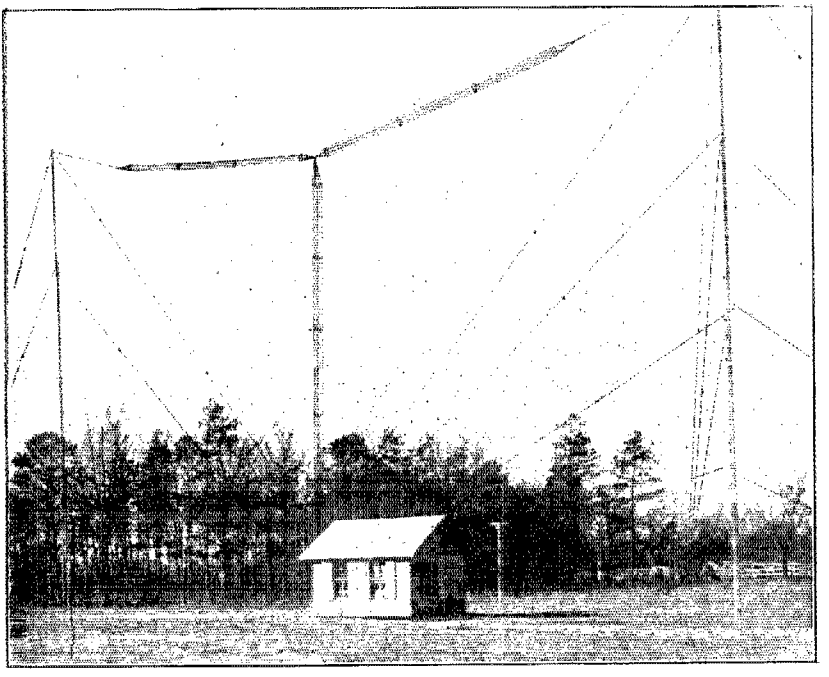
The Successful Transatlantic Stations

By Robert C. Higgy

THE recent transatlantic tests have brought benefits to us amateurs in many forms among which one of the most important is the data and information about the successful stations. A questionnaire was prepared and sent to all of the stations getting across and much valuable and highly interesting information has resulted. It is the object of this article to set forth a few of the outstanding features of some of the stations altho no attempt will be made to give a detailed description of all of the successful transmitters.

1RU of Hartford, Conn., is a fitting example of the average station and contains many features typical of all. It is the station of Mr. R. S. Miner and did some very excellent work prior to the tests. The antenna consists of a six-wire cage 80 feet long supported on each end by masts 54 feet above the ground. The lead-in is in the form of a six-wire cage eighteen inches in diameter running to the outside of the operating room. A counterpoise is used and is a duplicate of the antenna with the exception of being supported on spreaders. The transmitter uses a single 50-watt Radio-



2BML-2EH Antenna System

The accompanying tables have been prepared from the data received and from them may be gathered a skeleton description of each transmitter. The matter contained is for the most part self-explanatory and does not need further comment. The power outputs were calculated wherever possible by squaring the antenna current and multiplying by the total antenna resistance. The efficiencies could then be determined, since the output powers were known. In calculating the efficiencies, input power to the plates of the transmitting tubes only was considered.

tron in the reversed feedback circuit that has proved very popular of late. The antenna inductance consists of thirty turns of edgewise-wound copper ribbon which may be seen back of the panel in the photograph, and the grid inductance of the same type but smaller in diameter is mounted fixed within the larger antenna inductance. The panel was originally designed for a DeForest one-half-kilowatt tube. It's mountings can be seen back of the antenna inductance. On the panel are the filament ammeter, plate milliammeter and hot wire meter for measuring the antenna current.

