

# THE AMATEUR'S CODE

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- 1** *The Amateur is Gentlemanly.* He never knowingly uses the air for his own amusement in such a way as to lessen the pleasure of others. He abides by the pledges given by the A.R.R.L. in his behalf to the public and the Government.
- 2** *The Amateur is Loyal.* He owes his amateur radio to the American Radio Relay League, and he offers it his unswerving loyalty.
- 3** *The Amateur is Progressive.* He keeps his station abreast of science. It is built well and efficiently. His operating practice is clean and regular.
- 4** *The Amateur is Friendly.* Slow and patient sending when requested, friendly advice and counsel to the beginner, kindly assistance and coöperation for the broadcast listener; these are marks of the amateur spirit.
- 5** *The Amateur is Balanced.* Radio is his hobby. He never allows it to interfere with any of the duties he owes to his home, his job, his school, or his community.
- 6** *The Amateur is Patriotic.* His knowledge and his station are always ready for the service of his country and his community.

# Story of Amateur Radio

## *How It Started — The Part Played by The A.R.R.L.*

AMATEUR radio represents, to some seventy thousand people, the most satisfying, most exciting of all hobbies. Over 50,000 of these enthusiasts are located in the United States and Canada, for it is this continent which gave birth to the movement and which has ever since represented its stronghold.

When radio broadcasting was first introduced to the public some years ago, it instantly caught the fancy of millions of people all over the world. Why? Because it fired their imagination — because it thrilled them to tune in on a program direct from some distant point, to hear speech and music that was at that moment being transmitted from a city hundreds and even thousands of miles away. To be sure there was also a certain amount of entertainment value, and it is true that as the years have passed this phase has become paramount in the minds of most listeners; yet the thrill of "DX" is still a major factor in the minds of hundreds of thousands of people, as witness the present popularity of international short wave reception of foreign programs.

That keen satisfaction of hearing a distant station is basic with the radio amateur but it has long since been superseded by an even greater lure, and that is the thrill of *talking* with these distant points! On one side of your radio amateur's table is his short-wave receiver; on the other side is his private (and usually homemade) short-wave transmitter, ready at the throw of a switch to be used in calling and "working" other amateurs in the United States, in Canada, Europe, Australia, every corner of the globe!\* Even a low-power transmitter makes it possible to develop friendships in every State in the Union. Of course, it is not to be expected that the first contacts will necessarily be with foreign amateurs. Experience in adjusting the simple transmitter, in using the right frequency band at the right time of day when foreign stations are on the air, and practice in operating are necessary before communication will be enjoyed with amateurs of other nationalities. But patience and experience are the sole prerequisites; neither high power nor expensive equipment is required.

\* Because of the current international situation, communication by U. S. amateurs with foreign countries is temporarily forbidden.

Nor does the personal enjoyment that comes from amateur radio constitute its only benefit. There is the enduring satisfaction that comes from doing things with the apparatus put together by one's own skill. The process of designing and constructing radio equipment develops real engineering ability. Operating an amateur station with even the simplest equipment likewise develops operating proficiency and skill. Many an engineer, operator and executive in the commercial radio field got his practical background and much of his training from his amateur work. So, in addition to the advantages of amateur radio as a hobby, the value of systematic amateur work to a student of almost every branch of radio cannot well be overlooked. An increasing number of radio services, each expanding in itself, require additional personnel — technicians, operators, inspectors, engineers and executives — and in every field a background of amateur experience is regarded as valuable.

Amateur radio is as old as the art itself.

There were amateurs before the present century. Shortly after the late Guglielmo Marconi had astounded the world with his first experiments proving that telegraph messages actually could be sent between distant points without wires, they were attempting to duplicate his results. Marconi himself was probably the first amateur — indeed, the distinguished inventor so liked to style himself. But amateur radio as it has come to be known was born when private citizens first saw in the new marvel a means for personal communication with others and set about learning enough of the new art to build a homemade station.

