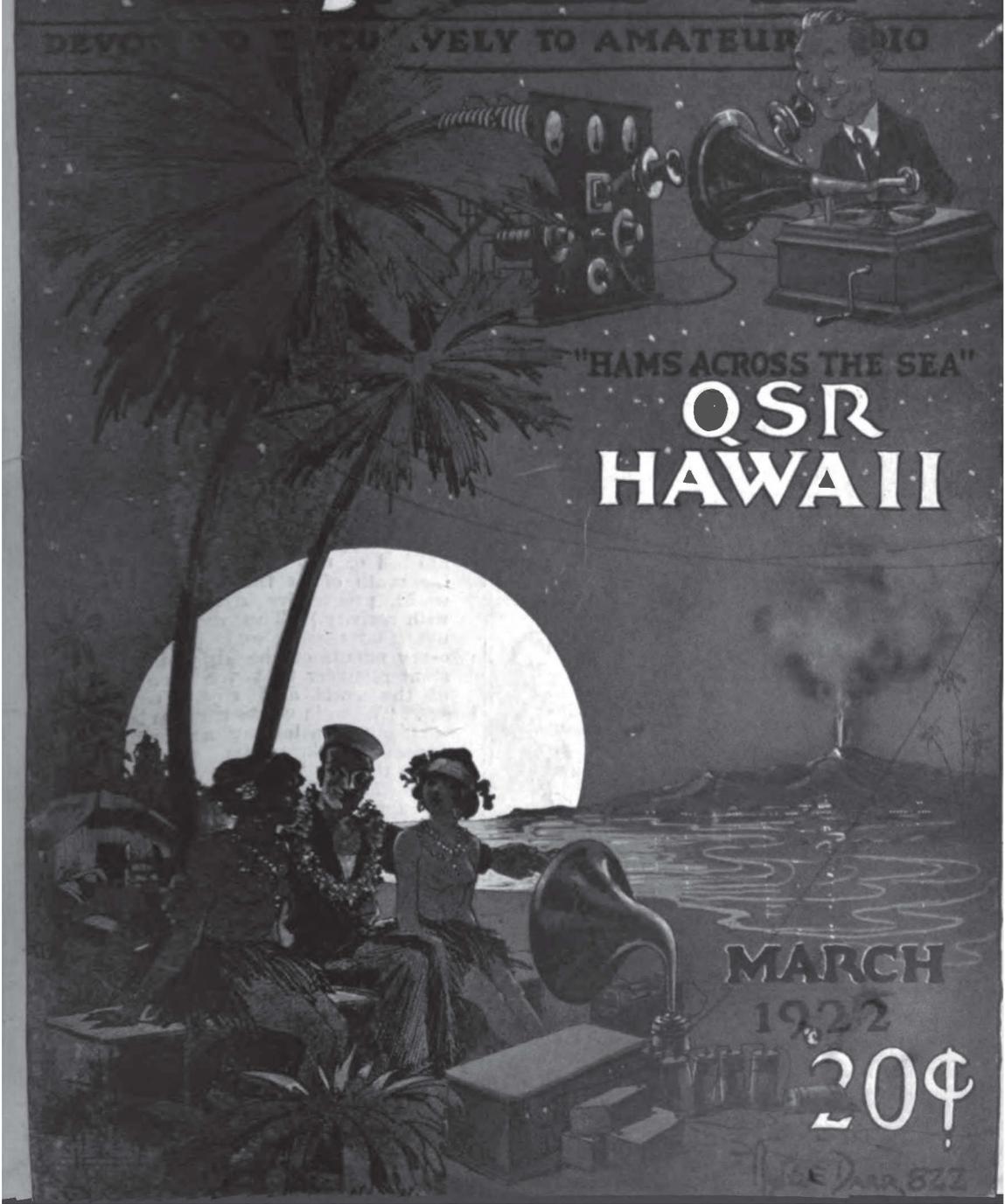


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MARCH  
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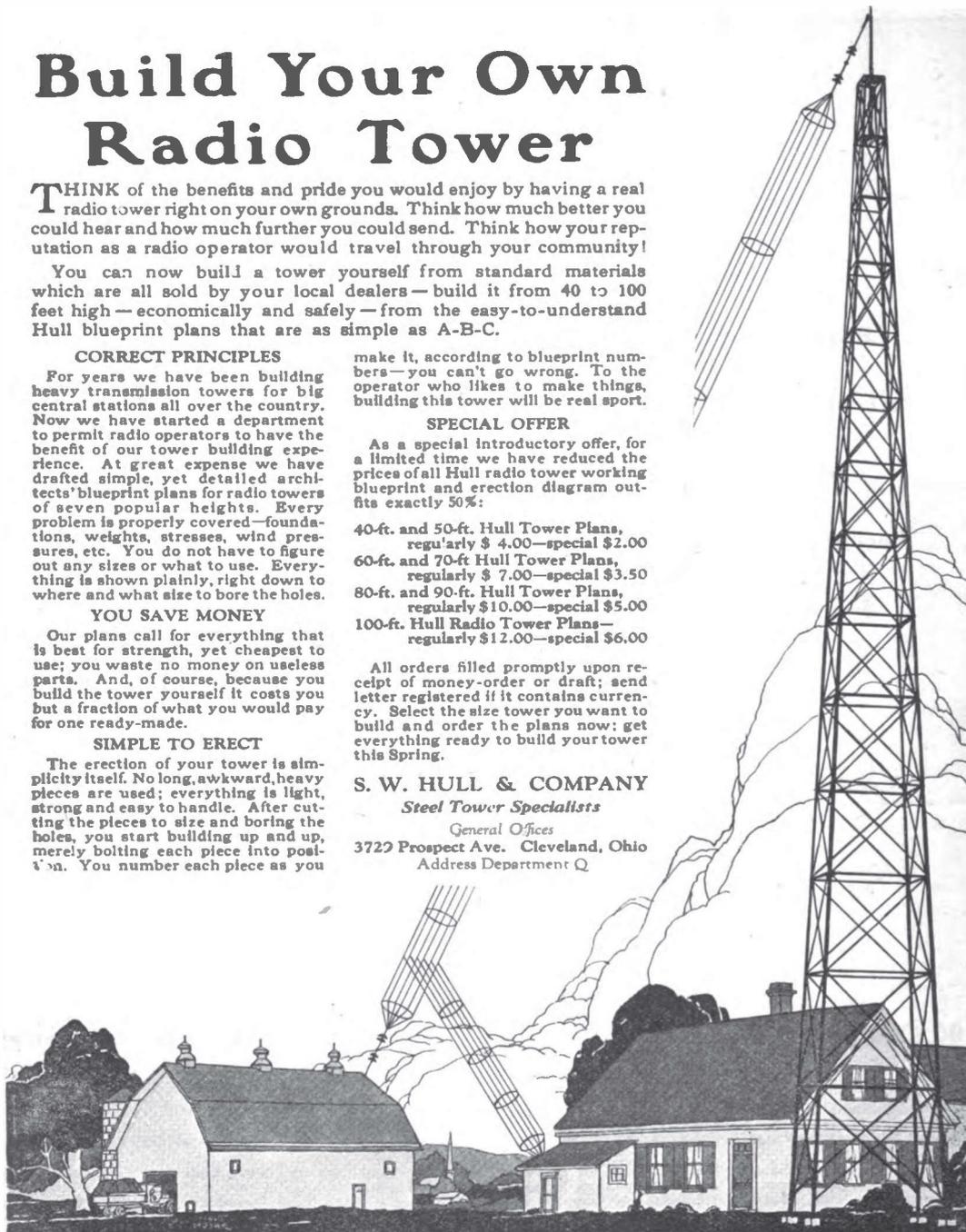
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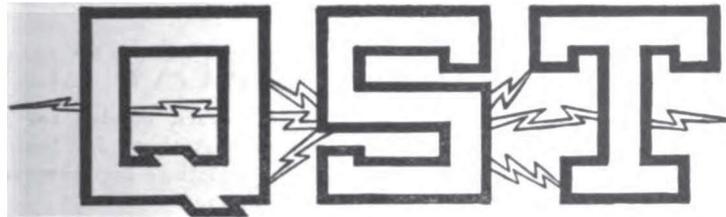
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# The Official Organ of the A.R.R.L.

VOLUME V.

MARCH, 1922

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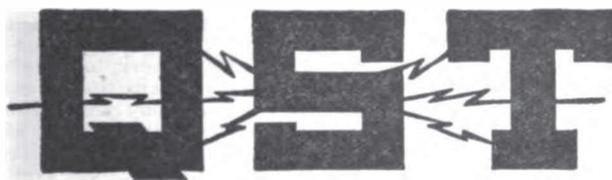
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A Magazine Devoted Exclusively to the Radio Amateur

## —And Now Transpacifics

**W**HILE Godley and the British amateurs were making history across the Atlantic in December another lone amateur in Hawaii was doing the same thing across a considerable portion of the Pacific Ocean and we have the honor of chronicling still another remarkable amateur achievement.

In the "Communications" department of QST last September we published a letter from Mr. Clifford J. Dow, 6ZAC, located at Wailuku, Maui, Hawaii, under the heading "Hawaii Getting QRV". Now Hawaii is *almost* QRV, as Mr. Dow has got his receiver in operation and has copied scads of American amateurs as far inland as Wisconsin and has received dozens of messages, proving irrefutably that it can be done. We have before us copies of Mr. Dow's log covering a period from December 14th to January 5th, during which time some two dozen stations were copied, most of them many times, including the following:

5XU, Austin, Tex., spark  
5ZA, Roswell, N. M., C.W.  
6XAC, Los Altos, Cal., Fone & C.W.  
6XAD, Avalon, Cal., C.W.  
6XAF, Oakland, Cal., C.W.  
6ZB, San Diego, Cal., C.W.  
6ZE, San Francisco, Cal., C.W.  
6ZR, Los Angeles, spark  
6ZAF, Berkeley, Cal., C.W.  
6ZAD, Napa, Cal., C.W.  
7JP, Astoria, Ore., spark  
7XF, Portland, C.W. & I.C.W.  
7YA, Boise, Idaho, spark  
7YG, Portland, spark  
7ZD, Bozeman, Mont., spark  
7ZJ, Vancouver, Wash., spark  
7ZP, Olympia, Wash., spark  
7ZT, Portland, spark  
7ZU, Billings, Mont., spark  
9GK, Neenah, Wisc., C.W.  
9ARJ, Hoisington, Kan., C.W.

9XM, Madison, Wisc., I.C.W.

9YAE, Le Mars, Iowa, C.W.

9ZAF, Denver, Colo., C.W.

He also reports the Army stations CL-8 at Camp Lewis Wash., and XF-1 at Langley Field, Virginia. The distance accomplished by the latter station is remarkable, even for its power—it has a 1 k.w. deForest radiophone operated at 500 watts as a C.W. telegraph set, putting 5 to 6 amps in an umbrella antenna and counterpoise at 375 m.

Most of the above copying was done thru heavy continuous QRN and in spite of tremendous difficulty encountered in the multitudinous harmonics of the Honolulu arc, NPM. Many of the stations are QSA and reliable; and A.R.R.L. message traffic has been copied solid from not a few; in fact, 6ZR, 6ZAF, 7ZJ and 7XF have been broadcasting messages "blind" to 6ZAC, and unless the arc interference and strays are too severe, Mr. Dow is copying them solid and acknowledging by cable or mail. 6ZAF and 6ZR particularly are practically in daily touch with him. As an example, we have received permission to publish the following message which was received by 6ZAF (Berkeley) from Pasadena on Jan. 16th and relayed to 6ZAC on the 18th, who delivered and acknowledged:

*Mrs. Irwin Spalding,  
2376 Liloa Rise,  
Honolulu, T. H.*

*Greetings from Pasadena via radio telegraphy by the courtesy of American Radio Relay League. Thank you for the book. It breathes the real aroma of the enchanted isles. S. G. McMeen.*

Commenting on the signal strength, Mr. Dow says that 6ZR of Los Angeles is the loudest station on the coast, and even beats KPH, the Radiocorp station at San Francisco; and in a letter to Mr. Babcock,

6ZAF, speaks of having him "in all over the house on two steps." 6ZR is using a 1 k.w. 60-cycle synchronous spark set on 375 meters, and 6ZAF is a 100-watt self-rectifying C.W. set using both sides of the 60-cycle supply.