OUTLINED DESCRIPTION OF THE SUCCESSFUL TRANSATLANTIC STATIONS

STATION	ANTENNA	ANTENNA HEIGHT	TOTAL LENGTH	GROUND COUNTERPOISE	INPUT WATTS	TYPE AND NO. OF TUBES	PLATE VOLTAGE	ANTENNA CURRENT	ANTENNA RESISTANCE	PERCENT EFFICIENCY	WATTS OUTPUT	WAVE LENGTH	CIRCUIT USED	OWNER AND STATION LOCATION
1AFV	VERTICAL CAGE 12 WIRES	70	—	COUNTERPOISE	—	4-UV203	1000 C.R	12 T.C.	—	—	—	200	REVERSED FEEDBACK	F.C. ESTEY SALEM, MASS
1ARY	T 4-WIRES	60-50	110	COUNTERPOISE	300	1-UV203	1400 C.R	4.6 H.W.	8	56.4	169.5	225	HARTLEY	UNIVERSITY OF VERMONT BURLINGTON, V.T.
1BCG	T-CAGE 8 WIRES	108-75	170	COUNTERPOISE 15 WIRES	990	4-UV204	2200 M.G.	6.0 T.C.	15.5	56.4	558	230	MASTER OSC.	*SEE FOOTNOTE GREENWICH, CONN.
1BDT	7 7-WIRES	90-50	115	COUNTERPOISE 18 WIRES	—	1-UV202	400 C.R.	.8 H.W.	—	—	—	200	HARTLEY	S.S. HEAP ATLANTIC, MASS.
1BGF	7 4 WIRES	40-40	100	COUNTERPOISE 4 WIRES	150	1-UV203	1500 A.C.	2.7 H.W.	—	—	—	210	REVERSED FEEDBACK	P.F. BRIGGS HARTFORD, CONN.
1BKA	FAN 15 WIRES	50-30	85	—	450	½ KW DEFOREST	1500 M.G.	5.2 H.W.	12.	73.7	332	225	COLPITTS	J.E. BROWN GLENBROOK, CONN.
1XM	7 4 WIRES	100-30	100	COUNTERPOISE	1000	G.E. 2-VT10	5000 A.C. 500~	8.5 T.C.	10.5	75.8	758	210	HARTLEY	M.I.T. SOCIETY CAMBRIDGE, MASS.
1YK	CAGE 4 WIRES	27	155	COUNTERPOISE	72	1-UV203	1000 M.G.	2.5 H.W.	—	—	—	235	HARTLEY	WORCESTER POL. INST. WORCESTER, MASS.
1ZE	FAN 22 WIRES	100-60	122	COUNTERPOISE	450	2-UV203	1500 T.R.	7.0 H.W.	4	43.5	196	375	COLPITTS	I. VERMILYA MARION, MASS.
1RU	T-CAGE 6 WIRES	54-54	120	COUNTERPOISE 6 WIRES	297	1-UV203	1350 M.G.	4.0 H.W.	—	—	—	204	REVERSED FEEDBACK	R.S. MINER HARTFORD, CONN.
1RZ	7 4-WIRES	43-23	80	COUNTERPOISE	150	1-UV203	1000 M.G.	3.5 T.C.	5	40.8	61.25	220	—	J.W. HUBBARD RIDGEFIELD, CONN.
2AJW	CAGE 6 WIRES	73-53	84	COUNTERPOISE	105	3-UV202 2-VT2	525 M.G.	2.0 H.W.	—	—	—	200	COLPITTS	H.S. COLLINS BABYLON, N.Y.
2BML 2EH	T-CAGE 6 WIRES	60-55	95	GROUND COUNTERPOISE	690	2-UV204	5000 T.R.	7 TO 9 T.C.	7	64.8	442	200	REVERSED FEEDBACK	RADIO ENGINEERS CLUB RIVERHEAD, N.Y.
2FD	T-CAGE 6 WIRES	80-50	140	COUNTERPOISE 10 WIRES	500	1-UV204	3000 A.C.	7.3 T.C.	6	64.2	324	200	HARTLEY	JOHN DI BLASI FLUSHING, N.Y.
2FP	7 7 WIRES	70-70	100	GROUND	500	1-UV204	6000 A.C. 500~	5.0 T.C.	—	—	—	200	HARTLEY	H.G. BARBER BROOKLYN, N.Y.
2ZL	7 4 WIRES	85-65	120	COUNTERPOISE	968	2-UV204	2200 A.C.	8.0 T.C.	7	46.2	448	325	—	J.O. SMITH VALLEY STREAM, L.I.
3DH	CONICAL CAGE 6 WIRES	110-90	160	COUNTERPOISE	700	G.E. 250 W	3000 M.G.	5.0 T.C.	12	42.8	300	225	HARTLEY	D.W. RICHARDSON PRINCETON, N.J.
8ACF	V 7 WIRES	78-30	100	GROUND	—	2-C302	550 C.R.	1.7	10.5	—	32	225	HARTLEY	MCNARY & HALL WASHINGTON, PA.
8BU	—	30-28	80	COUNTERPOISE AND GROUND	150	1-UV203	1000 C.R.	4.6 T.C.	—	—	—	200	HARTLEY	J.L. RUSSELL CLEVELAND, OHIO
8XV	LOOP AND CONDENSER	65	—	COUNTERPOISE	980	2-500 W	3750 T.R.	15.2 T.C.	3.5	82.5	808.5	200	—	F.S. MCCULLOUGH EDGEWOOD, PA.