Amateur radio's subsequent development may be divided into two periods: pre-war and post-war.

Pre-war amateur radio bore little resemblance to the art as it exists to-day, except in principle. The equipment, both transmitting and receiving, was of a type now long obsolete. The range of even the highest-powered transmitters, under the most favorable conditions, would be scoffed at by the rankest beginner to-day. No United States amateur had ever heard the signals of a foreign amateur, nor

# The Radio Amateur's Handbook

had any foreigner ever reported hearing an American. The oceans were a wall of silence, impenetrable, isolating us from every signal abroad. Even transcontinental DX was accomplished in relays. "Short waves" meant 200 meters; the entire wavelength spectrum below 200 meters was a vast silence — no signal ever disturbed it. Years were to pass before its phenomenal possibilities were to be suspected.

Yet the period was notable for a number of accomplishments. It saw the number of amateurs in the United States increase to approximately 4,000 by 1917. It witnessed the first appearance of radio laws, licensing, wavelength specifications for the various services. ("Amateurs? — oh, yes — well, stick 'em on 200 meters: it's no good for anything; they'll never get out of their own back yards with it.") It saw an increase in the range of amateur stations to such unheard-of distances as 500 and, in some cases, even 1,000 miles, with U. S. amateurs beginning to wonder, just before the war, if there were amateurs in other countries across the seas and if — daring thought! — it might some day be possible to span the Atlantic with 200-meter equipment. Because all long-distance messages had to be relayed, this period saw relaying developed to a fine art — and what a priceless accomplishment that ability turned out to be later when the government suddenly needed dozens and hundreds of skilled operators for war service! Most important of all, the pre-war period witnessed the birth of the American Radio Relay League, the amateur organization whose fame was to travel to all parts of the world and whose name was to be virtually synonymous with subsequent amateur progress and short-wave development. Conceived and formed by the famous inventor and amateur, the late Hiram Percy Maxim, it was formally launched in early 1914 and was just beginning to exert its full force in amateur activities when the United States declared war and by that act sounded the knell for amateur radio for the next two and one-half years. By presidential direction every amateur station was dismantled. Within a few months three-fourths of the amateurs of the country were serving with the armed forces of the United States as operators and instructors.

Few amateurs to-day realize that the war not only marked the close of the first phase of amateur development but came very near marking its end for all time. The fate of amateur radio was in the balance in the days immediately following declaration of the Armistice, in 1918. The government, having had a taste of supreme authority over all communications in wartime, was more than half inclined to keep it; indeed, the war had not been ended a month

before Congress was considering legislation that would have made it impossible for the amateur radio of old ever to be resumed. President Maxim rushed to Washington, pleaded, argued; the bill was defeated. But there was still no amateur radio; the war ban continued in effect. Repeated representations to Washington met only with silence; it was to be nearly a year before licenses were again issued.

In the meantime, however, there was much to be done. Three-fourths of the former amateurs had gone to France; many of them would never come back. Would those who had returned be interested, now, in such things as amateur radio? Mr. Maxim determined to find out and called a meeting of such members of the Board of Directors of the League as he could locate. Eleven men, several still in uniform, met in New York and took stock of the situation. It wasn't very encouraging: amateur radio still banned by law, former members of the League scattered no one knew where, no League, no membership, no funds. But those eleven men financed the publication of a notice to all the former amateurs that could be located, hired Kenneth B. Warner as the League's first paid secretary, floated a bond issue among old League members to obtain money for immediate running expenses, bought the magazine *QST* to be the League's official organ, and dunned officialdom until the war-time ban was lifted and amateur radio resumed again. Even before the ban was lifted, in October, 1919, old-timers all over the country were flocking back to the League, renewing friendships, planning for the future. When licensing was resumed there was a headlong rush to get back on the air.

From the start, however, post-war amateur radio took on new aspects. War-time pressure had stimulated technical development in radio. There were new types of equipment. The vacuum tube was being used for both receiving and transmitting. Amateurs immediately adapted the new apparatus to 200-meter work. Ranges promptly increased; soon it was possible to bridge the continent with but one intermediate relay. Shortly thereafter stations on one coast were hearing those on the other direct!