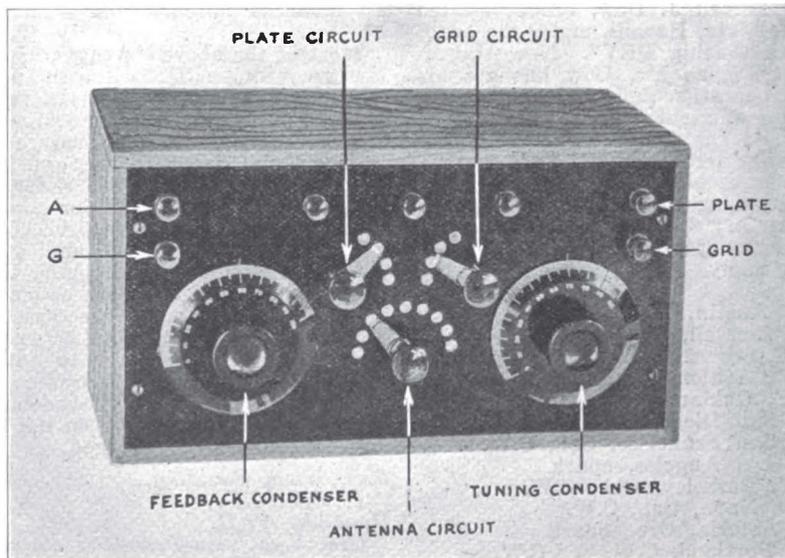
This reception has been accomplished on a simple amateur set using a detector and generally one, sometimes two, steps of audio amplification. 6ZAC, on the island of Maui, is a little less than a hundred miles from Honolulu, or about 2200 miles from San Francisco by the Great Circle route. The reception of 9th district signals, then, is a particularly impressive achievement. (All 9's heard were C.W.)

Mr. Dow is now building a 100-watt C.W. set, a duplicate of 6ZAF, and expects to connect up with the west coast soon. It will require some real co-operation among our fellows there, to get thru the QRM, but we are confident that it can be done. Then how for a relay from Honolulu to London, fellows? Or what's the matter with Capt. Norman Lee Baldwin, recently of 5YH, Camp Pike, Ark., but now military attache at Peking, and still amateuring? And British amateurs can QSO east. Why not Peking to The Hague, via A.R.R.L.? *That day is coming, men!*

## The Improved Reinartz Tuner

THE opening article in QST for last June described the construction of a tuner due to Mr. John L. Reinartz, 1QP of South Manchester, Conn., which while simple and inexpensive was greatly superior to anything else which had ever come our way in the reception of C.W. signals. Since that date some hundreds of enthusiastic letters from

functions aperiodically, resolving the tuning into the simple control of the secondary condenser; (2) feedback is accomplished by a combination of static and electro-magnetic methods in an adaption of the system originated by Roy A. Weagant, Engineer, Radio Corporation, rather than by tuning the plate circuit, so that readjustment of the feed-back is not necessary for each



individual readers of QST report the construction of as many sets, which in every case are performing as well or better than we said, to the surprise and delight of their owners.

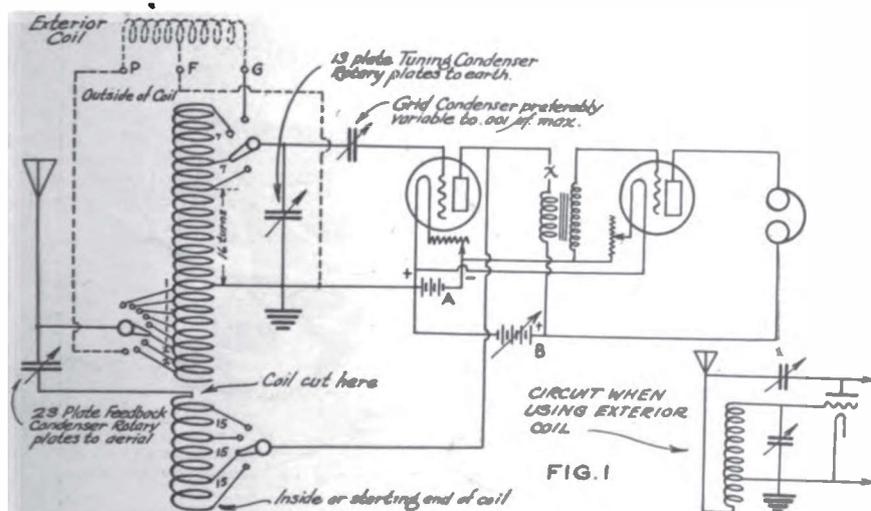
It will be remembered that the chief advantages of this set are (1) the primary

change in tuning; (3) hand capacity effects are practically nil. The result is that the feed-back may be set so that the tube is properly oscillating, and the tuning may be varied thru its entire range with the operation of but a single control with the bulb evenly oscillating; in fact, an adjust-

ment for best *regeneration* for spark signals may be set on the feed-back condenser and will hold good for a very considerable range of tuning condenser without further adjustment. It is in C.W. work that the set has its best field, however, and the possessor of one of these sets can generally pick up a dozen or so C.W. stations working within his tuning range and

is cut, this inner portion forming the plate inductance, but the remaining 40 turns are continued in the same coil and in the same direction, thus giving very tight coupling between the two sections. Taps are brought out to three switches as follows, and as is shown by figures on the diagram:

The plate winding is tapped at 0, 15, 30 and 45 turns, for feed-back control. Upon

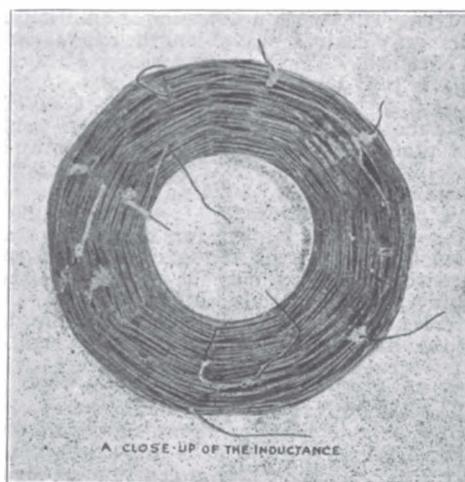


can stop at will on any one of them or return at will to any other, without the slightest fuss or inconvenience.

However, the reader is referred to the June article for a discussion of the principles and the operation of the set. This article is to present certain improvements that have since come to light. The original set had a fixed main inductance and a moving auxiliary inductance on each side thereof. The main expense and complication in the set entered in the construction and mounting of these movable coils. Mr. Reinartz, feeling that the most use of the set was being made by those who construct their own apparatus, accordingly has given thought to its simplification and has succeeded in doing away completely with the moving coils, the only inductance now being a single spider-web coil which can be made by anyone without difficulty.

We believe that the three photographs and the wiring diagram of Fig. 1 will give full information on the new tuner. In its main features it is the same as the old model. The new inductance is a spider-web consisting of 85 turns of No. 26 S.C.C. wire wound on nine "spokes" around a 2½-inch center, the completed coil being about 5 inches total diameter. This gives a wavelength range of from about 130 meters to 370 meters, thus taking in the concerts nicely. After 45 turns are wound, the coil

starting the second or outer section of the winding, taps to an antenna switch are taken off at the 2d, 4th, 5th, 6th, 7th, 8th, and 9th turn; and a ground connection



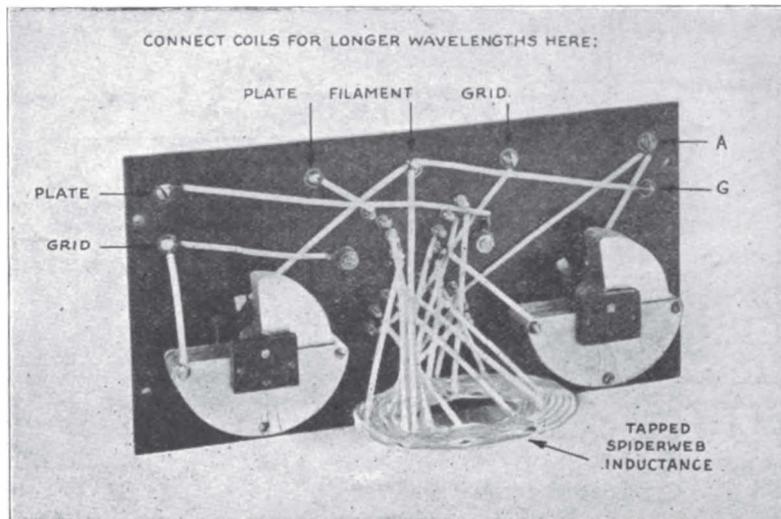
taken off at the 10th turn. Continuing the winding, taps are taken off for a grid switch at the 28th, 33d, and 40th or outside turn, for tuning purposes.

For the minimization of capacity effects

it is important that the rotary plates of the feed-back condenser be connected to aerial and the rotary plates of the tuning condenser to earth.

In Fig. 1 an extra switch-point will be noticed in the antenna switch and in the grid switch, and the plate switch also had a tap at 0 turns. When the respective switch blades are placed on these extra points, any desired exterior coil may be

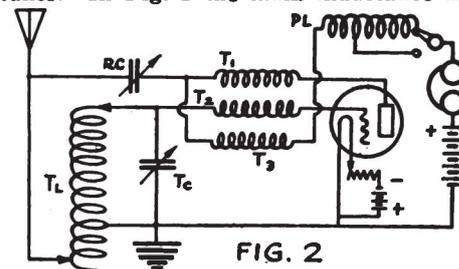
reactance of the primary winding of most amplifying transformers is so much less than the phones that when amplification is used it is found desirable to insert additional reactance, such as a small iron-cored winding of some sort, in series with the primary winding, as shown at X in Fig. 1. (Otherwise the filament would have to be crowded to make the tube oscillate.) Of course the most effective choke would be a



connected to the three binding posts provided at the top of the panel, the regular spider-web is cut out, and the new coil connected in to the tuning condensers and tube control. Thus with a few simple additional coils any desired wave length range can be obtained. The best disposition of such coils is that they have a tap at about one-third their number of turns, so that  $\frac{2}{3}$  of the turns may be connected between grid and filament and  $\frac{1}{3}$  between filament and plate. For 600 meter work Mr. Reinartz recommends a coil of 70 turns of No. 26 wire on a 2 $\frac{1}{4}$ " cylinder (ordinary single-layer winding), tapped for filament at a point 50 turns from the grid end. Even long-wave stations may be copied in this manner. The circuit obtaining when an exterior coil is used in this manner is shown in the little diagram in the lower right-hand corner of Fig. 1.

The Reinartz tuner utilizes what is known as a parallel or shunt supply of its B-battery energy, and it is important that only the audio frequency currents pass thru it and that radio-frequency variations be excluded and caused to pass thru the feed-back circuit paralleling it. When only a detector tube is used, the reactance of the telephones generally is sufficient to choke out the r.f. in the B-battery circuit, but the

tuned trap consisting of a small coil and shunt condenser, capable of being tuned to the working wave, but this would involve an additional adjustment. Accordingly we are indebted to Mr. C. A. Briggs of Washington, D. C., for an interesting innovation designed to get around this trouble, and which will be of particular interest to the possessors of the original type of Reinartz tuner. In Fig. 2 the main inductance and



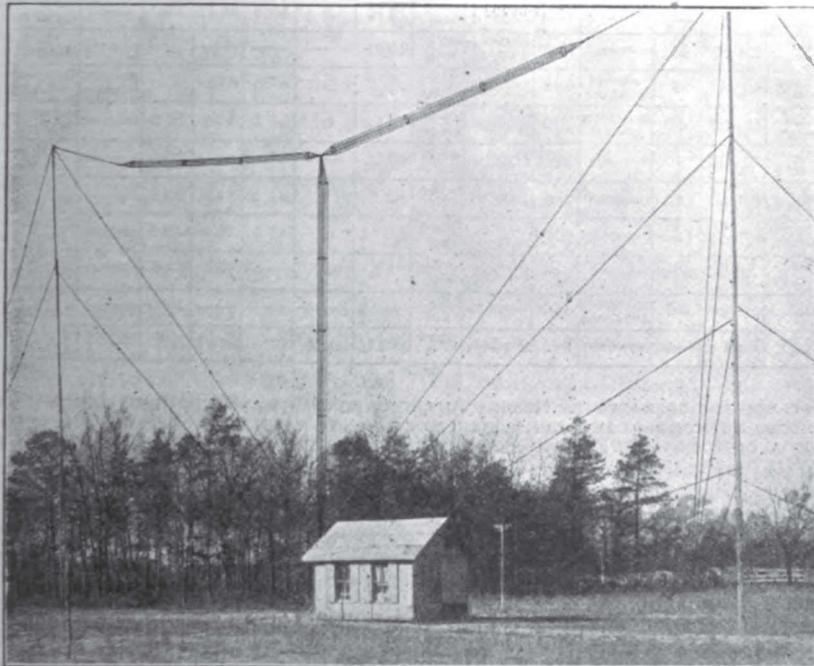
condensers and the two auxiliary inductances  $T_1$  and  $T_2$  are just as shown in our June issue. Mr. Briggs first added a tapped plate reactance shown at PL, consisting of approximately a hundred turns of wire on an oatmeal box, but found of course that at certain wave lengths the radio-frequency currents still leaked by. (Concluded on page 26)