*1BCG WAS OWNED AND OPERATED BY MESSRS. AMY, ARMSTRONG, GRINAN, CRONKHITE, INMAN and BURGHARD.
THE ABOVE DOES NOT CONSTITUTE A COMPLETE LIST OF THE SUCCESSFUL C.W. STATIONS.
UV 202 NORMAL OUTPUT 5 WATTS, UV 203-50 WATTS; UV 204-250 WATTS C.R.-CHEMICAL RECTIFIER.
T.R.-TUBE RECTIFIER

A relay, improvised from a telegraph sounder, can be seen mounted on the front of the panel also. Keying is accomplished by shorting a small-capacity condenser in series with the antenna, which lowers both the wave and power output when the key is up. Back of the main panel may be seen the filament-lighting transformer and the iron-core choke coils used for smoothing out the plate supply furnished at a voltage of 1350 from a motor-generator set. Prior to the tests distances up to 1800 miles had been covered frequently and very consistent work was done over distances up to a thousand miles.

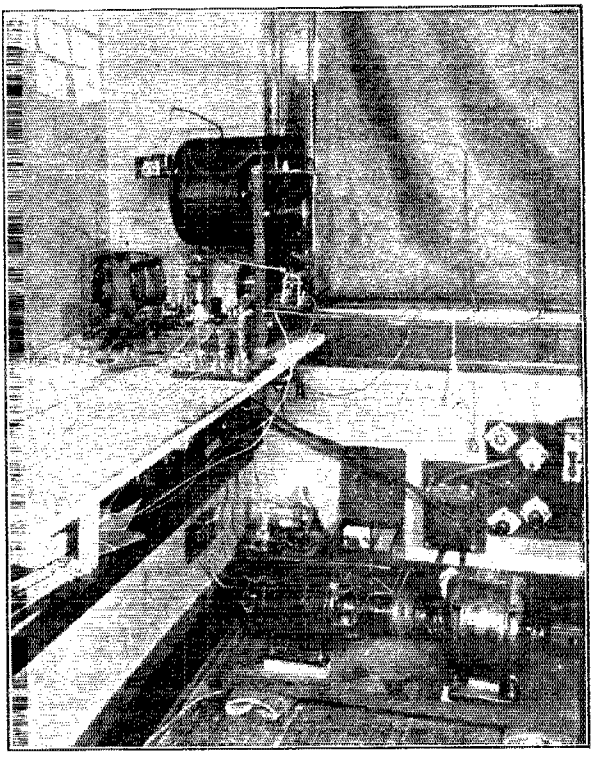
2BML-2EH is the station of the Radio Engineers' Club of Riverhead, Long Island. The antenna, of which we are reproducing a photograph, is a six-wire cage 80 feet long with a cage down-lead in the center. It is supported by two wooden masts 60 and 55 feet in height and is in an excellent location. The transmitter consists of two 250-watt Radiotrons in a reversed feedback circuit similar to that used at 1RU with the exception that the grid coil is not coupled to the main antenna inductance. The large inductance on the left is the antenna inductance while the grid inductance may be seen in the center of the photograph near the large variable condenser, which shunts it for variation in wave length. On the right are the two 250-watt tubes and in back of them are the Kenotrons which rectify the alternating current at 6600 volts supplied by the four large power transformers set-

THE TRANSATLANTIC SPARK TRANSMITTERS

STATION	ANTENNA	HEIGHT	TOTAL LENGTH	WAVE LENGTH	INPUT WATTS	ANT CUR.	OWNER AND LOCATION
1ARY	T 4 WIRES	60-50	110	200	1000	5.5 H.W.	University of Vermont Burlington, Vt.
1BDT	7 7 WIRES	95-55	115	200	1000	6.0 H.W.	S.S. Heap Atlantic, Mass.
2BK	FAN 4 RIBBON	75	105	203	800	5.8 T.C.	C.E. Trube Yonkers, N.Y.
2DN	7 4-1/4" CAGE	95-75	125	200	700	3.0 H.W.	Arnold Brilhart Yonkers N.Y.
2ARY	7 6 WIRES	60-40	80	208	1000	4.0 H.W.	W.W. Redfern, Jr. Brooklyn, N.Y.

