THE ARRL BOARD OF DIRECTORS – HISTORICAL COMMITTEE

THE ARRL HERITAGE MUSEUM

Presents

THE HISTORIAN'S VIEW

Chapter two
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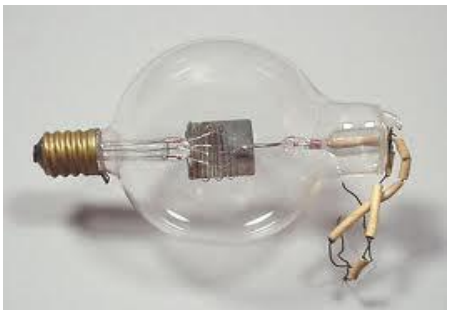
Extending the Limits-the Tests and Relays

The decade following the First World War was a formative period for amateur radio. Every facet of the activity continued to grow despite the temporary abatement of activities necessitated by the war. Amateurs returned from service to find their wireless world rapidly resuming momentum- the number of participants, the regulations, the organizations, the technology and the operating activities were all in motion. Technological advancements continued to enable the amateurs to challenge the envelope of distance and time within which they were constrained and at this moment dramatic innovations were being realized. Amateurs strove to press the limits. Their success is dramatically revealed by the progress of amateur operating achievements during the period.

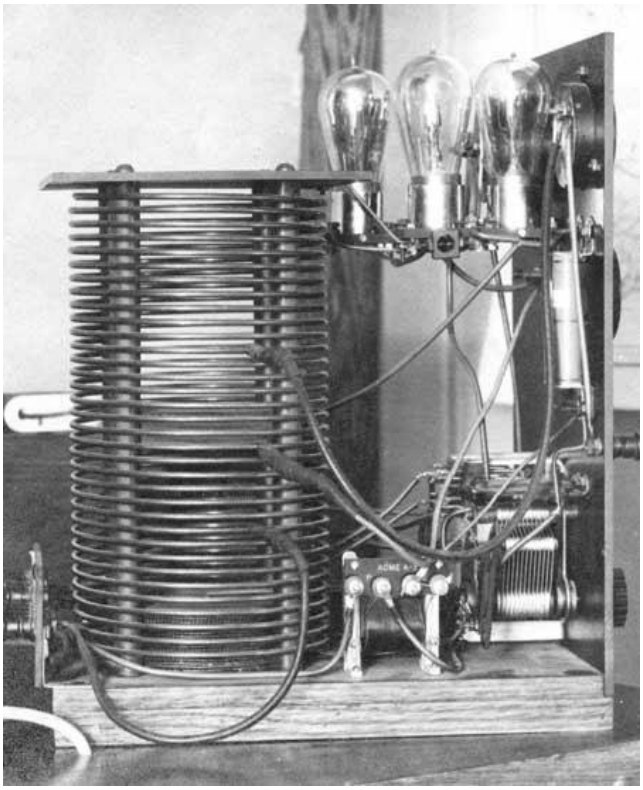
For perspective a look at the world of commercial wireless reveals that it had grown enormously since Marconi's first transatlantic signals were barely heard less than two decades ago. Marconi's most modern 200KW transmitter at Caernarvon, Wales from, 1916 on, was in consistent, reliable daily contact with their transoceanic stations on the East Coast of the United States. Just as the war ended the Company announced that the station had spanned the globe by having two messages received at Sydney, Australia without relay. Operating on 14 meters or approximately 21.5 khz the transmitter used represented the ultimate in spark transmitter design-a timed-spark continuous wave transmitter. The advance from raw spark to continuous wave technology meant more effective utilization of power and spectrum- a great advancement in communications. Although the concept of continuous wave science was known its implementation, other than with massive rotating

equipment, was impractical. The thermionic valve or vacuum tube provided the radio amateur with a practical solution to producing continuous wave emissions at modest power levels.[1] Circuit designs utilizing tubes as transmitter oscillators and singly or in multiples as power amplifiers, were published in the late teens and early twenties. However, the availability of tubes was quite limited and they were expensive. This situation gradually improved as more manufacturers entered the market and made available increasingly powerful tubes at more affordable prices. The rapid conversion of amateurs from spark to continuous wave is remarkably demonstrated by the method used by amateurs in the two events reported below. The first of the two events had only a few continuous wave stations- the second event less than a year later, reported predominate participation by continuous wave stations. Simultaneously, with the advent of the Audion amplifier triode coupled with advances in receiver circuitry the amateur was capable of progressively hearing better with improving sensitivity and stability.