## The Successful Transatlantic Stations

By Robert C. Higgy

**T**HE 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. Its 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 18 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 HW	8	56.4	169.5	225	HARTLEY	UNIVERSITY OF VERMONT BURLINGTON, V.T.
18CG	T-CAGE 8 WIRES	108-75	170	COUNTERPOISE 18 WIRES	990	4-UV204	2200 M.G.	6.0 TC	15.5	56.4	558	230	MASTER OSC.	*SEE FOOTNOTE GREENWICH, CONN.
18DT	7 WIRES	90-50	115	COUNTERPOISE 18 WIRES	—	1-UV202	400 C.R.	8 HW	—	—	—	200	HARTLEY	S. S. HEAP ATLANTIC, MASS.
18SF	7 WIRES	40-40	100	COUNTERPOISE 4 WIRES	150	1-UV203	1500 A.C.	2.7 HW	—	—	—	210	REVERSED FEEDBACK	P. F. BRIDGES HARTFORD, CONN.
18KA	FAN 15 WIRES	50-30	85	—	4.50	1/2 KW DEFOREST	1500 M.G.	5.2 HW	12.	73.7	332	225	COLPITTS	J. E. BROWN GLENBROOK, CONN.
1XM	7 4 WIRES	100-30	100	COUNTERPOISE	1000	G. E. 2-VT40	5000 A.C. 300 V.	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 HW	—	—	—	235	HARTLEY	WORCESTER POL. INST. WORCESTER, MASS.
1ZE	FAN 22 WIRES	100-60	122	COUNTERPOISE	450	2-UV203	1800 T.R.	7.0 HW	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 HW	—	—	—	204	REVERSED FEEDBACK	R. S. MINER HARTFORD, CONN.
1RZ	7 4 WIRES	43-23	80	COUNTERPOISE	150	1-UV203	1000 M.G.	3.5 TC	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 HW	—	—	—	200	COLPITTS	H. B. COLLINS BABYLON, N.Y.
2BML 2EH	T-CAGE 6 WIRES	60-55	95	GROUND COUNTERPOISE	690	2-UV204	5000 T.R.	7.0 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 TC	6	64.2	324	200	HARTLEY	JOHN DI BLASI FLUSHING, N.Y.
2FP	7 WIRES	70-70	100	GROUND	500	1-UV204	6000 A.C. 500 V.	5.0 TC	—	—	—	200	HARTLEY	H. G. BARBER BROOKLYN, N.Y.
2ZL	7 4 WIRES	85-65	120	COUNTERPOISE	968	2-UV204	2200 A.C.	8.0 TC	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 TC	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	M. NARY & HALL WASHINGTON, D.C.
8BU	—	30-28	80	COUNTERPOISE AND GROUND	150	1-UV203	1000 C.R.	4.6 TC	—	—	—	200	HARTLEY	J. L. RUSSELL CLEVELAND, OHIO
8XV	LOOP AND CONDENSER	65	—	COUNTERPOISE	980	2-500 W.	3750 T.R.	15.2 TC	3.5	82.5	808.5	200	—	F. S. McCULLOUGH EDGEWOOD, PA.

\*18CG WAS OWNED AND OPERATED BY MESSRS. AMY, ARMSTRONG, GRINAN, CRONKHITE, INMAN & BURGARD. 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

THE TRANSATLANTIC SPARK TRANSMITTERS

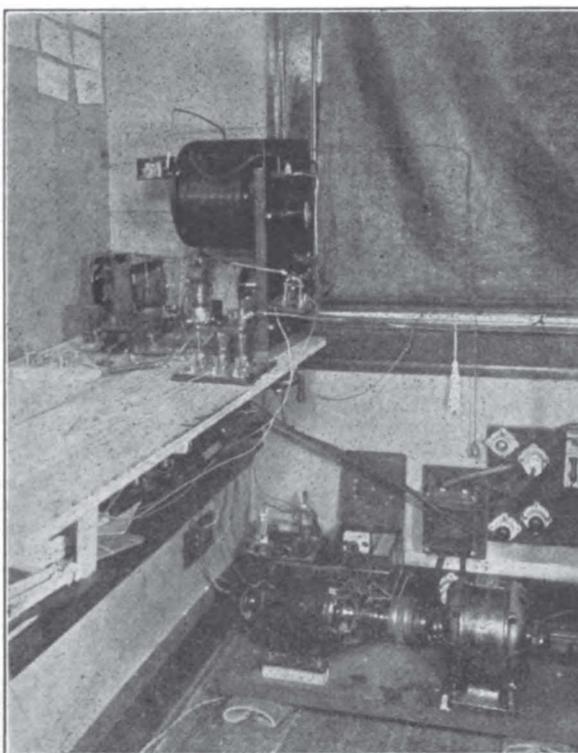
STATION	ANTENNA	HEIGHT	TOTAL LENGTH	WAVE LENGTH	INPUT WATTS	ANT CUR.	OWNER AND LOCATION
1ARY	T 4 WIRES	60-50	110	200	1000	5.5 HW	University of Vermont Burlington, Vt.
18DT	7 WIRES	95-55	115	200	1000	6.0 HW	S. S. Heap Atlantic, Mass.
2BK	FAN 4 WIRES	75	105	203	800	5.8 TC	C. E. Trube Yonkers, N.Y.
2DN	T 4 WIRES	95-75	125	200	700	3.0 HW	Arnold Brihart Yonkers N.Y.
2ARY	T 6 WIRES	60-40	80	208	1000	4.0 HW	W. W. Radfern, Jr. Brooklyn, N.Y.

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-

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.

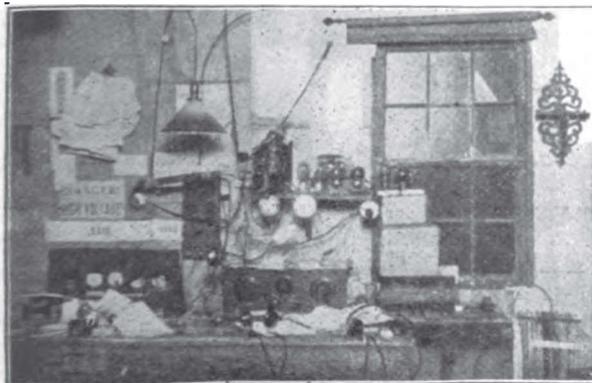
1YK, the station of the Worcester



1RU Transmitter

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.

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



2AJW, Babylon, L. I.

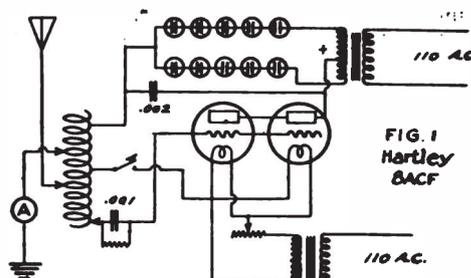
watt transmitter. A fifteen-wire fan 50 feet high was used, being somewhat different from the other stations in that respect. The photograph needs no further comment as it shows the arrangement and types of the apparatus very clearly.

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

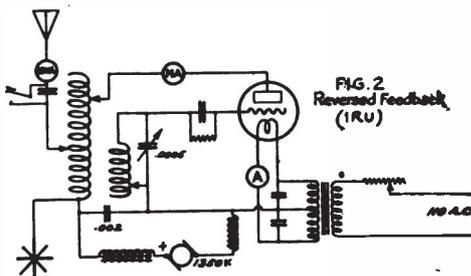
fection and also resulting in a lower antenna current of 15.2 amperes. The antenna is a loop condenser scheme and is of unusually low resistance, 3.5 ohms. Further details are lacking at this time. The tubes used were of a special type, designed for an input of 250 watts, but



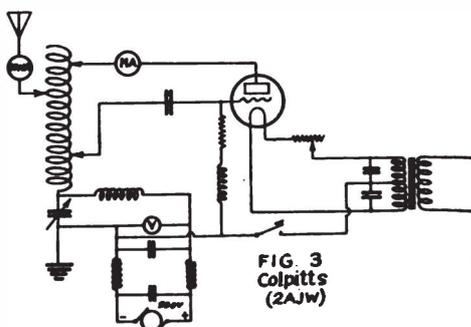
approximately 500 watts were used in each tube. Recently two additional tubes have been added as modulators for telephone and exceptionally good distances spanned.

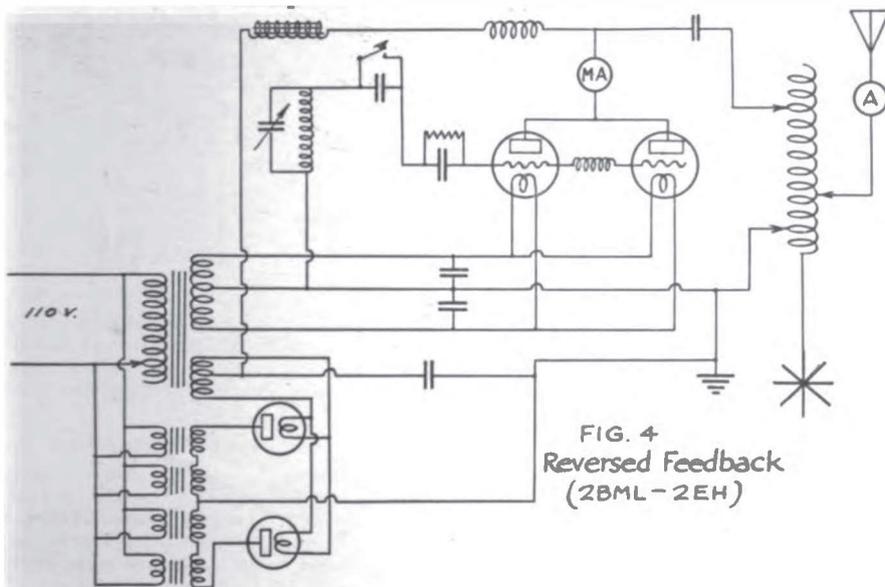
**The Spark Transmitters**

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.



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





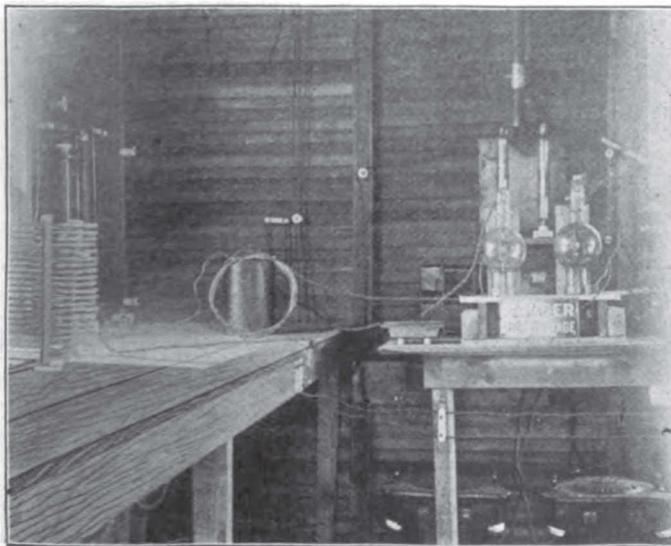
movable knife-edge electrodes of aluminum and twelve stationary brass electrodes designed to give a quick break. The C.W. transmitter uses a single 50-watt tube and needs no further comment.

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.

2ARY, originally 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.