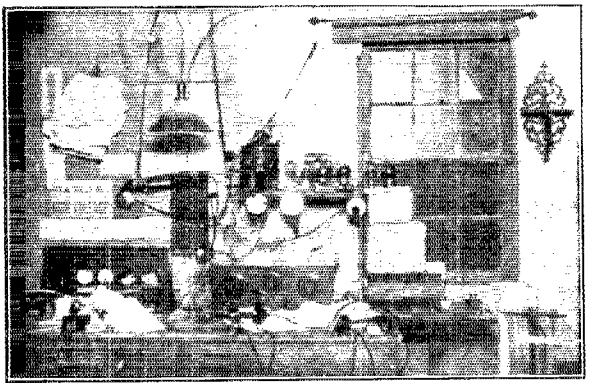
ting on the floor. This arrangement gives approximately 5000 volts direct current, at which voltage the power supplied to the tubes is 690 watts. 2BML and 2EH are the same station and are operated by members of the Radio Engineer's Club. It has been one of the successful stations in the east and has a very good consistent range.

2AJW is the station of Mr. H. S. Collins of Babylon, L. I., and is a very good example of what the strong desire to get signals across the Atlantic can accomplish. The transmitter was composed of three 5-watt Radiotrons and three VT-2's, which Mr. Collins tells us had seen better days. One had no base, one a broken element, and the pet had a busted filament which had been shaken into contact and "spot-welded" many times before. Hard pressed for the little bottles, he put all of these in the circuit with a hope that they would shove a little more power in the antenna. The circuit was a Colpitts and as shown in the diagram. The antenna was a six-wire cage eighteen inches in diameter and 54 feet long, 73 feet high at one end and 35 at the other. A counterpoise was used consisting of various sizes of wire from 50 to 100 feet long in a fan-shape, ten feet above the ground. The plate supply was obtained from a small motor-generator giving 525 volts, at which the input was 105 watts to all six tubes. Mr. Collins has worked stations from Orono, Maine, to Orlando, Florida, and as far west as Detroit, while his signals have been reported at Eastland, Texas and Maplewood, Missouri. Just another example of the great efficiency of a little C.W. energy.



1RU Transmitter

1YK, the station of the Worcester Polytechnic Institute at Worcester, Mass., is different from the other successful stations in many respects. The antenna is a four-wire cage 90 feet long and 27 feet above a copper roof to which it is connected through an inductance at the far end of the antenna. The free end of the antenna and roof are connected to the main inductance of the transmitter and form a large loop. The circuit is a Hartley for straight C.W. but for telephone and buzzer modulation is so arranged that the single 50-watt Radiotron may be used as a power amplifier, the oscillator and modulator tubes being of 5-watts output capacity. The plate voltage is obtained from the street railway line and a small generator in series, giving a total of 1000 volts. For the 5-watt tubes the small generator only is used. The inductance between the antenna and roof was adjusted so that the same current was flowing in each end of the system. Unfortunately the photograph submitted was not suitable for reproduction.

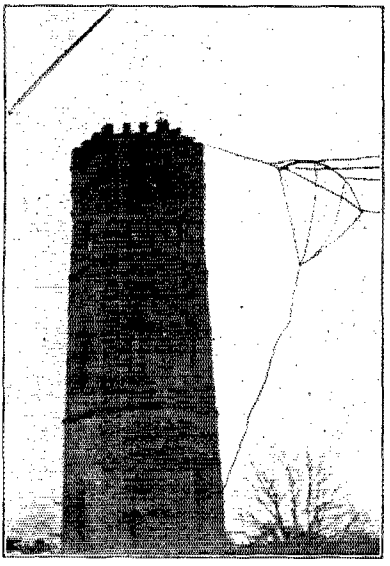


2AJW, Babylon, L. I.

1BKA, the station of Mr. J. E. Brown of Glenbrook, Conn., used a a standard DeForest one-half-kilo-

watt transmitter. A fifteen-wire fan 50 feet high was used, being somewhat different from the other stations in that respect. The photograph needs no further comment as it shows the arrangement and types of the apparatus very clearly.

8XV was one of the stations erected particularly for the Tests. Construction was started but three days before the first night of the test schedule and quite a number of unexpected problems were encountered. Using two 250-watt tubes, supplied by approximately 5000 volts of A.C. rectified by tube rectifiers, trouble was found in the antenna insulators and it was necessary to use eighteen-inch insulators to stop leakage. The antenna current was 22 amperes on a thermocouple meter. In order to test the effectiveness of the transmitter and radiating system, a galvanometer was arranged in the receiving circuit at a station three and one half miles from 8XV and four miles from Mr. Conrad's station, 8XK. A deflection of 51 divisions was obtained when 8XK was transmitting and 35 divisions was obtained when 8XV was transmitting. The antenna was improved and later a deflection of 72 divisions was obtained, a change in height of but 22 feet making the additional de-