EARLY TRANSMITTER TUBE- RCA UV-202 5 WATT



DEFOREST AUDION TRIODE AMPLIFIER TUBE



QUAD RCA UV-202 TUBES IN TRANSMITTER

Transcontinental Relay Test-January 14-16, 1921

With six trunk lines up and running the ARRL now expanded to include a Operating Department, designed a test to prove the system under prevailing conditions and with the new receiving and transmitting technologies which were available. Cross country relayed message deliveries were now a common occurrence and accuracy, speed and proficiency were the desired attributes. The specific objective was to establish a new round trip East to West coast and return time record.Three routes to the West coast were designated- Northern, Central and Southern and only specific stations were selected to participate.

Three messages were initiated each night-from East to West -each to be received and to be replied to. This resulted in six messages crisscrossing the country each evening. Details of the structure were published in *QST*. The results appeared in the March, 1921 issue of *QST*. Under the banner "The Story of the Transcons."(sic) General Manager K.B. Warner exclaimed "*Fellows, we did it! Smashed it into bits-just naturally lambasted the everlasting stuffing out of it! "Aint it a grand and glorious feeling?"" (sic)* The new record….elapsed time… six and one half minutes ! The route was: 1AW Hartford to 9ZN Chicago to 5ZA Roswell to 6JD Los Angeles and reply back 5ZA to 9ZN to 1AW flawlessly at 30 words per minute. The record was achieved on the third and final morning of the event at 4:20 AM EST. The route and times were carefully checked before the rising sun curtailed operations. Conditions were so good that night that stations in the mid west copied stations on both coasts. Coast to coast completions had been reported on the second night and

earlier on the third night, along other routes but with longer elapsed times.

<u>Washington Birthday Relay III- February 21th , 1921</u>

The indefatigable 9XE, W. H. Kirwan initiated and structured what was to be the last of the official Washington Birthday relays but not the last of the organized relay tests. Conducted with the cooperation of the Leagues Operating Department this relay presented a unique and quite difficult challenge to the operators. A 30 word message from President Harding was composed. At the start the message was divided into three component parts each part becoming a separate message. Accordingly, the original message became three component messages. From the East a component with 14 alternative words only was sent;

from the West the component with the center or intervening words only was sent; and finally from the Midwest the last component with the two remaining words was sent. Accordingly, a successful operator was required to receive via relay, each of the three components to assemble the complete message. The complete message from President elect Harding was then to be delivered to the operator's governor, mayor, and/or highest local official. Astonishingly, 7240 amateurs reported assembling the complete message and making delivery. In total the message was delivered to 14 governors, outgoing President Wilson, 22 Senators, 35 State Senators, and over 500 Police Chiefs, Selectmen, Councilmen, Sheriffs, Postmasters, and News Editors. Receipts were obtained for all deliveries.

The results were judged by a Prize Committee comprised of A.N. Goldsmith of the Institute of Radio Engineers, E.H. Armstrong, and H.P. Maxim. Entrants were judged for "speedy and correct reception" quantified to miles per minute in receiving and delivering. Seventy eight operators were awarded prizes which had been donated by manufacturers and publications. The winners were announced in the QST issue of June, 1921 with the top six winners located in the West. All this on 200 meters and down predominantly with spark gap!

9XE, W. H. Kirwan, suggested that another Washington's Birthday Relay be held in 1922. This suggestion was preempted by the two other relays which occupied continental operators during the year of 1922. The Governors-President relay in March conveyed congratulatory messages from forty-three governors to newly inaugurated President Harding and in June thousands of police chiefs nationwide received a message from the host chief of the International Association of Chiefs of Police who were meeting in San Francisco. These events demonstrated the capabilities and effectiveness of the amateur

corps to the nation. But now the attention of amateurs turned to reaching out and spanning greater distances and they engaged in the planning of a major event.