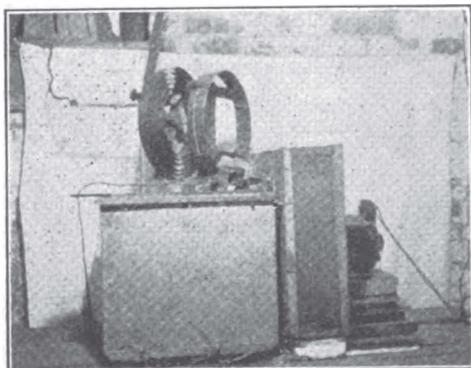


2BML-2EH Transmitter

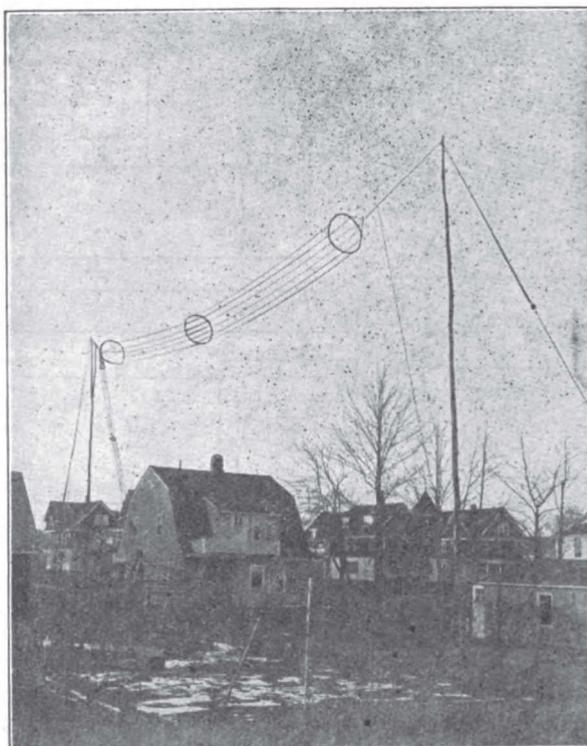
2DN of Yonkers, N. Y., another of the successful sparks, contains many features typical of the average spark set. The antenna was an inverted L 30 feet between spreaders of 16 feet width. Four one-foot cages were used instead of the usual four wires. A small cage lead-in 95 feet long was used, the antenna 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 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.



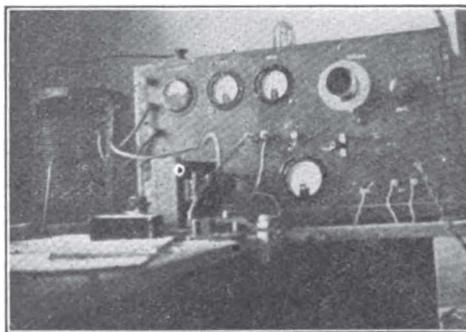
2BK's Spark Transmitter



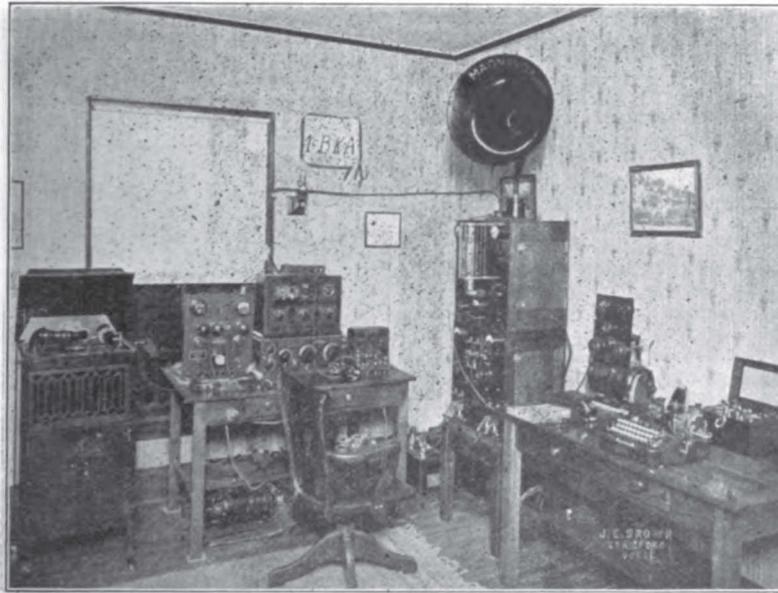
The Antenna at 1RU

#### 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



The 50-Watt C.W. at 1RZ



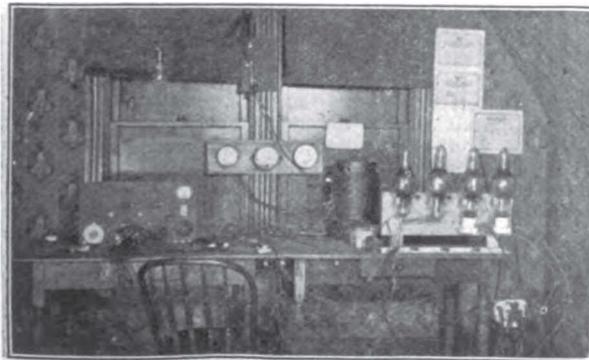
1BKA, Glenbrook, Conn.

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 capacitive 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

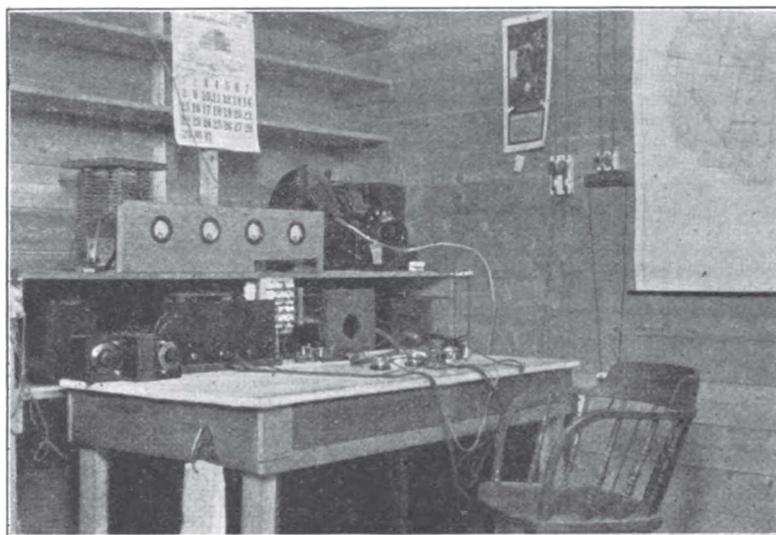
accomplished with input powers of less than one kilowatt and on our low wave lengths. We have conclusive proof that C.W. was far more successful than spark not only from the standpoint of comparative efficiencies but also that of power outputs. It is interesting to note that no spark stations were heard 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 some of the stations had very poor locations, others good, one station will show a comparatively high antenna resistance and



IARY, University of Vermont, Burlington, Vt.

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

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”.

## “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,

I shall have what I desire!" And his Storm-and-Strife wondered exceedingly at his spunk.

And it came to pass that on the eve of the last day before the rent became due again that they explored a house in a splendid neighbourhood. And the house hath hardwood floors both upstairs and down and a fireplace and a built-in book-case which they both long after, and the walls were newly decorated, and the paint was fresh even unto the point of stickiness. The residence hath every modern improvement, even unto a burglar-proof locker in the cellar, yet the bulb-burner spreadeth gloom at every glance.

For he hath seen that the back yard is crowded with 110 and telephone wires, and that a power line drapeth itself near-by. He noteth with tears that elms of great age and altitude stand close by. He weepeth when he seeth a slate roof, which taketh not kindly to the erection of a mast.

And on the quiet he taketh aside the owner and asketh about an aerial (for hope springeth eternal in the breast of the ether-agitator!) and he waiteth with bated breath for the reply.

And the landlord scowleth dangerously, and growleth in a manner that fortelleth disaster, speaking of lightning and dangers of which he knoweth not that beset the property whereon wireless flourisheth.

And the wife entereth at this moment, and catcheth the word "Wireless", and lo, a great light breaketh upon her. And she saith unto the landlord, "We take this house!" and it was even so: they did! And those among you who be married know well why, for out of experience and suffering cometh the knowledge that when SHE speaketh thusly, it is exceedingly wise to obey, even unto the letter!



And so they moved into their new domicile and the wife rejoiceth exceedingly in the beauty of the place, but her husband faileth rapidly and mourneth continually.

For had he not torn down an aerial that

was a wonder, and torn up a ground that would have pleased even Warner? And had he not been forbidden to erect an aerial? He reflecteth that Job had an easy time after all; and he trieth divers means of erecting aerials that would escape the attention of the landlord.

He stringeth up an aerial in the attic, and on a rainy day the wash-lady hangeth her clothes thereon to dry. And the wires,



being but lightly attached, hold not the weight put upon them, and they break loose. The clothes thereon trail over a dusty floor and become exceedingly soiled.

The wash-lady becometh disgusted and quitteth her job, and the wife of the circuit-hound becometh exceedingly angry and reproacheth him saying, "Thy foolishness hath caused me to lose the best wash-woman in the city!" And she weepeth and refuseth to be comforted with less than a twenty-five dollar hat.

So he trieth a spiral cage antenna and placeth it in a large closet, saying naught unto his wife. But the next day she discovereth it and layeth violent hands upon it; so that when he returneth at evening he findeth only a tangle of wire. And when he attempteth to bawl her out she rareth up and saith, "Thinkest thou in thy ignorance that thou canst clutter up one of those wonderful closets with that mess of wire?" And he, being aware of the value that women-kind place upon closets wherein they may hang their finery, saith nothing, as was wise, for what profit it a man to speak in a case like this?

And in the days that followed he trieth many and divers aerials, and he runneth in bad luck always in this wise: He hooketh onto the eave-trough, and that night it raineth and the water followeth the wire thru the open window and on to a Persian rug that his wife cherisheth above all things. He useth condensers and connecteth onto the telephone line; but his set regenerateth exceedingly and the howls thereof

(Concluded on page 26)

## The European Transatlantic Results

**I**N the issue of "The Wireless World" for January 21st Mr. Philip R. Coursey, in charge of European arrangements for our Second Anglo-American Transatlantic Tests, reports on the results achieved by the British amateurs.

All the reports were not yet in at the time of writing but it was possible to say that signals from American amateurs were heard there by eight British stations, and some signals were also heard at The Hague (Holland) and at Nice, France. British amateurs picked up the complete and correct code-words from stations 1AFV, Salem, Mass., 1ZE, Marion, Mass., 2BML, Riverhead, L. I., 2FP, Brooklyn, and 2ZL, Valley Stream, L. I. Calls were also heard during the free periods from 1RU, West Hartford, Conn., 1BCG, Greenwich, Conn., 1UN, Manchester, N. H., 1XM, Cambridge, Mass., 2ZC, South Orange, N. J., and 2RU (?), the last one being uncertain. 1BCG was heard by five of the British amateurs, due to its prolonged calls. Commenting on this station's signals, Mr. Coursey says:

"While doubtless of considerable use to Mr. Godley, it is unfortunate that the signals from this station acted as a hindrance to some of the British amateurs, who picking them up, recognizing that they were of American origin and not knowing the special nature of the station [i.e., erected on Godley's recommendation, that he might have a known signal to tune to—Ed.], copied the repeated calls and messages for hour after hour during the best nights of the tests, to the complete exclusion of possible signals from other American amateurs—signals which must have been there had they been tuned in if the exceptional transmission qualities of those particular nights are considered."

Of those who picked up the signals, by far the best reception was made by W. R. Burne, of Sale, Cheshire, who heard seven stations, three on individual transmissions with the correct code-letters, and who has been awarded the British prizes allocated to the most successful reception of the signals. The value of these prizes seems to total in the neighborhood of \$600. Other prizes offered by British manufacturers for various performances have likewise been assigned to other contestants. H. H. Whitfield, of Hall Green, Birmingham, was second in merit, hearing two stations besides 1BCG, altho listening but two nights during the tests. Mr. W. Corsham, of London, Mr. R. D. Spence of Huntley and Aberdeenshire, Messrs. A. E. Greenslade and E. McT. Reece of London, Mr. J. R. Forshaw of Ormskirk, and Mr. T. Cutler of

Southampton, all heard at least one station during the tests. It is of interest to note that in all cases the aerials used by the British amateurs were within the limits imposed by their Post Office licenses and therefore much smaller than the system used by Mr. Godley.

Commenting in general on the tests, Mr. Coursey goes on to say:

"It is indeed fortunate that the tests on this occasion lasted for a longer period than last time, as the general results obtained by all stations, including Mr. Godley's, show that the signals were heard on a few nights only. Apparently at the beginning of the test period transmission was bad, but the signals gradually increased in strength during the next two nights and then faded right away again until nothing whatever was heard during the last nights of the test. Doubtless these changes were closely connected with the meteorological and other atmospheric conditions existing over the Atlantic at that time. This point is being investigated further, as the weather charts for that period are being collected. Had the tests only lasted the three days allocated on the previous occasion, it is quite likely that once again nothing would have been heard."

We are awaiting with interest information on the apparatus and circuits used by the successful British stations, and will endeavor to present some of this information to our readers.

### One of the American Stations Received in Holland

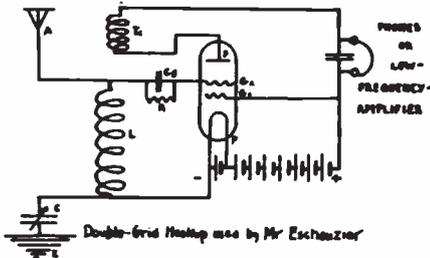
The following is a translation from the Dutch magazine "Radio Nieuws", organ of the N.V.v.R.T., sent us by Mr. Hatto Tapperbeck of Stanford University, Cal.