2BK's Ribbon Antenna

flection and also resulting in a lower antenna current of 15.2 amperes. The antenna is a loop condenser scheme and is of unusually low resistance, 3.5 ohms. Further details are lacking at this time. The tubes used were of a special type, designed for an input of 250 watts, but

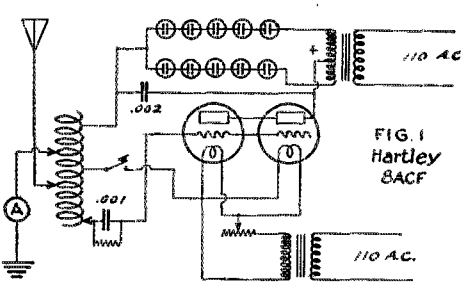


FIG. 1
Hartley
8ACF

approximately 500 watts were used in each tube. Recently two additional tubes have been added as modulators for telephone and exceptionally good distances spanned.

The Spark Transmitters

There were seven spark transmitters that succeeded in covering the many miles to Ardrossan. One of these unfortunately cannot be located and at the present time, descriptions of but five are available.

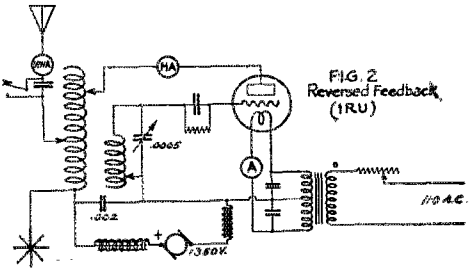
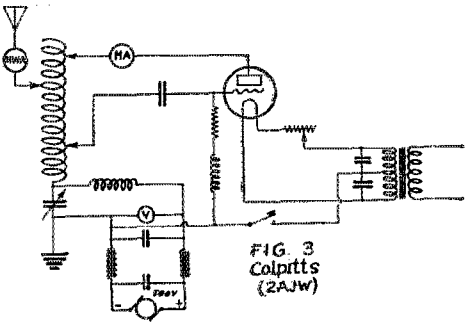


FIG. 2
Reversed Feedback
(1RU)

1ARY, University of Vermont at Burlington, Vermont, was one of the stations heard on both spark and C.W. The spark transmitter for the most part has been made at the University and comprises a one-kilowatt open-core transformer and variable series reactance for varying the power input, Murdock condensers, O. T., and rotary gap. The gap consists of two



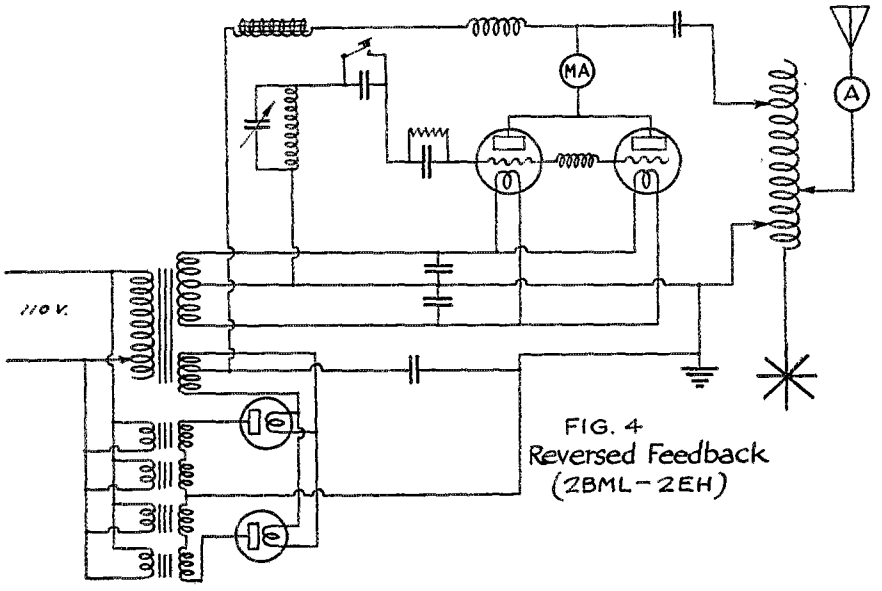
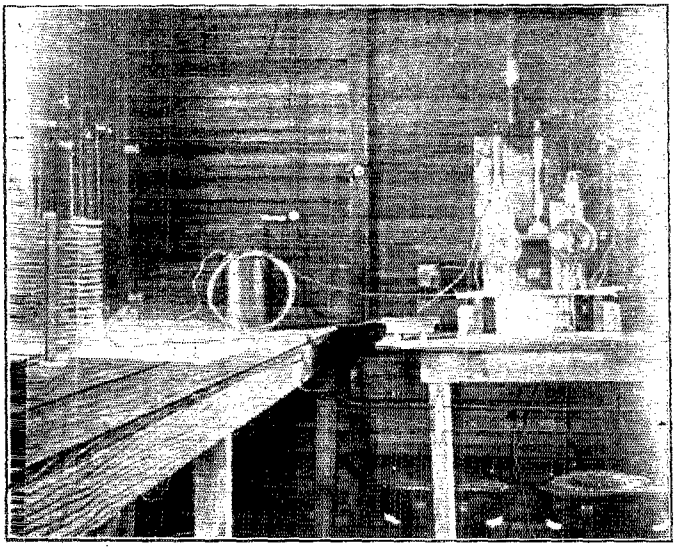