The early 20's amateur radio world was energized with the innovative technology and the operating achievements that they enabled. New distance records were claimed daily.

2PM was copied by a ship off lower California
9ZN was reported by a ship at Colon, Panama-2600 miles
8DA was heard off Venezuela
6EA contacted Honolulu
6ALE heard by 1ES
6XAD QSO'd consistently with 1's, 2's, 3's and the Midwest 8's
6KA reports 2FP
6BF reports 8BOX
8QM (Elmira, N.Y.) using two five watt tubes is heard 1008 miles away
4GL using three five watt tubes is heard 2450 miles at sea

and among many more 1AW relayed a message to 6ZAC in Hawaii and an answer was returned in four minutes and eighteen seconds via 9AWM. A editorial in the November 1920 issue of QST acknowledged some of the above records and inquired.. "*What constitutes the supreme amateur DX record for approximately 200 meter*?" and requested that claims be submitted for verification.

During the year 1921 the accomplishments of station 2RK in Brooklyn, New York were outstanding. J. (John) Kenneth Hewitt owned and operated this station. He distinguished his prior call, 2AGP, when in Albany, New York as a prolific traffic handler. He and his to some extent partner James V. Candido, 2RV, [2]set out to create a record setting station which was described and imaged in the February 1921 issue of QST. A United Wireless 30,000 volt transformer, and Grebe synchronous rotary gap provided 3-1/2 amperes of

current to a 75 foot inverted L antenna of robust materials. The station broke one operating record after another:

Heard by ships in Europe, Africa, Canal Zone, Mexico, Cuba and Bermuda
Heard by ship at Gibraltar-3200 miles
Heard by ships off Brazil -3800 miles
Worked 5ZA in Colorado regularly
Heard in Guatemala regularly
Heard by 6ALE Los Angeles
Heard in all but four states
Worked ship 2700 miles south
AND
Simultaneously handled 3200 messages in these 6 -1/2 months!

Great achievements as acknowledged by the League. However, a mystery arises here. The June, 1921 issue of QST page 44, under "Strays" reports…."*Station 2RK has been indefinitely closed for an alleged interference with the U.S.N. station at Sandy Hook on 800 meters…It is reported that 2RK continued operation after having his licensed suspended and is now charged with that, with operating on an illegal wave length, with operating CW equipment not covered by his license and with signing the letters "KH" for a call. If the charges against Hewitt are substantiated, it is probable that 2RK will be no more*."

Despite the charges apparently evolving John Kenneth Hewitt makes two further appearances in the spot light. He delivers a technical talk at the first National ARRL Convention in Chicago in September, 1921 and is applauded in a biographical sketch published the same month in QST under the title of "Who's, Who in Amateur Wireless." He then disappears from the amateur world with no further mentions in QST. But, his station gear goes on to participate and perform in the greatest amateur operating event in

history- The Transatlantic Test! for 2RK's station had been acquired by 2FP a main event finalist.

<u>Transatlantic Tests-1921 through 1924</u>

The efforts to transmit signals easterly and later westerly across the Atlantic were exerted over a three year period. At first the tests were one way exercises in being heard and culminated with the first two way transatlantic QSO in 1924. The main event, which generated the most excitement and received the greatest publicity was the second one way test conducted from the United States to Europe in December of 1921.

Hiram Percy Maxim had editorialized that beyond the domestic relay tests the next hurdle was the Atlantic. *Everyday Engineering* magazine organized the first sending test with English amateurs prepared to listen for signals from the U.S. Upon the magazines' suspension of publication the League hurriedly assumed the leadership of the project. The test was scheduled for the nights of February 1, 3 and 5 of 1921. Twenty five almost entirely east coast stations, including 1AW and 2RK, were selected to transmit designated

signals at designated times on 200 meters. This test was a failure. Not one of the U.S. stations was heard by any of the 250 or so enrolled British amateur listeners. The misfortune was attributed to the poor design and sensitivity of the English receiving equipment which also produced interfering heterodynes; harmonics from commercial press stations; inference from a Royal Navy station; the short period of time permitted for individual transmissions; and the fact that most of the transmitting stations were using spark. Encouragingly, reports of reception were received from American ships plying the Atlantic who obviously were equipped with superior receiving equipment.