"During the period of the Transatlantic Tests Mr. Eschauzier, a Dutch amateur in The Hague, Holland, listening in eight nights succeeded in receiving the following signals at a wave length of 230 meters.

"On the night of Dec. 10, at 1:05 a.m. G.M.T. the word "test" was given several times followed by: "CQ CQ CQ de 1BCG 1BCG 1BCG test test test rp rp", etc. At 1:50 a.m. G.M.T. the signals disappeared. The next night (Dec. 11) from 1:35 a.m. G.M.T. until 3:00 a.m. the same station was heard again sending: "MGES MGES MGES de 1BCG 1BCG", and at 3:00 a.m. G.M.T. again: "test test test de 1BCG 1BCG followed by: "MGES de 1BCG" and by "P.F."

"Dec. 12, at 1:35 a.m. G.M.T. 1BCG came in again with: "test de 1BCG PF PF PF Godley Godley Godley bi thirty minutes", repeating every word several

times. The same night at 2:30 a.m. 1BCG sends: "bi one hour" several times and stops at 2:35 a.m. Back at 3:35 a.m. send-



ing: "Test v 1BCG nr. 1.... Newcark... to Paul Godley Ardrossan Scotland... congratulations.... Burghard Inman Grinan Armstrong Amy Cronkhite bi two hours, 1BCG". It stopped at 3:45 a.m.

G.M.T. and was heard again at 5:58 a.m., but too faint to receive more than: "nr 2 nr 2".

"Since Dec. 12, 1BCG has not been heard any more. The hookup below was used with a three-step low-frequency amplifier and a 60-ft. three-wire antenna 75 ft. above the ground and 30 ft. above the roof of the house.

"The reason for not receiving the text of nr. 1 completely is the fading away of the signals. This has been observed to occur periodically. The signals were very strong for 5 to 10 seconds, faded away, disappeared entirely during a period of 5 to 10 seconds and increased gradually afterwards to the maximum strength. Sometimes the signals held their maximum strength only for 1 to 2 seconds while they disappeared completely for about half a minute."

## The Radiophone and the Code Station An Argument for Co-operation

By S. Kruse

Here is a very splendid article on a phase of amateur work that is becoming decidedly important—the relation between amateur phone operators and dot-and-dash operators. This should not be confused with any C.W.-and-spark argument—"code station" means one using telegraphy, whether spark or C.W. Like all of our amateur problems this one melts into nothingness when co-operation, that much-used but invaluable word, is brought to bear upon it. Mr. Kruse points the way. Every amateur operator should read this article and take it to heart—it surely will result in untangling the local misunderstandings that now exist.—Editor.

IT has been the history of Citizen Radio that its accomplishment in any field is in proportion to the spirit of co-operation shown by its followers in the region considered. In the relay field Chicago occupies the position of "hub of the relay system" because there was first conceived in Chicago a fraternal system of club co-operation which aided the radio inspector in his duty of providing the best possible radio conditions by securing obedience to law. The "Chicago Plan" did not stop there but voluntarily provided time divisions for each class of station and required stations to adhere to those divisions, doing not only all that the law required but much more.

It was this fine willingness to allow the other man complete freedom over a part of the evening, to aid the inspector in limiting decrements and waves, that resulted in those splendid operating conditions that long distinguished Chicago from other cities.

Today this is widely recognized and city after city has adopted the Chicago Plan or some time division scheme that takes the

place of part of the Chicago Plan. In most cities it is not today considered courteous to operate a station all evening long nor in an improper manner and in quite a few there is provision that those who have not gentlemanly instincts will feel a force of public sentiment which they can understand.

It seems very peculiar then that there exists today such an amount of enmity between the radiophone men and the code men that they must indulge in acid correspondence thru our QST rather than to attempt thru those columns to establish that understanding which is rapidly being completed between local and DX, between spark and tube, and between spark coil and transformer.

Let us analyze the situation:—

### The Code Station—Its Virtues

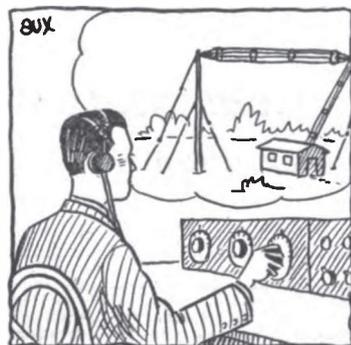
**Operation**—The code station begins with a low-powered set, increasing power and knowledge simultaneously. The small set usually belongs to a beginner and its smallness mercifully limits the amount of harm that ignorant operation may cause.

When the spark or CW set has grown larger the operator has acquired a device

with which more interference can be produced but at the same time he has learned to operate, and, if he be normally perceptive and equipped with those gentlemanly instincts referred to above, we find that he has learned to operate well. In this the code operator seeks justification to despise the inferior fone operator, whatever the latter's technical ability.

**Code Ability**—He understands both the code and the English language, hence can be reached by all classes of stations. Accordingly he cannot understand the man who knows but one language.

**Working Periods**—He works in short periods and of necessity listens between times to the reply of the other man, hence can be called if it is necessary. That anyone should send continuously causes the code man to rave.



In any city where the A.R.R.L. cooperative spirit has not utterly failed of appreciation he operates during a certain part of the day—the time agreed upon by his club for his class of station.

**Tone**—If it is spark or I.C.W. the tone is at least passable, for all its correspondents will "razz" a station with a bad tone.

**Back Wave**—Finally the set emits energy only when the key is down.

**Fraternalism**—Almost every code man belongs to a radio club, for in operating his station he has made many friends. He is accordingly alive to all transmission conditions and to any novelties or changes in citizen radio.

#### Code Stations—Their Defects

**Calling**—Code stations are very generally guilty of needlessly calling a station which two minutes' observation would prove to be unworkable thru QSS, QRN or QRM.

**Brevity**—Code men are almost all guilty of wordiness.

**Percentage of Listeners Who Are Interested**—The indictment can be brought against the code station that while (excepting NAA) its signals interest but one, it jams many.

#### The Phone Station

**Operation**—Phone operators often do not

build their sets but by them ready-made. Because of the tremendous carrying power of a small amount of C.W. the operator will cause long-distance interference for a while before he learns to operate. It is a fact also that a large number of phone men, because they have the technical knowledge needed to construct and operate a phone, assume that they are good operators. Now it can be put down as a nearly universal rule that a good laboratorian is a horribly bad operator; and nothing exposes his abysmal ignorance of operating ethics as does a radiofone. On the whole the phone operator is an inferior operator, weak on operating practice.

**Code Ability**—The usual fone man is a poor code man. In the course of operating he may become poorer, forgetting even the bit of code he knew when passing our foolishly-easy license examination. He works with other fones only or broadcasts without listening, and regards code as annoying and meaningless noise.

**Working Periods**—The radiofone seems to cause normally taciturn and reserved people to lose their reserve utterly, to talk much and to play their phonograph records over and over again. This is neither more nor less annoying than the long-winded spark. Club time divisions have in the past been ignored by fones. It is pleasing therefore to see that they are beginning to cooperate.

**Tone**—With the fone, "tone" means "quality of modulation". Here we have to make the first really important indictment of the fone. I am going on record as saying that I have so far heard but two fones, namely KDKA and 3NR, that were not open to material improvement in modulation quality. There are in use very many fones of both high and low power whose modulation is wretched.

**Back Wave**—Many fone stations are allowed to radiate while no sending is being done, while the operator is resting or while the phonograph is being wound. This is illegal and discourteous.

**Calling**—The fone usually does less foolish calling than the code set. It would distinctly be the better behaved if the operator knew a standard method of calling.

**Brevity**—Fone operators are usually even wordier than code men. The added speed of speech compensates for this.

**Fraternalism**—The fone man may or may not belong to a radio club. Not infrequently he appears to regard the code man as an inferior and to flock by himself.

**Percentage of Listeners Who Are Interested**—A broadcast fone if properly operated can claim a very high percentage of its hearers as interested listeners. A conversation fone, used as a code set would be used, ranks right with those code sets unless it can prove a superior sharpness that will result in fewer unwilling listeners.

### A Plan of Co-operation

It has now become apparent that interference cannot be avoided between the two types of sets unless some changes are made, and further than these, changes must be made in

- A—mental attitude of the operator
- B—operating practice
- C—sending equipment.

*A—Mental Attitude*—Neither the fone nor the code station has in the analysis proved itself alone perfect, nor has either brought any paralyzing indictment against the other.

It follows that both have a right to existence and that neither should attempt monopoly. To deny this is to prove one's utter selfishness. The practical applications of this principle are these—

The code man must abandon his attitude that the fone is a toy to be lumped with the spark coil and consigned to the local hours just after supper. Phone broadcasts have a very widespread audience; it would not be surprising if even today KDKA's audiences are larger than those of NAA. In turn the fone man should recognize the fact that code is not being sent to jam someone's broadcasting but that the operator of that code set is doing a thing the fone man and his set are not capable of unless they have greatly superior power—he is with a few watts of energy conducting a conversation with an unseen friend five hundred miles away. Also the code man is doing this thing according to an internationally known system that is a grand mystery to the fone man and is doing it in accordance with his local club's rules of time division, hence is in a large measure justified in jamming a phone which has not asked for a place in the ether.

It will help both men to appreciate each other's right to a place in the radio game if they will consider each other's attainments. To the spark operator the fone man is a "ham", "punk" or "lid" because he cannot send or receive properly and often violates the recognized courtesies of the ether. To the technician who operates a phone the code man is an ignorant brass-pounder. But the former overlooks the phone man's superior technical ability and the latter overlooks the code man's amazing store of knowledge of operating conditions, his pride of trade in his operating ability, his co-operative governing schemes, his fine gregarious sociability. Evidently the two *ought to meet*—they would then understand each other.

There we have the crux of the mental attitude matter; both the fone man and code man should belong to a radio club and should visit each other's stations.

In no other way will either learn that the depth of his own ignorance nor the attainments of the other.

A time division should be discussed between them and broadcasts confined to that time, no other sending being done. That method has solved the other interference problems and will solve this comparatively simple one.

*B—Operating Practice*—The department will correct itself if the basic principle of a friendly attitude can be driven home. Nonetheless we may point the way.

To earn his place in the ether the phone man should develop operating ability. A man who stands before a microphone and says "Hello-Hello-Hello-Hellooo! 1-2-3-4-5-6-Hello" is stamping himself as an ass before a large, tho unseen, audience. The man who makes long-winded, incoherent speeches over a broadcasting fone makes a public fool of himself, and it is almost certain that both will cap the performance by not signing off at all or by giving a firm's name, whereas it is definitely illegal to fail to sign one's proper call. The fone operator should listen to well operated code and fone stations, should question more experienced men and read the radio laws regarding methods of calling and signing.

There should really be defined in law a standard method of fone calling but until there is, an A.R.R.L. method is urgently needed.

The phone operator furthermore should be a code man capable of code reception and (as the law requires) should interrupt broadcast programs 3 minutes out of each 15 and should *shut off his tubes* whenever not actually talking for a few seconds.

The code man on the other hand can with profit learn to observe before calling and to *be brief*.

That is a short paragraph but its observation would reduce transmission 90%. The major portion of the code clan is chronically afflicted with "callitis", the key having an attraction like that of a bright bit of glass to a blackbird. But it would if they would just observe the second rule.

*C—Sending Equipment*—The code man and the fone man both can help greatly by a critical inspection of their own sets.

The precautions to be observed on the spark are too obvious for discussion.

Tube men as a rule blandly assume that their sets create no interference because they are "so sharp". That notion needs violent treatment. A tube set of any power throws a dense blanket over spark reception nearby. It is in order then to keep that C.W. blanket spread out as small a part of the time as possible. Fones should accordingly be equipped with readily accessible and easily operated plate power switches and C.W. code sets should *never* use a compensating wave.

A tube set also jams C.W. and fone reception on its own wave. It is necessary to make sure that the wave is really sharp. Now it happens that the frequency gener-

ated by a tube set is shifted by some systems of modulation so that the carrier wave itself is "waved" back and forth, hence broadened. Similarly the frequency generated by a tube varies if the plate voltage

leaf from the same book and improve his range while decreasing interference by rectifying his plate power and by equipping generator or rectifier with an effective filter.



Every evening that Chauncey calls on Kid Kickback's sister all the bugs within range of the Kid's radiophone set nearly flop from the giggling hysterics

is changed, especially if the circuit has large inductance and small capacity (like our antennas). Hence the use of A.C. plate power makes a horrible mess locally compared to a C.W. set.