FIG. 4
Reversed Feedback
(2BML-2EH)

movable knife-edge electrodes of aluminum and twelve stationary brass electrodes designed to give a quick break. The C.W. transmitter uses a single 50-watt tube and needs no further comment.

2BK of Yonkers, N. Y., was another station erected solely for the tests. Mr. Trube moved his transmitter to the City's water tower and erected an antenna from the top of the tower to a nearby telegraph pole. The antenna proper consisted of a four-ribbon horizontal fan 25 to 45 feet in width and 40 feet long at an average height of 75 feet. A radial 5-ribbon counterpoise 5 feet off the ground, 70 feet long and 72 feet wide, was used in addition to a connection to the water pipes and the tank in the tower. Brass ribbon was used instead of wire and was one inch wide and .015 inch in thickness. The apparatus consisted of a one-kilowatt Marconi open-core coffin, home-made oil-immersed condenser, synchronous gap and O.T. A series condenser was necessary for operation on 200 meters on account of the large natural period of the antenna system. (215 meters). The photograph shows clearly the arrangement of the transmitter.

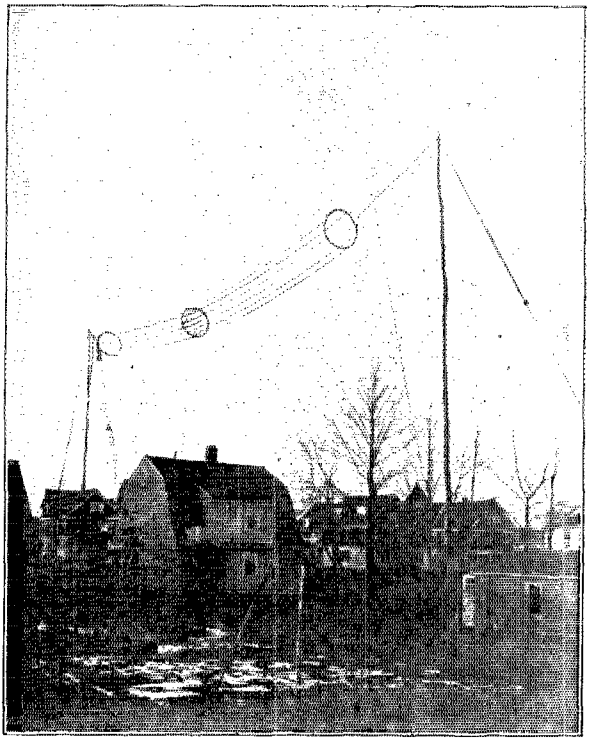


2BML-2EH Transmitter

2ARY, orginally reported as a C.W. station, consisted of a one-kilowatt Acme non-resonant transformer, home-made rotary gap having 14 points running at 1800 r.p.m., condenser using a Dubilier and Marconi jar in parallel giving a total of .01 mfd. capacity, and an O.T.

2DN of Yonkers, N. Y., another of the successful sparks, contains many features typical of the average spark set. The antenna was an inverted L 30 feet between spreaders of 16 feet width. Four one-foot cages were used instead of the usual four wires. A small cage lead-in 95 feet long was used, the antenna being 95 feet high at the lead-in end and 75 feet high at the free end. Using a buried ground the total resistance measured approximately 12 ohms and an antenna current of 3 amperes was obtained on a wave length between 200 and 210 meters. The location is very poor, many large trees surrounding the antenna and a high hill to the eastward.

