasing awareness of the public service values of amateur radio has come to the fore on the part of those of the fraternity not previously connected with this branch of activity. With attention focusing on the value of the amateur rather than on "how to have fun," our public service activity, both in operating and in technical fields, has come under sharp scrutiny.

While all this is happening, amateurs continue to render the communications services they have always rendered. The closing of ranks to perform this service in a fully-organized fashion and pattern augurs well for the future, but during the period from 1960 to the present only a bare beginning has been made in this direction. Let's review briefly the emergency

Among the best-organized for emergency operation is the state of Florida. In 1961, the two SECs organized a "Simulated Emergency Test (SET) to end all simulated emergency tests." "Hurricane SET" was dug from the Weather Bureau's historical files and used as an example to test AREC facilities.



This block diagram illustrates how the AREC and NTS were tied together to form the Amateur Radio Public Service Corps in 1963. While the two divisions are centralized at the top level and conduct liaison at the bottom, in an emergency situation liaison among leadership appointees exists at all levels.

communications picture during the past five years, then consider for a moment what the future holds or can hold for us.

In February of 1960, many American amateurs stationed in the area took part in communications problems connected with the disastrous earthquake in Morocco. In March and April there was extensive flooding in the midwest, and of course amateurs were conspicuous by their presence. In September we had Hurricane Donna, which made some memorable history in the annals of Florida emergency communications.

A year later, in Sept. 1961, Hurricane Carla drove inland from the Gulf of Mexico across Texas as far as Waco, where she dispersed after causing untold damage and alerting thousands of amateurs in the southwest, many of whom performed notable emergency communications deeds.

In March of '62 a widespread storm on the Atlantic Coast brought amateurs on the scene in many areas. And most readers will remember Typhoon Karen, that monster which all but wiped out our establishment on the island of Guam in November of '62.

On Good Friday, 1964, came the disastrous Alaskan earthquake which showed us so much, both good and bad, about our public service establishment. A week later a tornado ripped Wichita Falls, Texas, precipitating a communications crises in which amateurs responded nobly.

As we write this, reports of amateur operation during a series of Florida hurricanes (notably Cleo, Dora and Isbell) and one which hit Louisiana (Hilda) are crossing our desk and going into files from which source material for recording in *QST* will be taken. Right down to the present time, amateurs have made themselves felt in every and all communications emergencies, to a greater or lesser extent.

Probably one of the most significant occurrences to affect emergency preparation during the period since 1960 has been ARRL's program to upgrade the amateur service. Although our AREC and NTS organizations have been doing just this for periods of thirty and fifteen years respectively, the new drive put the spotlight on our program, gave it increased emphasis and support. Headquarters staff working on public service projects such as AREC and NTS was increased. More prominence was given these subjects in *QST*, some innovations were made, and recruiting and training programs were undertaken.

One of the more significant developments was the combination of AREC and NTS under a single heading without changing the basic and essential functions of either — the birth of the Amateur Radio Public Service Corps as a single entity in fact rather than as just a "feeling" among public-service-minded amateurs.

"Stuck away in the back pages in small print," says *With the AREC*, May '63 *QST*, "an announcement of the creation of a new entity will make no big splash." But, the announcement goes on, this is a "go-slow, take-it-easy, spontaneous progression which one falls into in the natural course, like love and mar-

riage." Most of the AREC and NTS had gradually been worked into such a program through the years, and there was no great reaction, nor was there intended to be one. The creation of ARPSC was like the hatching of an egg long in incubation. Many were pleased, some were excited, but no one was really surprised. This was a perfectly logical and natural development, long in the making. This is the spirit in which the amateur accepted the Amateur Radio Public Service Corps; and with the present emphasis on this type of activity, the concept has made giant strides.

We promised to look into the future. The ARPSC program is a positive one, and as such there is no limit to the extent of its impact on the amateur fraternity. Its two principal components, AREC and NTS, have long utilized the services of those amateurs who derive their greatest satisfaction out of doing something which is useful or valuable to others. A few have participated out of a sense of duty, though not very enthusiastically and not for long. The pure fun-seekers and hobbiests have, for the most part, gone their own way, most of them unaware of or uncaring about the needs for public service by amateurs to justify the use of frequencies.

Our crystal ball seems to show that public service operation, with ARRL emphasis and encouragement, will become a fad, a hobby in itself, a "way of life" among thousands of amateurs, increasing in number until it is a principle activity in amateur radio. ARPSC organizations will become larger but at the same time tighter, to the extent that emergency preparedness will exist not just because a net or net system drills once per week or so, but because it is continuously active in traffic handling or/and other regular public service pursuits.