It can be put down as a general rule that anything superimposed on C.W. will broaden the wave and make it carry less effectively while creating more interference. The fone man will therefore see that, power being the same, he will always cause more interference than his code brother, hence he is really on the defensive in the QRM discussion. The C.W. code man can take a

Finally, let the code man investigate his keying system and the fone man investigate his modulation by going somewhere else and listening. They are promised a surprise. The spark man will hear defects in his tone, the C.W. man will find his wave jumping about and the fone man will hear modulation that is a horrid cartoon of what he thought he was emitting and which all had assured him was "pretty fair".

And now we have made the circuit and have arrived again at my text which was go and get acquainted with the other fellow and co-operate with him.

## Radio Below 200 Meters

By Boyd Phelps, 9ZT

IT is a very lamentable fact that all general amateurs should have to try to tune to 200 meters. It would be much worse if all of them were tuned to exactly this wave. The result is that many of them are tuned somewhat above 200 to get away from the QRM that would result if everyone was on the same wave. This tendency towards lawlessness is fast hurting citizen wireless.

The general amateur station license provides for wave lengths "not exceeding 200 meters" which leaves a vast number of available waves below this limit. If the regulations were changed assigning amateurs only the waves between 1600 and 1800 meters there would be a very definite number of stations that could work at one time. As it is now, there is no limit below 200 meters to which an amateur can go and

still be within the law. There is really an infinite number of wave lengths available and on the lower waves tuning is so sharp that several meters difference in wave length is sufficient to completely tune out a station.

Looking at the situation in a broadminded fashion, it appears ridiculous that out of the immense number of possible adjustments we should all strive for the same one. If we could spread out more and still be within our legal rights it would mean better working conditions, less cussing at QRM and QRN, more traffic handled, and at the same time provide an efficient way for our Canadian brothers to actually do DX on their 150, 100, or 50 meter wave assignments. Realizing the value of radio below 200 meters, let us plunge into the more technical details.

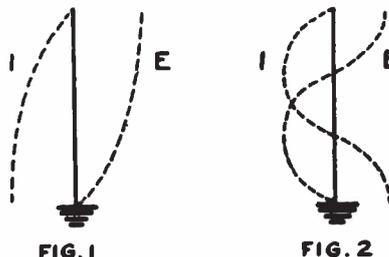
The chief difficulty in the minds of many is the thought of having to use an antenna only a few feet long and perhaps not extending up high enough to clear surrounding objects. The following method worked out by the writer obviates this great disadvantage.

A vertical wire grounded at its base as shown in Fig. 1 is the simplest oscillator. Here the current (I) is greatest at the bottom and decreases to zero at the top while the voltage (E) with respect to the ground is greatest at the top and decreases to zero at the bottom. It is hinted in several publications that this antenna may oscillate with other distributions of current as in Fig. 2 which illustrates the first harmonic of oscillation. The frequency is three times that of Fig. 1 for the same length of wire and the wave length is one-third. Other possible modes of oscillation have wave lengths of 1/5th, 1/7th, 1/9th, etc. of the fundamental. The writer recalls, when a boy, of having shaken a long rope extending up to the top of a barn. By suddenly shaking the bottom of the rope back and forth rapidly and regularly the rope would be made to swing widely at some parts of its length and remain quiet at other even intervals in two, three, or four places depending on how rapidly the motion was started and sustained. This is analogous to what happens in an antenna when oscillating at a harmonic.

An antenna with a fundamental of 300 meters when excited by a straight gap was found to emit waves on 300, 100, 60, 43, and 33 meters. It is only necessary to excite the aerial at one of its harmonic frequencies to have it absorb and radiate energy on that wave. It was found that the ratio of one to three does not hold between the harmonic and the fundamental when the antenna is loaded. At 9FO with the large antenna having a fundamental of 350 meters the use of a series condenser was impractical for 200 meters. All of the secondary of the oscillation transformer was inserted, bringing the wave up to 525 meters; the first harmonic then increasing to 169 meters as determined with a spark gap in the ground lead and a spark coil connected across this gap. With the closed circuit carefully tuned to 169 meters and coupled to the antenna circuit good radiation was obtained on this wave length. Moving any clips on the O.T. caused a falling off of antenna current. With the wave meter coupled to the ground a sharp wave was found at 169 meters but no matter how close the wave meter was coupled to the aerial circuit no wave could be found around 525 which was the normal wave length of the open or aerial circuit. By the ordinary method of tuning it would be next to impossible to tune this station to comply with the law while now communication is

carried on thru QRM on 200 meters. This new method permits easy working on 200 meters and below with a large aerial.

It is perhaps not well to encourage the above experiments too much, especially in coastal cities, as inaccurate adjustments may cause a strong wave to be emitted at about 600 meters. The real value of this method of tuning comes in the use of C.W. A vacuum tube, we are told by many eminent experimenters, will in laboratory circuits oscillate at wave lengths of five



meters or less. Even at this low figure there are countless wave lengths still lower available under the general amateur's license so why all crowd around 200 meters and creep over? Tuning is extremely sharp at low wave lengths so that more stations may be accommodated at wave lengths differing but a few meters. For example, a change of from 10,000 meters to 10,001 meters means a change of but about 3 cycles per second while a change from 100 to 101 meters means a change of 29,703 cycles.

Any vacuum tube oscillating at these low wave lengths will cause the aerial to oscillate provided the aerial coupled to the tube circuit has a harmonic of the same wave length. Energy will be absorbed from the tube circuit and radiated at that wave length under these conditions. Circuits have been used with conductive coupling as well as inductive. It is not to be expected that the radiation ammeter will read as much on low waves as the current in an antenna varies inversely as the square of the wave length.

The writer has been greatly hampered in testing out transmitters on low wave lengths because of the few receiving stations that can get below 200 meters. The single circuit tuner with series condenser seems the best for reception below 200 meters. The ease of adjustment more than offsets the broadness of this type of receiver on low waves because most stations very much below 200 meters will be C.W. Vernier adjustments should be used thruout all tuning elements of the circuit. With the above tried at several stations the path will soon be broken for handling traffic on waves between 100 and 200 meters just as the path was broken by the pioneers in C.W. a year ago. Working on 150 meters now

is equivalent to a Z call and 375 meters, as far as interference is concerned. It is not expected traffic will move on low wave lengths for a while yet, but with the sharpness of tuning, the great decrease in atmospheric disturbances, and the crowding on and just above 200 meters, it appears that getting below is the logical solution of our problem.

#### THE IMPROVED REINARTZ TUNER

(Concluded from page 10)

It then occurred to him to make these "leakage currents" do useful feed-back work and this he accomplished by making a third auxiliary coil,  $T_3$ , of some 25 or 30 turns, placing it in the phone (or primary transformer winding) circuit where it would be coupled to the grid auxiliary coil  $T_2$ , and completing the circuit to a point between  $T_1$  and the feed-back condenser RC. The new arrangement now works beyond criticism, and has resulted in a decided improvement in results.

#### "AND IT CAME TO PASS"

(Concluded from page 19)

cause his neighbors disturbance when they would hold converse on the line, and the telephone company sendeth a man unto him who speaketh unkindly and threateneth to sue if the performance be repeated. And then he remembereth Major Squires, and he trieth a tree antenna, but the next day a junk man cometh and maketh off with the nice copper wire. And he buildeth a loop antenna which worketh not and stringeth up wires in the basement to no purpose.

And he sweareth to himself that next summer he will build himself a house of his own, and will have built into it a special sound-proof room. And there will be special wiring and fuse-panels, and on

the roof there will be a tower of great height. And the back yard will be two hundred feet long and treeless, and his aerial will be a thing of beauty to him and an abomination in the eyes of his neighbors who understand not the complex joys of radio.

And the dabbler in dots and dashes rejoiceth exceedingly in this vision, and in the meantime planneth new aerials and new methods of circumventing landlord of the Tribe of Damphools, for hope, as we have stated, springs eternal!

For truly, as was spoken by the prophets, "Necessity is the mother of invention, and he who trieth to repress a condenser-twirler is as one who maketh hooch and putteth in the stoppers too soon!"

Selah!

#### A.R.R.L. Boosters

By L. Q.

OUR A.R.R.L. has two kinds of boosters and we love 'em both.

The first kind wears a QST in the coat pocket, a smile on the face, and fellowship in the heart. He whoops us up at every chance, converting to A.R.R.L. all within sound of his loud and joyous voice.

We love him for the new friends he brings.

The second kind makes no noise. But at the club door he grasps the star speaker's hand saying—"O.M., that was a fine talk and no paper but QST deserves it. Come over to the Allnite Lunch while we make a preliminary write-up." Then he camps on that trail until the paper goes to Hartford.

And we love him too, for he keeps our old friends with us and who shall say he brings no new ones?

Moral—Are you the first or the second kind of booster?

## An Improved Primary Condenser Switch

By Chas. T Jacobs

THE primary circuit of the modern receiver seems to include more often than not a variable condenser for tuning purposes. In most cases it is highly desirable to connect this condenser so as to be able to throw it at will (a) in series with the primary inductance, (b) in parallel therewith, and (c) out of circuit altogether. This is usually accomplished by means of flat spring switches on the surface of the control panel, either two single-blade two-point switches, or a double-blade eight-point switch being used.

Desiring to find a switch which would not take up so much panel space, yet at the same time be at least as convenient in operation as the usual types, the writer

resorted to the use of one of the anti-capacity switches on the market today. These have three positions, as required, but unfortunately for the work in hand are entirely open circuited in the middle position. The series and parallel connections can be obtained, but no plain connection of the inductance and omitting the variable condenser is possible without a change of some kind in the switch itself. A little experimenting revealed that by slightly bending two springs a switch could be obtained that would meet the requirements in every respect.

A side view of the spring assembly of a switch such as the writer used is shown in Fig. 1. It should be mentioned that his switch has two rows of six springs each,

instead of only one, as shown. The other springs would be directly behind those shown in the drawing. But only one row is necessary (though two rows could be used connected in parallel to reduce resistance, if desired) and only one row need be treated as described.

In the drawing, A and B are the movable springs, each exerting a pressure on wheel W, by the raising or lowering of which they are operated. Numbers 1, 2, 3, and 4 are stationary springs. When the wheel is

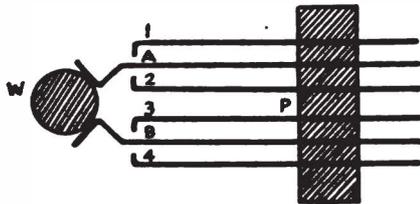


FIG 1

raised by pressing down on the switch handle (not shown) spring A is forced against spring 1, and spring B is allowed to rest on spring 3, which it will do, owing to its tension. Conversely, when the wheel is lowered by raising the switch handle, spring A is allowed to rest against spring 2, while spring B is forced against spring 4.

To adapt the switch for the use under discussion it is simply necessary to bend up spring 2 so that it shares with the wheel the pressure of spring A, and to bend down spring 3 so that it shares the pressure of spring B. This is not much of a job if a small pair of pliers is available, but certain precautions must be observed if a satisfactory result is to be obtained.

First it is well to see that both springs A and B are exerting equal pressure against the wheel. In a single row switch this is easily determined by the switch handle, which should stand out straight. If it does not, bend one or the other spring at the base (P) till an equal pressure by both springs is indicated by the position of the switch handle. In a two-row switch it is necessary that in each row individually the pressure of spring A equal that of spring B. For this reason these two springs should be wedged apart in one row so that neither touches the wheel, and the two springs in the other row adjusted as in the single-row switch. Then the wedge is removed, and the springs which were wedged adjusted till the switch handle stands out perfectly straight. This insures a properly adjusted switch to begin with, and is important, as these springs are often affected by careless handling, etc.

Having equalized the pressure of springs A and B, and with the switch in the neutral, or middle, position, bend spring 2 at its base till its tip just touches spring A, and

no more. Then bend spring 3 till its tip just touches spring B. Now carefully bend each a shade further. Raise the wheel by pressing down on the switch handle, forcing spring A away from spring 2 and against spring 1. If spring 2 has been correctly bent it will start to move with spring A when the wheel is raised. This movement of spring 2 evidences a slight pressure against spring A when the switch is in the middle position, and this is what is wanted. The movement, however, must be as little as can still be noticed, and if it is appreciably more than this, or if no movement at all can be discerned, re-adjust the spring. Now lower the wheel by raising the switch handle, and observe and adjust spring 3 similarly with respect to spring B. One adjustment affects the other somewhat, and it may be necessary to adjust each alternately two or three times. Pains are essential here, however, as every bit of unnecessary movement reduces the possible space between the contacts when the switch is thrown, increasing the capacity of the switch, and in extreme cases risking the thoroughness of the break. On the other hand, an absence of any movement at all would argue a bad contact between the springs when the switch was in the middle position, even though a contact apparently existed. This sounds difficult, but a satisfactory adjustment is reached very quickly in actual practice.