1BDT of Atlantic, Mass., was among those successful on both spark and C.W. Mr. Godley reports his signals as being exceptionally good in Scotland on the spark. Mr. Heap attributes much of his success to his unusually fine antenna and location. An inverted L 65 feet long of seven wires on 20-foot spreaders, 95 and 55 feet high, composes his radiating system, a small cage lead-in 50 feet long dropping from the flat top. The spark transmitter uses a one-kilowatt Acme transformer, oil-immersed condenser, a synchronous gap and home-made O.T. Antenna current approximates 6 amps. The C.W. set consists of a single 5-watt Radiotron tube in a Hartley circuit, supplied by 400 volts of chemically-rectified A. C.

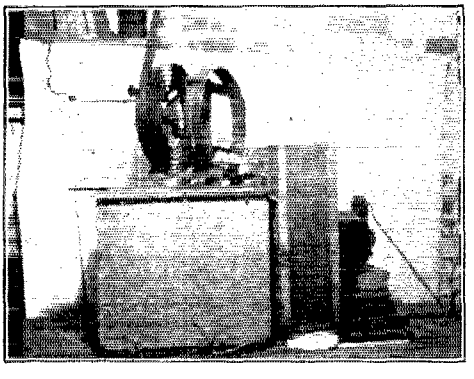


The Antenna at 1RU

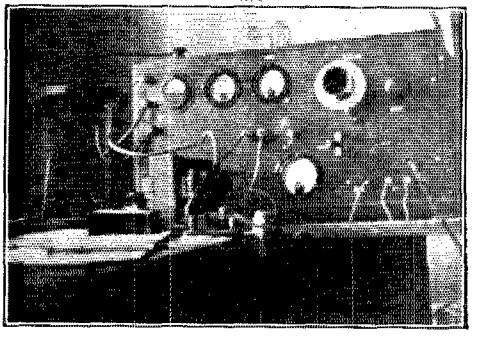
The January QST contained a description and photographs of 1AFV and the entire story of 1BCG was well told in the Radio Club of America paper appearing in our February number.

The Circuits

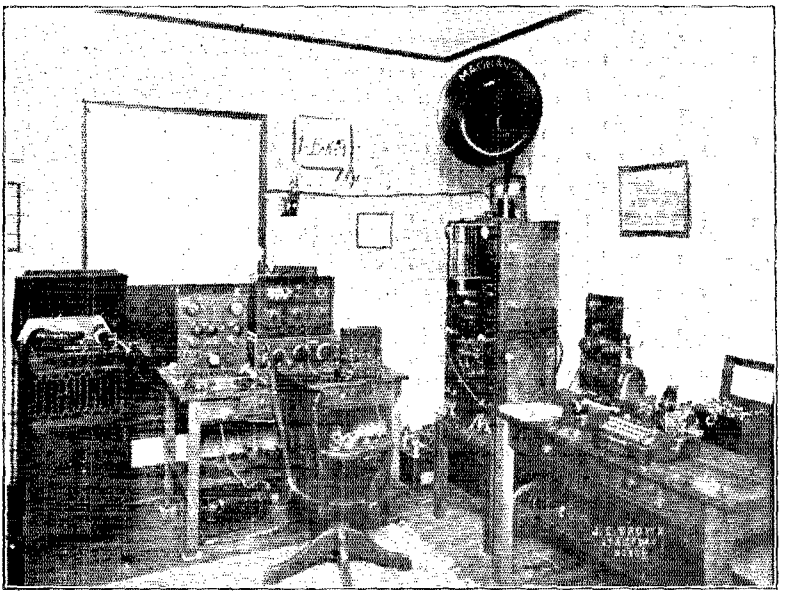
The circuit diagrams reproduced here are typical examples of the circuit arrangements used at the various stations. Figure 1 is a circuit known as the Hartley employing a direct-coupled inductive feedback arrangement. A chemical rectifier is used to rectify the high voltage alternating current supplied by the step-up transformer. Figure 2 is a reversed-feedback circuit that



2BK's Spark Transmitter



The 50-Watt C.W. at 1RZ

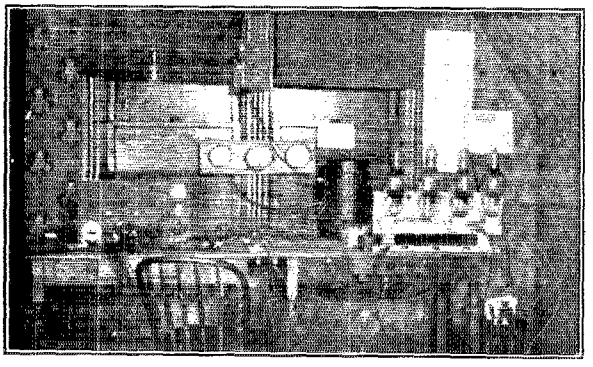


1BKA, Glenbrook, Conn.

was described in Mr. Whittier's article in QST for July, 1921. It has proved very popular and is quite efficient. Figure 3 is known as the Colpitts and is a capacitative feedback circuit, the series antenna variable condenser governing the feedback voltage. Figure 4 is the circuit used at 2BML-2EH and is a reversed-feedback similar to that of Figure 2 but the grid inductance is not coupled to the main antenna-plate inductance. Tube rectifiers rectify the high voltage alternating current supplied by four large commercial power transformers. Many articles have appeared recently in QST explaining more in detail the above circuits.