These developments had an inevitable result. Watching DX come to represent 1,000 miles, then 1,500 and then 2,000, amateurs began to dream of transatlantic work. Could they get across? In December, 1921, the A.R.R.L. sent abroad one of its most prominent amateurs, Paul Godley, with the best amateur receiving equipment available. Tests were run, and thirty American amateur stations were heard in Europe! The news electrified the amateur world. In 1922 another transatlantic test was carried out; this time 315 American calls

## 10 CHAPTER ONE

# Story of Amateur Radio

were logged by European amateurs and, what was more, one French and two British stations were heard on this side.

Everything now was centered on one objective: two-way communication across the Atlantic by amateur radio! It *must* be possible — but somehow they couldn't quite make it. Further increases in power were out of the question; many amateurs already were using the legal maximum of one kilowatt. Better receivers? They already had the superheterodyne; it didn't seem possible to make any very great advance in that direction.

How about trying another wavelength, then, they asked? What about those wavelengths *below* 200 meters? The engineering world said they were worthless — but then, that had been said about 200 meters, too. There have been many wrong guesses in history. In 1922 the assistant technical editor of *QST* (Phelps, now W9BP) carried on tests between Hartford and Boston on 130 meters. The results were encouraging. Early in 1923 the A.R.R.L. sponsored a series of organized tests on wavelengths down to 90 meters and it was noted that as the wavelength dropped the reported results were better. A growing excitement began to filter into the amateur ranks.

Finally, in November, 1923, after some months of careful preparation, two-way amateur communication across the Atlantic became a reality, when Schnell, 1MO (now W9UZ), and Reinartz, 1XAM (now W3IBS), worked for several hours with Deloy, 8AB, in France, all three stations using a wavelength of 110 meters! Additional stations dropped down to 100 meters and found that they, too, could easily work two-way across the Atlantic. The exodus from the 200-meter region started.

By 1924 the entire radio world was agog and dozens of commercial companies were rushing stations into the 100-meter region. Chaos threatened, until the first of a series of radio conferences partitioned off various bands of frequencies for all the different services clamoring for assignments. Although thought was still centered in 100 meters, League officials at the first of these conferences, in 1924, came to the conclusion that the surface had probably only been scratched, and wisely obtained amateur bands not only at 80 meters, but at 40 and 20 and 10 and even 5 meters.

Many amateurs promptly jumped down to the 40-meter band. A pretty low wavelength, to be sure, but you never could tell about these short waves. Forty was given a try and responded by enabling two-way communication with Australia, New Zealand and South Africa.

How about 20? It immediately showed entirely unexpected possibilities by enabling an east-coast amateur to communicate with

another on the west coast, direct, at high noon. The dream of amateur radio — daylight DX! — had come true.

From that time to the present represents a period of unparalleled accomplishment. The short waves proved a veritable gold mine. Country after country came on the air, until the confusion became so great that it was necessary to devise a system of international intermediates in order to distinguish the nationality of calls. The League began issuing what are known as WAC certificates to stations proving that they had worked all the continents. Over five thousand such certificates have been issued. Representatives of the A.R.R.L. went to Paris and deliberated with the amateur representatives of twenty-two other nations. On April 17, 1925, this conference formed the International Amateur Radio Union — a federation of national amateur societies. The amateur as a type is the same the world over.

Nor has experimental development been lost sight of in the enthusiasm incident to international amateur communication. The experimentally-minded amateur is constantly at work conducting tests in new frequency bands, devising improved apparatus for amateur receiving and transmitting, learning how to operate two and three and even four stations where previously there was room enough for only one.

In particular, the amateur experimenter presses on to the development of the higher frequencies represented by the wavelengths below 10 meters, territory only a few years ago regarded even by most amateurs as comparatively unprofitable operating ground.