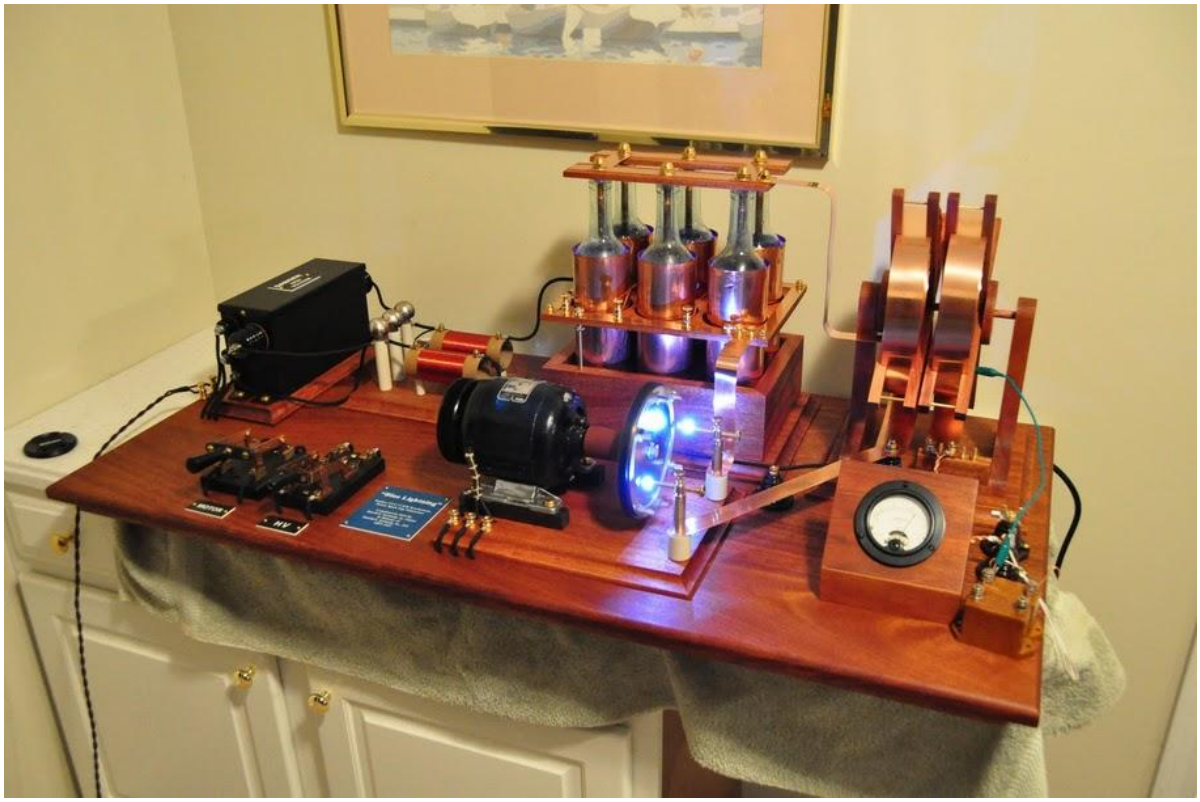
Undeterred the League began to plan for a second transatlantic test to include what was thought essential-the presence of an American expert, equipped with the most modern receiver at the European receiving end. The ARRL Board selected receiver circuit designer, Paul F. Godley for this assignment. They considered Godley… "*the most expert operator in the practical reception of short wave signals.*"[3] The intent was for Mr. Godley to augment but not supersede the British listening effort.

And so the intrepid went forward. Preliminary distance trials, held in November, qualified twenty seven station finalists each of whom were assigned a group of sealed secret code letters and specific and rotating transmission times during the period of 9:30 PM to 1:00 AM EST on each of the ten consecutive days December 7 to December 16. Non qualifying stations were encouraged to transmit from 7:00 PM to 9:30 PM EST on each evening during time segments divided into rotating 15 minute segments by district. The rest of the U.S. amateurs were asked to remain silent.