The results of the tests have shown that transmission across the Atlantic can be accomplished with input powers of less than one kilowatt and on our low wave lengths. We have conclusive proof that C.W. was far more successful than spark not only from the standpoint of comparative efficiencies but also that of power outputs. It is interesting to note that no spark stations were heard by the British amateurs. Since the tests 1AFV (C.W.) has successfully transmitted messages on schedule to England, showing further that amateur transatlantic transmission is not an idle dream.

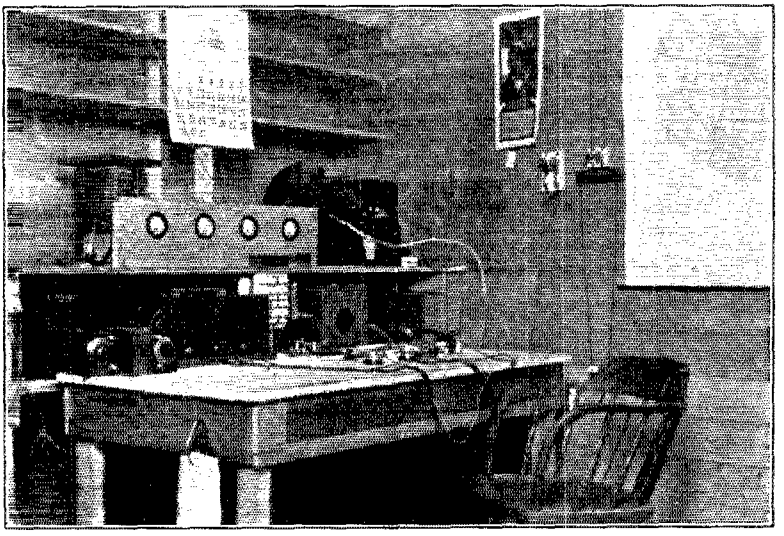
Much of the success was probably due to the high efficiencies and accurate adjustments of the participating transmitters, accomplished only by hours of careful study and work. While data in the efficiency column of the tables is somewhat incomplete and can only be considered as approximate, it shows remarkable values which were thought impossible a year or so ago. The single "5 watt tube" at 1BDT is a striking example of the possibilities of tube transmission and it is hard to believe it was heard in Scotland. The data in the tables are too incomplete to show anything further in common as to a definite reason for success. However much inconsistency is in evidence and contrary to what was generally to be expected, extremely low powered transmitters were successful in bridging the Atlantic.



8XV, Edgewood, Pa.

Most of us were a little too uncertain to predict that such small powers could cover over three thousand miles on schedule but we knew positively that some of our stations would be successful. Many of them had covered distances in excess of two thousand miles previous to the tests.

It is interesting to note however that some of the stations had very poor locations, others good, one station will show a comparatively high antenna resistance and the next a remarkably low resistance; from which it is impossible to come to any further reasons in common for the success of the stations that bridged the Atlantic—except that 200-meter signals "do get out".



1ARY, University of Vermont, Burlington, Vt.

"And It Came To Pass"

The Parable of the Continental-Pusher and the Unfeeling Landlord.

By S. P. W.

AND it came to pass that a certain amateur, whose name mattereth not, having at last succeeded in getting his aerial just as he would have it, and a wonderful counterpoise system completed, was visited by his landlord who saith unto him all manner of unpleasant things, yea, even that his rent was raised fifteen per month.

And the ham taketh counsel with his so-called better half and she speaketh unto him words of wisdom, and many of them. Being wise in the ways of women, he departeth and inserteth an ad in the papers.

He getteth many replies and they visit many domiciles, but he findeth not what he seeketh, for it appeareth that two things come not together; and the names thereof are a Nice Long Backyard and a Decent House.

His wife wondereth exceedingly why he refuseth to be pleased and she pleadeth with him, saying, "Knowest thou not that our rent becometh due in four days?". And she reproacheth him in many other ways of which wives know. But he remaineth firm and shaketh his head decisively, saying, I pay the rent and lo,