A new breed of amateur will become common in our ranks — the versatile amateur, who is equally at home on c.w. or voice, s.s.b. or a.m., v.h.f. and h.f., who has RTTY equipment installed and ready to operate whenever it can be useful, who is mobile-equipped for the road and has emergency power available at home, and who has the interest and ability to use all these things to best effect under any conditions.

And because of this, along with increased technical proficiency, the amateur radio service will retain its operating frequencies.

Technical

THE technical achievements of the past few years have been so inextricably tied in with operating that there is no need to repeat them here. The main direction seems surely to be toward extending v.h.f. and u.h.f. ranges by every conceivable means, including orbiting active satellite repeaters (OSCAR).

The technical history has always been tied closely to operating. In the beginning, with spark transmitters and crystal receivers, true *communication* was largely a matter of operating cooperation (staying off the air until it was your turn). Transcontinental relays in a single evening were made possible only by full cooperation all along the way. Technical refinements in transmitters and receivers couldn't alter the basic fact that spark and crystals could never make up an efficient narrow-band communications system.

With vacuum tubes the situation changed considerably. The road toward narrow-band high-efficiency systems was opened (although it was quite a few years before the paving was completed!). New frequencies — the "short waves" — became available. Slowly the inquisitive and the adventurous pushed the road farther and farther into the spectrum, often into areas considered useless or unprofitable by other services. The curiosity led to h.f. daytime DX and other extensions of operating range (in distance and in time). When finally amateur "band" operation (as opposed to the "channel" operation of all other services except, possibly, the military) became established, the technical problem was basically that of crowding an increasing number of stations into any given band without losing communications effectiveness. This led to A1 instead of A2 code, improved receiver selectivity, transmitter stability, and s.s.b. With the exception of the d.c. regulations, a result of regulation "forced" upon the amateurs (at their request), the remainder were improvements initiated by the amateurs themselves. Without these technical advances, and some old-fashioned amateur cooperation, it would be impossible to pack as many hams as we do into the bands we have.

Getting along with other services has always been an amateur problem, sometimes social, sometimes technical. At one time interference with broadcast reception was a big threat to amateur radio, and several decades later TVI became an even greater menace. These challenges were met, not yet happily for everyone perhaps, but at least the problems are completely defined and the solutions are known.

Up To Now

DECEMBER 1915 through December 1959 — most of the life span of a fellow old enough to copy NAA or WCC before World War I — were the years covered by our ten preceding installments on the industry and its advertising in *QST*. By 1960 the amateur radio business was

well stabilized. S.s.b. was established, electronic keys were fairly common, the conventional kilowatt/beam station was just another signal in DX pile-ups. Although many manufacturers brought out new models during the years of 1960 through 1964, equipment with performance exceeding even the dreams of the hams of the thirties, there were no radically new developments like single signal or s.s.b. to advertise. The only significant change in operating practice due to commercially built equipment was the sharp increase in the use of transceivers.

In fifty years of amateur radio the change in companies has been great. Firms have disappeared from the advertising pages of *QST*; more have come in. Perhaps we forget how many friends we now have in the business—such as manufacturers who are consistently developing new gear and distributors who take our old equipment in trade and accept monthly payments for the new.

Let's look at the companies who have been genuinely interested in us hams during the years of 1960 through 1963, and who in 1964 are still proving their interest through the advertising pages of *QST*:

Receivers, Converters

Ameco Equipment Corp.
Collins Radio Co.
R. L. Drake Co.
Eico
FM Sales Co.
Gonset Division
Hallicrafters
Hammarlund Mfg. Co.
Heath Co.
International Crystal Mfg. Co.
Justin, Inc.
National Radio Co.
Scientific Associates
Squires-Sanders Inc.
Technical Materiel Co.
Tecraft
Vanguard Electronic Labs.

Transmitters, Transceivers, Amplifiers

Ameco Equipment Corp.
Barker & Williamson, Inc.
Collins Radio Co.
R. L. Drake Co.
Eico
FM Sales Co.
Galaxy Electronics
Gonset Division
Hallicrafters
Hammarlund Mfg. Co.
Heath Co.
Hunter Mfg. Co.
International Crystal Mfg. Co.
E. F. Johnson Co.
Justin, Inc.
James Millen Mfg. Co.
National Radio Co.
P & H Electronics, Inc.
R. F. Communications Assoc.
Sideband Engineers, Inc.
Squires-Sanders, Inc.
Swan Electronics Corp.
Technical Materiel Corp.
Tecraft
Vanguard Electronic Labs.
Whippany Laboratories, Inc.