At the other end Paul F. Godley and a local Marconi man acting as verifier, Inspector D.E. Pearson situated themselves and the equipment in a cold tent in Scotland in a field located

at Androssan, near the sea and Glasgow. A Super-Hetrodyne and regenerative receiver , a 1300 foot Beverage antenna suspended 12 feet above ground, batteries and auxiliary equipment constituted the rough listening post.

When the official starting time arrived the receiving apparatus had been fine tuned and a identifiable spark signal from 1AAW was distinctly heard but only briefly and not in test format. This, the first station to traverse the Atlantic albeit it unofficially, was determined to be a pirate in the Boston area. The duo continued to listen on the subsequent mornings of December 8 , and 9 to no avail. On the morning of the 10th the CW signals of official entry 1BCG, are solidly heard on 230 to 235 meters. This, the specially designed and constructed station of the Radio Club of America at Greenwich, Connecticut was the only station heard that morning. During the nights and early mornings that followed until the end of the test eight spark and eighteen CW stations[4] were heard. Eight English amateurs heard eight stations[5] including 2FP first and five listeners logging 1BCG, all CW; and a Dutch amateur heard 1BCG. Surprisingly, many of the stations that qualified in the preliminary tests were not heard in Europe. Conspicuously CW won the day adding the final blow to the demise of spark.