The switch is now ready for use. Fig. 2 shows the circuit in which it is used. The springs 2 and 3 are connected together and

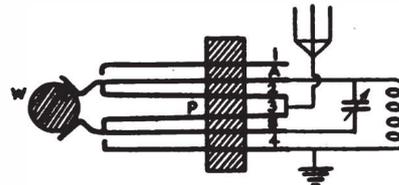


FIG. 2

to the aerial. Spring 4 is connected to the ground. The variable condenser is connected between springs A and B, and the inductance between springs A and 4. Spring 1 is left unconnected. With the switch in the middle position there is a complete circuit from the aerial through springs 2 and A to the inductance and ground, the condenser being short-circuited. With the wheel lowered (handle raised) the circuit through the inductance to the ground is undisturbed, but spring B is forced away from spring 3 and against spring 4, connecting the lower end of the condenser to the ground. As the upper end is connected to the upper end of the inductance, the condenser is now in parallel

(Concluded on page 43)

## Governors'-President's Relay

March 6th, 7th, and 8th.

**I**F ever we had to show what we amateurs can do it is during the Governors'-President's Relay. We must make a strong impression on our President, we must convince him that we are not small boys playing with wireless but real men capable of fighting for our country if he calls us. There must not be a slip-up anywhere along the line and 48 messages must reach President Harding.

Right now we are confronted with the most dangerous situation in amateur radio since the attempt was made to close all amateurs. If we are to overcome that danger we must demonstrate our ability to operate in an orderly manner and with precision during the tests. Stop your other message traffic and stand by for the messages that will come pouring in from every state. Put those messages into the hands of Washington stations at any cost. Don't be afraid to relay a message from Maine to Indiana if that is necessary to get it to Washington. There are some very freakish conditions in the Third District, but don't let them stop our messages.

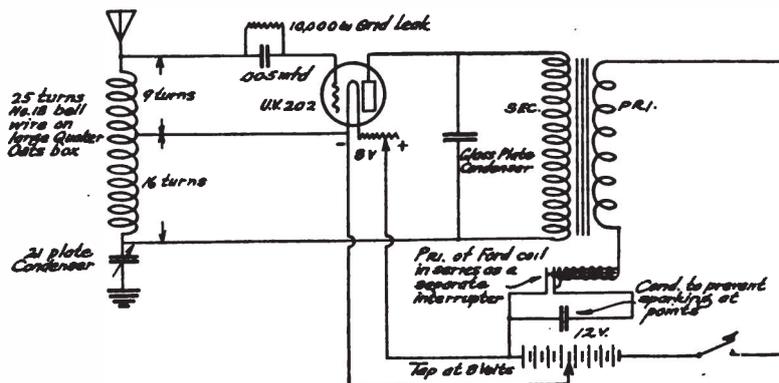
48 messages to the President or whyinell not!

## A Spark Coil-C.W. Transmitter

By Francis L. J. Duffy, 9DDY

**T**HE following description of a little "5 watt" spark coil C.W. set which has been reaching out quite a little distance is tendered in the hope that all of the "gang" who have swamped me with letters asking hook-up and description will see it and profit thereby.

must be of large capacity to prevent sparking in the glass stem of the tube. No fixed capacity can be given but it must be determined by experiment. In my case as I use a one inch coil I used three common spark coil condensers in parallel. The best way, however, is to have it arranged so that

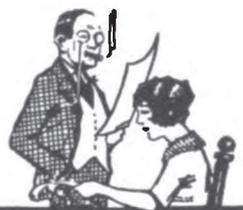


First study the appended circuit diagram. The filament tap is taken off at the 9th helix turn. Using the series condenser a 200 meter wave can be obtained easily. The condenser across the coil secondary

sheets of tinfoil can be added to the condenser at will. An old style Ford coil is used in series with the primary as a separate interrupter, in order to obtain a  
(Concluded on page 48)

# EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



## The 'Phones and Amateur Radio

**A**T our National Convention in Chicago last fall a paper was to have been presented on "The Effect of the Radio Phone on Traffic". The gentleman who was to have spoken on this subject unfortunately could not attend and the paper was never produced. The title of that undelivered paper, however, strikes the keynote of this editorial—the effect the 'phones, whether amateur or commercial, are having on our amateur work. We have some very serious things to say and we want everybody to read this carefully.

Fellows, do you know the grand old game has changed—that it isn't what it used to be, even a year ago? Time was, before the war and just after we had got on to regenerative receivers, when we could work as often and as long as we liked, and we owned the local air. After the war, with all the publicity radio got, there were many more of us and we had to adopt co-operative schemes whereby the hours were divided so that all got an equal show—like the Chicago Plan and its variations. Once we introduced the idea of team-work and co-operation, tho, we got along splendidly—until the radio telephone came suddenly into prominence this past fall. This prominence of the phone is evidenced in the commercial broadcast services and in amateur broadcasts and in the novice listeners. Within the short space of six months the entire aspect of the amateur world has been tremendously changed, bringing serious problems with it, and we must consider these problems. The whole legislative situation is again in upheaval, and the Secretary of Commerce has just been instructed to appoint another committee of radio experts to devise a new code of radio laws particularly to take into account the new situation brought about by the advent of the phone. Our A.R.R.L. expects to be accorded a voice in the deliberations, representing what the government calls the private radio interests, and your officers want practical suggestions from our affiliated clubs and individual members on the two big matters before us—the regulation of *amateur* broadcasts and the interference

problem between amateur transmission and commercial broadcast reception. Let us consider them in order.

### The New Broadcast Regulations.

In January, paragraph 57 of the Radio Regulations was amended to require a limited commercial license for all transmitting stations used for broadcasting news, concerts, lectures, and such matter, the wave length for which service is fixed at 360 meters, with 485 meters for crop reports and weather forecasts. The immediate effect of this was the prohibition of all radio phone broadcasts under amateur licenses, with all new licenses stamped with the statement that the station was not licensed for any broadcasting. Our A.R.R.L. has had a committee in Washington investigating this matter and we now have the whole story. Our readers are particularly requested to note the following points:

(1) This prohibition is only *temporary*—the Department of Commerce does not mean to permanently prohibit any useful activity. As quickly as a practical basis can be determined upon, all legitimate services will be restored.

(2) Altho undoubtedly the corporate interests maintaining broadcasting establishments have requested better regulation of amateur phones to protect their own broadcasts, the main actuating motive on the part of the Department of Commerce has been a desire to protect the radio-TELEGRAPH amateur, whom the Department recognizes as the great national asset and whose activities were being fairly swamped by the amateur phones.

(3) Broadcasting is growing tremendously and must be regulated now before it gets out of hand. It should be permitted only when the general radio public is interested, and not merely because an individual to broadcast for his personal amusement or for advertising purposes without regard to the desires of his audience. Nor should amateur phones with rotten modulation, illegal outputs, awful "plate supply noises", and indifferent programs be permitted to broadcast under any circumstances. The right kind of stations will be permitted to continue their service

under a limited commercial license when their activity is desired by the general radio public.

(4) Special authority in all probability will be granted by the Bureau of Navigation to conduct any broadcasts already arranged for previous to the inauguration of the new regulation, and provision will be made for the continued broadcasts of those radio phone stations that are handling market and crop reports, weather forecasts, police alarms, etc., in co-operation with a branch of the Federal Government or their municipalities. In such cases a letter from the Government branch or municipality being served should be submitted, showing that the service is necessary for the public welfare, and we understand the necessary authority will be granted.

(5) The new regulation does not apply to radioTELEGRAPH stations.

(6) The Department of Commerce now needs and wants a new basis for the various amateur activities, one which will give proper protection to all the amateur interests. Suggestions are solicited. It must be borne in mind that this is a big undertaking, probably involving a change in the radio law, and it cannot be accomplished in a day or a week. Everyone's viewpoint must be determined and a fair plan formulated, and then this must be enacted into law before it can be administered. Meanwhile we must be patient in the present situation.

Except for the part that the corporate interests may have played in bringing this about, we are well pleased with it and confident that the concentrated thought now being brought to bear on the matter of regulation will result in an equitable arrangement. Our 200-meter wave length is horribly crowded with the legitimate telegraphic business of an amateur field comprising some 14,000 transmitters, without being burdened with even the best of broadcasts from 200-meter phones. And what chance have the latter of being heard thru the din? And as to the awful stuff that most amateur phones put out from ten-cent records on \$1.89-phonographs with a supply ripple like a thrashing-machine and a wave like the Atlantic—we are glad it is gone and hope it never comes back! Amateur Radio is decidedly the better without it.

We say again, fellows, that the Department of Commerce is our friend. An amateur phone carrying on local conversation during local hours cannot cause much inconvenience, nor can it cause particularly great interference in the amount of traffic it can successfully handle in the later hours. It causes its trouble, then, in its generally ill-guided inclination to "favor" the public with broadcasts, whether the public desire

to be favored or no. The temporary suspending order was issued because it was apparent to the Department that such broadcasts were interfering with stations conducting other kinds of business—the novice listeners to some extent but mainly the other 200-meter activities, the amateur telegraph station. They believe that it is the later who is truly of value, who is most likely to make a real contribution to the art, who is of actual aid to his country in time of need, who can cover distances with speed and perform a worth-while service. And his activities were being hampered to an extent that was getting unbearable and conditions were getting chaotic—the telegraph amateur was being put out of business.

The Department largely looks to our organization, thru its affiliated clubs, to decide by the interchange of ideas just how the amateur radiotelegraph and amateur radiotelephone stations are to be co-ordinated with each other and with the other services involved. It is now necessary to find some way to permit amateur broadcasting where such service is desirable, and still not "gum up the works" for other amateur operation. Some schemes under consideration at present are, first, to allow broadcasting on some other wave length, such as 175 or 225 meters, or, third, to revise the present system completely and institute graded amateur licenses restricting transmitters to waves below 175 for their first year or so, putting all amateur phones on 200 meters, sparks (telegraph of course) on 225, and 275 for C.W. stations using code; and in everybody's mind is the feeling that the commercial broadcasts ought to go to a higher wave length where conflicts with amateur work would be avoided.

Now it's up to us to express ourselves. What do we want? We feel pretty sure that of the two, telegraph and phone, one must be subservient to the other in the new regulations. Our A.R.R.L. is primarily a telegraphing organization and we have always felt that that was the most important thing. It is for us amateurs ourselves to decide the question. We wonder if we have come to the parting of the ways? Do we want to favor the phone to the detriment or possible discarding of the telegraph? We at headquarters don't think so, and feel that "the telegraph's the thing", but we want instructions and suggestions from the gang. What do YOU think about it?

Now, fellows, don't get hot-headed over this thing and join in any loud talk about petitions to Congress to change matters, how the corporations are slipping it all over us and this is the beginning of the end, and so on. This is a thing that has been done largely for our own protection and it has got under control a situation that bid fair to destroy us. And we have been asked to say what we want. So don't start writing

wild protests to your senators and putting on a "blue-card" fight when there are only shadows to fight. If we are dignified and business-like we will gain the consideration of those senators and congressmen when we make our recommendations, and we may need their help in a real blue-card fight some day.

Meanwhile the present regulation is to be obeyed. No more phone broadcasts. And sending out music and addressing it to a particular station while it is yet a broadcast in its intent is just a subterfuge and will not be tolerated. A limited commercial license is necessary for the transmission of such phone matter. Stick within the law.

#### The Broadcast Listener.

And now we come to the second difficulty created by the increased use of the phone—the interference our regular amateur work causes the broadcast listeners. This is a really grave problem and one about which every A.R.R.L. man must think, as it is staring us in the face like a grim spectre.

Here's the story: the big corporations have capitalized all the publicity radio has got since the war, have put up big broadcasting stations which generally transmit entertaining and instructive programs, they advertise this extensively and create an immense demand for apparatus, and then they build and sell the equipment. We all know what the result has been. A year ago the radio industry consisted of a hundred or so firms, struggling along as best they could with what by comparison was a pitifully small amount of trade, counting nickles to make ends meet. Then came the boom! And now they can't keep up. In the east it is practically impossible to buy a receiving set, one has to stand in line to get waited upon only to find that the store hasn't got even the parts one wants, the factories are months behind in their orders altho some of them have tripled their production, and in general the business has taken a boom that was beyond the fondest dreams of a year ago. And it's Mr. Novice who is doing the buying. He doesn't know a thing about radio and he doesn't care as long as he can hear something over it. These men have come in by the hundreds of thousands. We have no doubt they outnumber us amateurs a hundred to one right now, and they are still coming strong. They are buying apparatus by what must be the millions of dollars worth—in other words the broadcasting companies are making "big business" out of what was the game of us amateurs for so many years.