Antennas, Rotators, Towers

Alliance Mfg. Co.
Antenna Specialists Co.
Barker & Williamson, Inc.
B & K/Mark Div.
Barrington Specialties
Columbia Products
Communication Products Co.
Cornell-Dubilier Electronics Div.
Cubex Co.
Cush Craft
E-Z Way Products, Inc.
Finney Co.
Gain, Inc.
Gotham
Hi-Par Products Co.
Hornet Electronics Co.
Hy-Gain Antenna Products Co.
E. F. Johnson Co.
Herb Kreckman Co.
Lattin Radio Labs.
Mini-Products, Inc.
Master Mobile Mounts
Mor-Gain
Mosley Electronics, Inc.
New-Tronics, Inc.
Rohn Mfg. Co.
Skylane Products
Telrex, Inc.
Tri-Ex Tower Corp.
Vesto Co., Inc.
Webster Mfg. Co.
World Radio Laboratories

Distributors, Equipment Wanted

Adirondack Radio Supply
Aircraft Radio Industries
Airex Radio Corp.
Allied Radio Corp.
Amateur Electronic Supply
Arrow Electronics, Inc.
Walter Ashe Radio Co.
Barry Electronics

Burstein-Applebee Co.
Communications Equipment Co.
Corky's Division
Crawford Radio
Theodore E. Dames Co.
Evans Radio
Fort Orange Radio Dist. Co.
Grand Central Radio
Harrison Radio
Harvey Radio Co.
Henry Radio Stores
Lafayette Radio
Newark Electronics
Organs & Electronics
Radio, Inc.
Bill Slep Electronics
Smalley's Radio Ltd.
Trigger Electronics
Van Sickle Radio Supply Co.
Willard Wilson, Inc.
World Radio Laboratories

Vacuum Tubes

Amperex Electronic Corp.
Eitel-McCullough, Inc.
Penta Labs
RCA Electronic Components and Devices
Sylvania Electric Products, Inc.

Operating Accessories, Components, Test Equipment

Alkan Products
Allinger Mfg.
Alltronics-Howard Co.
Astatic Corp.
Barker & Williamson, Inc.
Belden Mfg. Co.
British Radio Electronics, Ltd.
Clemens Mfg. Co.
Collins Radio Co.
Cush Craft
Dow-Key Co.
R. L. Drake Co.
Eico
Electronicraft, Inc.
Electro-Voice, Inc.
Electrophysics Corp.
Fichter Electronics
Frederick Electronics Corp.
Gertsch Products, Inc.
R. W. Groth Mfg. Co.
Hallicrafters
Ham Kits
Ham World Wide Novelty Clock
Hammarlund Mfg. Co.
Heath Co.
H & M Engineering Lab
International Crystal Mfg. Co.
E. F. Johnson Co.
Kit Kraft
Kolin Engineering Co.
Lampkin Laboratories, Inc.
Linear Systems, Inc.
LTV University
McCoy Electronics Co.
Mach Electronics
Master Mechanic Mfg. Co.
James Millen Mfg. Co.
J. W. Miller Co.
Mosley Electronics, Inc.
National Radio Co.
New Products
Pennwood Numechron Co.
Productive Tool & Mfg. Co.
Punches Division
P & H Electronics, Inc.
Radio Amateur Call Book
Seco Electronics, Inc.
Shure Bros. Inc.
Technical Materiel Corp.
Telex/Acoustic Products
Tepabco
Terado Corp.
Topaz Transformer Products
Trans-Pro Labs.
United Transformer Corp.
Vanco Sales
Vibroplex Co.
Waters Mfg. Co.
Wisco
WA6DUW
W3KT QSL Service

Miscellaneous Helps

Ameco Equipment Corp.
Camp Albert Butler
Cleveland Institute of Electronics
Douglas Instrument Lab.
Editors & Engineers, Ltd.
Epsilon Records
Gardiner and Co.
Instructograph Co.
I. E. E. E.
W. J. Miller & Co.
Radio Publications, Inc.
Raytheon Co.
Teleplex Co.

Quite a list! The radio amateur is no longer the little boy in the attic. Two hundred and sixty thousand U. S. hams are now buying about forty million dollars worth of equipment, accessories, towers, beams, etc., each year.

The circulation of *QST* is now greater than 110,000. Advertising rate card No. 16 went into effect with the June 1961 issue. The cost of one page is $476.

We can be proud that more than one hundred and fifty companies are catering to our needs. It should be obvious to everyone—even to the prophets of doom who from time to time briefly emerge from well deserved oblivion—that amateur radio is here to stay and that its growth is steady and healthy. QST