The amateur's experience with five meters is especially representative of his initiative and resourcefulness, and his ability to make the most of what is at hand. In 1924 first amateur experiments in the vicinity of 56 Mc. indicated the band to be practically worthless for distance work; signals at such frequencies appeared capable of being heard only to "horizon range." But the amateur turns even such apparent disadvantages to use. If not suitable for long-distance work, at least the band was ideal for "short-haul" communication. Beginning in 1931, then, there was tremendous activity in 56-Mc. work by hundreds of amateurs all over the country, and a complete new line of transmitters and receivers was developed to meet the special conditions incident to communicating at these ultra-high frequencies. In 1934 additional impetus was given to this band when experiments by the A.R.R.L. with directive antennas resulted in remarkably consistent two-way communication over distances of more than 100 miles, without the aid of "hilltop" locations. While atmospheric con-

# The Radio Amateur's Handbook

ditions appear to have a great deal to do with 5-meter DX, many thousands of amateurs are now spending much of their time in the 56-Mc. region, some having worked as many as four or five hundred different stations on that band at distances up to several hundred miles. Recently the radio world has been astounded by conditions whereby transcontinental contacts have been made on five meters, with hundreds of contacts over a thousand miles or so. To-day's concept of u.h.f. propagation was developed almost entirely through amateur research.

Most of the technical developments in amateur radio have come from the amateur ranks. Many of these developments represent valuable contributions to the art, and the articles about them are as widely read in professional circles as by amateurs. At a time when only a few broadcast engineers in the country knew what was meant by "100% modulation" the technical staff of the A.R.R.L. was publishing articles in *QST* urging amateur 'phones to embrace it and showing them how to do it. When interest quickened in five-meter work, and experiments showed that the ordinary regenerative receiver was practically worthless for such wavelengths, it was the A.R.R.L. that developed practical super-regenerative receivers as the solution to the receiver problem. From the League's laboratory, too, came in 1932, the single-signal superheterodyne — the world's most advanced high-frequency radiotelegraph receiver. In 1934 the commercial production of r.f. power pentodes came as a result of the A.R.R.L. Hq. technical staff's urging and demonstration of their advantages. In 1936 the "noise-silencer" circuit for superheterodynes was developed, permitting for the first time satisfactory high-frequency reception through the more common forms of man-made electrical interference. During 1938 the use of transmitters whose frequency could be changed by a continuous panel control became common, along with improved directive antennas.

Amateur radio is one of the finest of hobbies, but this fact alone would hardly merit such whole-hearted support as was given it by the United States government at recent international conferences. There must be other reasons to justify such backing. One of these is a thorough appreciation by the Army and Navy of the value of the amateur as a source of skilled radio personnel in time of war. The other is best described as "public service."

We have already seen 3,500 amateurs contributing their skill and ability to the American cause in the Great War. After the war it was only natural that cordial relations should prevail between the Army and Navy and the amateur. Several things occurred in the next few years to strengthen these relations. In

1924, when the U. S. dirigible *Shenandoah* made a tour of the country, amateurs provided continuous contact between the big ship and the ground. In 1925 when the United States battle fleet made a cruise to Australia and the Navy wished to test out short-wave apparatus for future communication purposes, it was the League's Traffic Manager who was in complete charge of an experimental high-frequency set on the U.S.S. *Seattle*.

Definite friendly relations between the amateur and the armed forces of the Government were cemented in 1925. In this year both the Army and the Navy came to the League with proposals for amateur coöperation. The radio Naval Reserve and the Army-Amateur Net are the outgrowth of these proposals.

The public service record of the amateur is a brilliant one. These services can be roughly divided into two classes: emergencies and expeditions. It is regrettable that space limitations preclude detailed mention of amateur work in both these classes, for the stories constitute high-lights of amateur accomplishment.