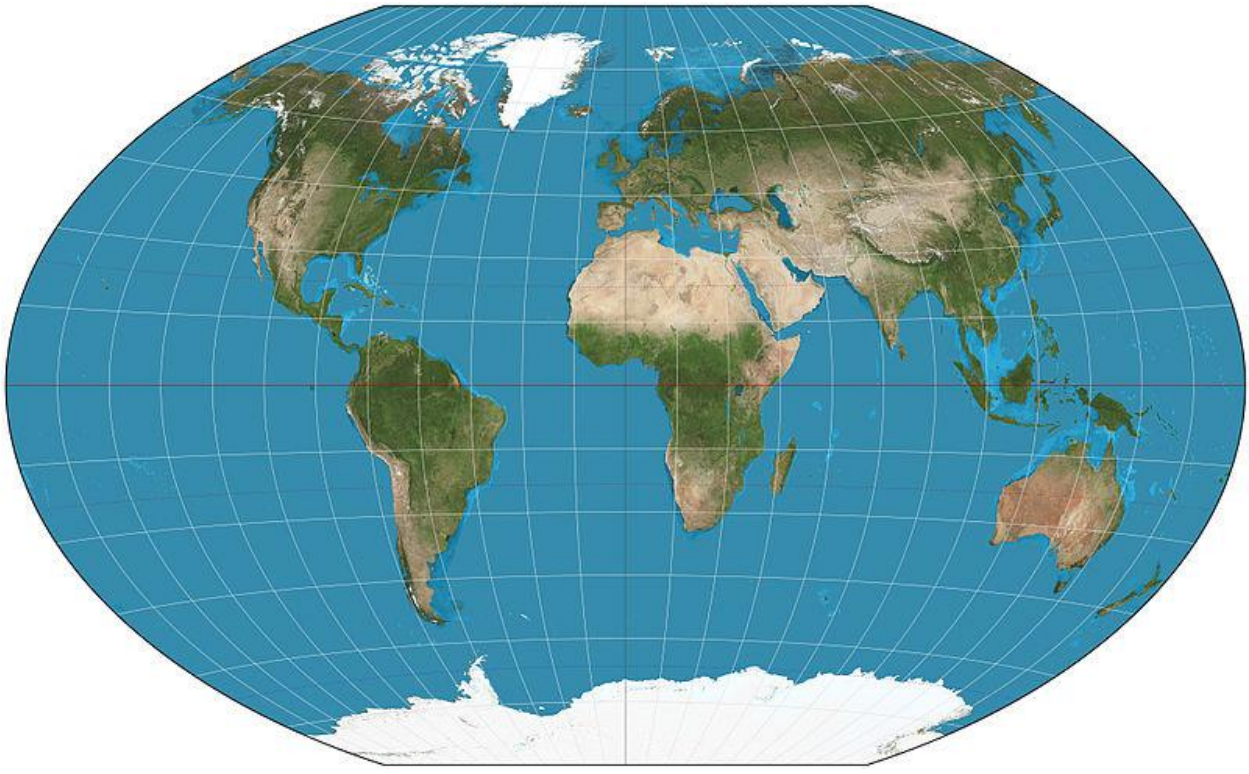


REPRODUCTION - COMPACT SPARK TRANSMITTER

The next Transatlantic Test scheduled for December, 1922 was again a listening test but now international in scope with the second half of the event devoted to North American amateurs listening for British and French stations. The ARRL Operating Department was the leader of this complicated program with the Wireless Society of London and a French committee of their three leading societies and Swiss and Dutch participation conducting the activities in their respective countries. Other unique features of this test was the use of Greenwich Mean Time as the recording standard and the broadcasting of results daily by RCA long wave commercial stations on both sides.

The twenty day test was divided into two ten days transmitting periods. The first period, December 12th to 21st was for signals from the U.S. to Europe and the second for signals from Europe to the U.S. Each U.S. morning (midnight GMT onward) was divided into the first 2-1/2 hours for non-qualified, "free-for-all" stations rotated by district and the remaining 3-1/2 hours for qualifiers. The 324 U.S. and Canadian stations that qualified were assigned transmitting times and individual codes to transmit and similar procedures were set down by the Europeans.

The U.S. and Canadian results were striking! The European results were lackluster. 315 different North American stations from all nine districts and Canada were heard in Europe 85 of which were heard in the British Isles as well as on the continent. In the reverse 20 American reporters heard only 2 British stations (specially constructed 5WS London and 2FZ Manchester) and one French station (8AB in Nice from whom we will hear more later).



Two major international tests were conducted during the later part of 1923. A Transpacific one way test with amateur listeners in Australia ultimately reporting hearing upwards of 150 stations from the U.S. and Canada was run in October. Stations as far east as the 3rd and 2nd districts were logged by the Melbourne receivers.

This listening test was succeeded by the fourth Transatlantic test run from December 21, 1923 through January 10, 1924. This was strictly an east to west affair –initially North American stations were to listen only. The test period was divided into three one way transmitting periods-European free for all; French designated individual; and English designated individual. Innovatively, the day after the listening periods, January 11 was devoted to attempts at two way trans-Atlantic communications. The test results evidenced that the Europeans had improved their previous test performance with 42 stations including 4 in Holland now received by 100 North American amateurs.

The two way segment was encouraged by two record contacts which had been made while the event was being planned. The first two way Transatlantic contact was accomplished by Connecticut's 1MO and 1XAM and France's 8AB on November 17, 1923. This contact was followed shortly on December 8, with Connecticut's 1MO contacting British station G2KF. It is significant to note that these contacts took place on 108 to 118 meters after attempts on 200 meters had failed.

The balance of the 20's saw the Pan American tests, the Franco-British tests, the Italian tests, the Australia-U.S. tests, and the Commonwealth tests as well as replays of previous tests. Continually improving technology brought reliable and consistent relays domestically. As amateurs began to recognize the potential of the shorter wave lengths and the understanding of propagation advanced, new records were established and trans-world

communication became increasingly frequent. Simultaneously, the interest in listening tests gave way to two-way transmitting tests which became more specific as to intent, region, mode and wave length; and consequently more competitive. The designation "test" evolved to "contest". Contest inaugurations include Field Day, 1934; International test, 1927; Sweepstakes 1930; and the ARRL DX contest, 1932. Challenging, tests spurred our technological and knowledge advances and are a corner stone element in the foundation of amateur radio and its enjoyment.

The twenties concluded with a unique relay which captured the spirit and sentiment of the times. This relay was not announced in QST because it was to be kept secret. Instead it was announced by mail to members of the field organization and on the air by the appointed, Official Broadcasting Stations. Domestic stations were requested to inform foreign stations of the activity on the air. The week-end between August 31 and September 2, W1MK the ARRL official station in Hartford was on the air continuously on 80 and 40 meters receiving messages addressed to President Hiram Percy Maxim extending congratulations and good wishes on the occasion of his sixtieth birthday. The recipient was "bowled over" by the over 700 messages received from individuals and clubs and associations in all the United States except 7 and 10 countries including China. This was a fitting application of the system that the ARRL created and maintained and a portrayal of the temperament of the organization which had materialized.

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