Since 1913, amateur radio has been the principal, and in many cases the only, means of outside communication in more than one hundred storm, flood and earthquake emergencies in this country. Among the most noteworthy were the Florida hurricanes of 1926, 1928 and 1935, the Mississippi and New England floods of 1927 and the California dam break of 1928. During 1931 there were the New Zealand and Nicaraguan earthquakes, and in 1932 floods in California and Texas. Outstanding in 1933 was the earthquake in southern California. In 1934 further floods in California and Oklahoma resulted in notable amateur coöperation. The 1936 eastern states flood, the 1937 Ohio River valley flood, and the 1938 southern California flood and Long Island-New England hurricane disaster saw the greatest emergency effort ever performed by amateurs. In all these and many others, amateur radio played a major rôle in the rescue work and amateurs earned worldwide commendation for their resourcefulness in effecting communication where all other means failed.

During 1938 the A.R.R.L. inaugurated its emergency preparedness program, providing for the appointment of regional and local Emergency Coördinators to organize amateur facilities and establish liaison with other agencies. This was in addition to the registration of personnel and equipment in the Emergency Corps. A comprehensive program of coöperation with the Red Cross, Western Union and others was put into effect.

Amateur coöperation with expeditions goes back to 1923, when a League member, Don Mix of Bristol, Conn., accompanied MacMillan to the Arctic on the schooner *Bowdoin* in

## 12 CHAPTER ONE

# Story of Amateur Radio

charge of an amateur set. Amateurs in Canada and the United States provided the home contact. The success of this venture was such that other explorers made inquiry of the League regarding similar arrangements for their journeys. In 1924 another expedition secured amateur cooperation; in 1925 there were three, and by 1928 the figure had risen to nine for that year alone. Each year since then has seen League headquarters in receipt of requests for such service, until now a total of perhaps two hundred voyages and expeditions have been thus assisted. To-day practically no exploring trip starts from this country to remote parts of the world without making arrangements to keep in contact through the medium of amateur radio.

Emergency relief, expeditionary contact, experimental work and countless instances of other forms of public service — rendered, as they always have been and always will be, without hope or expectation of material reward — have made amateur radio an integral part of our national life.

## *The American Radio Relay League*

THE American Radio Relay League is to-day not only the spokesman for amateur radio in this country but it is the largest amateur organization in the world. It is strictly of, by and for amateurs, is non-commercial and has no stockholders. The members of the League are the owners of the A.R.R.L. and *QST*.

The League is organized to represent the amateur in legislative matters. It is pledged to promote interest in two-way amateur communication and experimentation. It is interested in the relaying of messages by amateur radio. It is concerned with the advancement of the radio art. It stands for the maintenance of fraternalism and a high standard of conduct. One of its principal purposes is to keep amateur activities so well conducted that the amateur will continue to justify his existence. As an example of this might be cited the action of the League in sponsoring the establishment of a system of Standard Frequency Stations throughout the United States.

The operating territory of the League is divided into fourteen United States and six Canadian divisions. The affairs of the League are managed by a Board of Directors. One director is elected every two years by the membership of each United States division, and a Canadian General Manager is elected every two years by the Canadian membership. These directors then choose the president and vice-president, who are also directors, of course. No one commercially engaged in selling or manufacturing radio apparatus or literature can be a member of the Board or an officer of the League.

The president, vice-president, secretary, treasurer and communications manager of the League are elected or appointed by the Board of Directors. These officers constitute an Executive Committee which, under certain restrictions, decides how to apply Board policies to matters arising between Board meetings.

The League owns and publishes the magazine *QST*. *QST* goes to all members of the League each month. It acts as a monthly bulletin of the League's organized activities. It serves as a medium for the exchange of ideas. It fosters amateur spirit. Its technical articles are renowned. *QST* has grown to be the "amateur's bible" as well as one of the foremost radio magazines in the world. The profits *QST* makes are used in supporting League activities. Membership dues to the League include a subscription to *QST* for the same period.

The extensive field organization of the Communications Department coordinates operating activities throughout North America.

## *Headquarters*

FROM the humble beginnings recounted in this story of amateur radio, League headquarters has grown until now it occupies an entire office building and employs nearly forty people.

Members of the League are entitled to write to Headquarters for information of any kind, whether it concerns membership, legislation, or general questions on the construction or operation of amateur apparatus. If you don't find the information you want in *QST* or the *Handbook*, write to A.R.R.L. Headquarters, West Hartford, Connecticut, telling us your problem. All replies are made directly by letter; no charge is made for the service.

If you come to Hartford, drop out to Headquarters at 38 LaSalle Road, West Hartford. Visitors are always welcome.

## *Headquarters Stations*

FROM 1927 to 1936 the League operated its headquarters station, W1MK, at Brainerd Field, Hartford's municipal airport on the Connecticut River. During the disastrous flood of 1936 this station was devastated. From the spring of 1936 until early summer of 1938 a temporary station was operated at the headquarters offices, at first under the old auxiliary call W1INF and later as W1AW. The call W1AW, held until his death by Hiram Percy Maxim, was issued to the League by a special order of the Federal Communications Commission for the official headquarters station call.

Beginning September, 1938, the Hiram Percy Maxim Memorial Station at Newington, Conn., has been in operation as the headquarters station. Operating on all amateur bands, with

# The Radio Amateur's Handbook

separate transmitters rated at the maximum legal input of one kilowatt and elaborate antenna systems, this station is heard with good strength in every part of the world. The building in which it is housed was designed by order of the League's Board of Directors as a permanent memorial to the founder-president, Hiram Percy Maxim.

## *Joining the League*

THE best way to get started in the amateur game is to join the League and start reading *QST*. Inquiries regarding membership should be addressed to the Secretary. There is a convenient application blank in the rear of this book. An interest in amateur radio is the only qualification necessary in becoming a member of the A.R.R.L. Ownership of a station and knowledge of the code are *not* prerequisites. They can come later. According to a constitutional requirement, however, only those members who possess an amateur station or operator license are entitled to vote in director elections.

Learn to let the League help you. It is organized solely for that purpose, and its entire headquarters' personnel is trained to render the best assistance it can to you in solving your amateur problems. If, as a beginner, you should find it difficult to understand some of the matter contained in succeeding chapters of this book, do not hesitate to write the Information Service stating your trouble. Perhaps, in such a case, it would be profitable for you to send for a copy of a booklet published by the League especially for the beginner and entitled "How to Become a Radio Amateur." This is written in simple, straightforward language, and describes from start to finish the building of a simple but effective amateur installation. The price is 25 cents, postpaid.

Every amateur should read the League's magazine *QST* each month. It is filled with

the latest amateur apparatus developments and "ham" news from your particular section of the country. A sample copy will be sent you for 25 cents if you are unable to obtain one at your local newsstand.

## *International Amateur Radio Union*

THE I.A.R.U. is a federation of thirty-three national amateur radio societies in the principal nations of the world. Its purposes are the promotion and coördination of two-way communication between the amateurs of the various countries, the effecting of coöperative agreements between the various national societies on matters of common welfare, the advancement of the radio art, the encouragement of international fraternalism, and the promotion of allied activities. Perhaps its greatest service lies in representing the amateurs of the world at international telecommunications conferences and technical consulting committee (C.C.I.R.) meetings.

The headquarters society of the Union is the American Radio Relay League. All correspondence should be addressed to 38 LaSalle Road, West Hartford, Conn., U. S. A.

The I.A.R.U. issues WAC (Worked-All-Continents) certificates to amateurs who qualify for this award. The regulations, in brief, stipulate that the applicant must have worked other amateurs in each of the six recognized continental areas of the world, supplying QSL cards or other indisputable proof of two-way contact in connection with his application; and that he must be a member of the member-society of the Union for the country in which he resides. In countries where no member-society exists the certificate may be secured upon payment of a fee of 50¢ to cover mailing costs. Two kinds of certificates are issued, one for radiotelegraph work and one for radiotelephone. There is a special endorsement for 28-Mc. operation.