The broadcast listener has been attracted by the phone and so he is undeniably one who has resisted the call of the wireless as we know it—the dots and dashes. He has heard of the A.R.R.L. but doesn't know what it is. He has heard where we have done some wonderful things but doesn't be-

lieve it. He hasn't a ghost of an idea as to how radio works and he doesn't have any interest in finding out. He only wants to know how much it will cost to get a set installed for him, pulling out his checkbook as he asks. He gets a broad-tuning simplified tuner in all probability, and doesn't know how to operate even that. He hears all kinds of disturbances, ships, commercials, amateurs, harmonics, leaky power lines, static. They annoy him, because he has no idea what they mean—knows nothing of the rest of the radio world. He is like a beginner in our own amateur game, only worse because often he is a prominent citizen and used to doing as he pleases in many things. Because, do you know, fellows, these listeners are the mayor, the eminent politician, the bank president, the leading merchant, the doctor, the minister, the president of the board of education—the kind of folks we have long wished under different circumstances to have in amateur radio in order that it might be a truer Citizen Radio. These men are discovering that most of the strange noises that interfere with their concerts are from us amateurs, and what we don't actually make ourselves we are getting blamed for anyway, including static. Directly they are going to get together and say "These amateurs are a damned nuisance—they bust up my concerts. They ought to be kicked out." For you see, men, the novice listener doesn't yet know that there are others besides himself that amount to anything in radio, and at the present time he wants *all the air*, the same as we used to have all of it for *ourselves*. The danger is that these listeners, these prominent men in the community, will call up their senators and congressmen and say "Bill, I want you to do something for me. I've got a wireless and the family likes to listen to these concerts, but we're bothered by a gang of kids all over creation who make the most infernal racket all night long with a bunch of squawks and crashes that knock things to pieces. They're a nuisance—can't you get 'em stopped?" And when all the eminent local politicians and big guns in all the towns get to telling Congress that we're a nuisance, we're likely to get the can whether we are or not. Therein lies the danger.

The trouble is chargeable to many causes. There's the broad tuning of the kind of receivers put out for these folks, their inability to operate anything right, their overbearingness but there's also the too-long and too-broad wave of countless amateur stations, the amateur ether-hog who never stops, the local concert fiends who try to compare with KDKA, the high-handed disdain of the amateur for the novice, the lack of willingness to share the ether with him; and there's the unfortunate fact, beyond the control of either at present, that the amateur wave and the broadcast wave

are much too close together for any hope of entirely successful working.

There will be objection to raising the broadcast wave but it will never be any easier to do than it is right now and it ought to be done now before it gets too difficult. If this were done there no longer would be any conflict between amateurs and concert listeners. There is a band of wave lengths between 1000 and 1800 meters that at present is almost entirely unused, reserved for the Navy. The Navy says that national security demands that they have these waves, but they are not using them. And in time of war *all* waves belong to the military. This is the age of efficient sharing and the trend of the times is to get back on a real peace-time basis and give more to domestic matters and less to military. It is our opinion that the official broadcast wave length should be changed to some band in this at present unused range. We believe the situation demands it even now, and it is getting worse, as all the broadcasts can't operate on the very same wave length of 360 meters and their isn't any particular room thereabouts for expansion.

But that may never come about and meanwhile we are faced by our most serious situation of recent years. Do you wonder that we say the game has changed? Up to now we amateurs have had all the air. Now the novices want all of it. Neither of us can have all of it—we must share it, the same as we amateurs did among ourselves when we started the Chicago Plan. We amateurs must start now to correct this situation as it relates to our own activities, and we must get busy immediately to educate the listener to the fact that he isn't alone in his glory and that he too must share. Either that, fellows, or good-nite amateur radio!

Our hope now is in our Affiliated Clubs, and we believe we are going to have a real test of our affiliated strength. Once upon a time our A.R.R.L. consisted of a lot of individual memberships, but since we started the business of local co-operative plans with community tribunals we have become more and more an association of affiliated societies, each representing a community viewpoint rather than an individual one. And it is to our affiliated clubs that we must look for the solution of the amateur-novice problem.

Generally folks are enemies only so long as they don't know each other. To meet is to have their difference dissolve into thin air. The radio club is the forum where we all meet and get our peevs off our chests. Affiliated Clubs, there's a job for you! You must take in to yourselves the broadcast listeners, not only because they're fine fellows when they know you right but to save your necks! Make your meetings in-

teresting for them, and invite them in. They're often the pillars of the community, the type of men you need. Don't let them club by themselves—they need helpful information in the worst sort of way and they're hungry for it—they'll come in if you'll let them. GO GET THEM!

Then you'll have a representative organization that can reflect the true desires of the radio population of your community. And then get busy on this interference problem. What are we going to do about it? Why, will you believe it, we have been asked how the A.R.R.L. would regard the proposal to introduce a bill prohibiting amateur transmission of any sort between the hours of 8 and 11 p.m., it being intimated that as the A.R.R.L. was primarily interested in long-distance work which was only possible in the later hours of the night, we might be expected to support such a bill. They're a thousand reasons why we don't want a law like this, but we must do something about the situation or it will happen. How many of us amateurs can get the broadcasts well and how many of us like to listen to them, so that of ourselves alone we would vote for quiet hours? It's a little surprising to find out that a great number of us seem already in favor of quiet hours, and in numerous communities the local amateur clubs have voted for silent air during the broadcasts. If we don't want a national law shoved thru against us we have got to do something quick. That something, as we see it, is to decide the matter in each community by *local option*, after we have got the broadcast listeners in to the clubs so that they will see that we are not a flock of little boys in short trousers but that we are really going after the thing in more serious fashion than they themselves. What you must do, Clubs, is to make yourselves representative bodies, capable of reflecting the spirit of the majority of the radio public in your community, and then actually do the reflecting. Vote on it. In your territory are there only a couple of listeners and a hundred telegraph transmitters who want to do amateur work, and are you far enough away from other broadcast listeners that you won't interfere with them? Then it is plain that you should go ahead and transmit, so that the majority may have their way. But are there as many with only receiving sets as there are real amateurs, and do you discover that most of the amateurs themselves like to receive the broadcasts and desire silent air? Then by all means have the quiet hours—start them at once and make everybody comply with your regulations.

That's co-operation. That's the rule of the majority. That's the only thing that's fair. And it's the only way to keep the broadcast listener from demanding all of the air—and coming close to getting it.

Let's speak a little more definitely. Here is what we want every A.R.R.L. affiliated club to do:

(1) Call a mass meeting of everybody in your territory who is interested in radio—amateurs, broadcast listeners, everybody. Take stock of your local situation and be sure that you get all the broadcast listeners in to the meeting. You *must* have them. Find out who they are and write them letters or better send a committee to invite them to the meeting, and do everything you can to round up everybody interested.

(2) Then talk over these matters fairly and squarely. Tell them that we have a nasty situation to solve and that you want to do it by co-operation. Find out how everybody feels, whether amateur or listener, about both of our big problems—the regulation of amateur phones and the interference between amateur and listener. Give everybody a chance to be heard.

(3) And then start the ball rolling at once in some scheme that will decide whether or not you are to have quiet hours for broadcast listening by the majority sentiment. Take a vote on it and agree to a definite program if at all possible, and broadcast this to everybody in your territory. Try to come to an understanding at that meeting, because it is a hard job to get out a big gang to a meeting. But whatever you do, be sure to get something in the works that will enable the prompt settling of this matter by "local option"—that is the vital thing.

(4) Then write immediately to A.R.R.L. Headquarters at Hartford, Conn., and let us know what you have done. There are two things your Board of Direction wants to know at once: first, is the amateur radio telephone or the telegraph to be favored in the new amateur regulations, and what are your suggestions as to a division of wave lengths; and, second, give us what assurance you can that you have arranged mat-

ters in your territory so that local option, whatever the outcome, will decide the matter of silent air for broadcast hours.

(5) Do all of these things just as promptly as you possibly can.

The general radio public have not yet come to the point where they know anything about what we amateurs have been struggling with for years in the way of QRM—or static. But they want help and that is our chance. At any club meeting not only can every question be answered but friendships can be made which will mean helpful visits from amateurs who know. Gradually they will wake up to the fact that the existing amateur organizations are the very thing they are looking for, and once they are in the clubs they will learn the situation and become a part of us and work with us instead of against us.

We must fight to the last ditch any law sponsored either by the general public or by the big manufacturing interests behind them, which proposes to prohibit amateur transmitting during most of the evening. There is no reason why the broadcast stuff should have it all. Amateur transmission now has it all but we cannot hope to keep it all. What we want is a just and fair distribution of the hours in accordance with the majority sentiment in each community—but we must give consideration to those who want to listen. We must make up our minds that as far as the large centers of population go, the old days of free-for-all amateur radio have gone for good. The day will never return when we can make all the noise we want at any old time of the day or night.

Our A.R.R.L. has a glorious history of real Americanism and team-work in all its doings. Now let's all put a shoulder to the wheel and whip this job. But the minute we break up the team-work—Good-Night!



# The Operating Department

F. H. SCHNELL, Traffic Manager  
1045 Main St., Hartford, Conn.



**A** FEW months ago it was our impression that our message traffic would reach the 25,000 mark and we thought that might be the sky limit, but along comes a bunch of "sky punchers" and over the limit she goes to the tune of 29,941. SOME traffic we'll say! Who is it that says the radio phones will put a crimp in our traffic?

First honors go to the Delta Division again with the new record for handling amateur traffic by 5ZAB.

5ZA—473                      9ZJ—310  
5ZI—465                      1SD—300

There is a list of stations that move traffic and they move it in big chunks. That is why they are way out in front. They are doing the very thing that our A. R. L. wants—relaying friendly messages.

Provisions have been made for a new division, the MARITIME Division, which will take in Nova Scotia, New Brunswick, Prince Edward Island and Newfoundland.

## Message Traffic Report By Divisions—JANUARY

Division	C.W.			SPARK			TOTAL		
	Stns.	Mgs.	M.P.S.	Stns.	Mgs.	M.P.S.	Stns.	Mgs.	M.P.S.
New Eng.	16	1157	72	15	1715	115	31	2872	92
Atlantic	33	1377	42	25	1838	73	58	3215	55
Roanoke	12	364	30	12	332	28	24	696	29
East Gulf	12	696	58	13	538	41	25	1234	49
Delta	3	138	46	13	1919	148	16	2057	129
West Gulf	6	969	161	47	3062	65	53	4031	74
Midwest	15	927	62	29	1886	65	44	2813	64
Central	46	1438	31	84	6884	82	130	8322	64
Dakota	10	476	48	12	1088	91	22	1564	72
Winnipeg	1	38	38	—	—	—	1	38	38
Northwestern	—	—	—	12	936	78	12	936	78
Pacific	3	20	7	12	2010	167	15	2030	129
Ontario	2	19	10	3	114	38	5	133	27
<b>Total</b>	<b>159</b>	<b>7619</b>	<b>48</b>	<b>277</b>	<b>22322</b>	<b>81</b>	<b>436</b>	<b>29941</b>	<b>69</b>

Total Spark Messages, 22,322—76%  
Total C.W. Messages, 7,619—24%

\*\*\*\*\*  
\* PULLEN BROTHERS, 5ZAB \*  
\* Houma, La. \*  
\* 664 Messages \*  
\* Delta Division \*  
\*\*\*\*\*

But wait, we haven't told you all by a long shot. Glance over the following list of stations and note the number of messages that were handled by these stations.

9UH—583                      2DI—461  
90X—575                      8FT—442  
6VX—528                      6ZZ—407  
2OM—523                      8ZAC—374  
8AWP—522                      5JD—356  
5XU—511                      5XB—354

K. S. Rogers has been appointed manager of the new division. A change of name from the St. Lawrence Division to the Quebec Division has been made and the Quebec Division will cover the Province of Quebec alone. A. J. Lorimer is manager of this division.

Reports of division activity follow:

### ONTARIO DIVISION A. H. K. Russell, Mgr.

No report is at hand from District No. 1 this month. but from outside sources the D M hears that there is lots doing in Windsor and Sarnia, but that the main trouble in that vicinity is that the boys there are suffering from inflated wave wengths which

may account for the few times they are heard eastward.

District No. 2 under Gowan is walloping right along though most of the boys stick to the old spark sets. 3PM and 3BA in Brantford have done some fine work, the latter having handled 73 messages. Guelph has formed a radio club but no details are available. 3SU in Galt is beginning to be heard in DX work. 3BI is putting in CW and has a fine receiving range. Galt has a 2 hour silent period every night from 8 to 10. 3KL in Preston is heard now and again. 3QJ reports 22 messages in Kitchener. 3DS is out of business due to deceased bottles caused by trying to make two amperes grow where one grew before.

District No. 3 is strong on transmission but weak on reporting. 3JL reports 19 messages handled on spark, while 9AL has made away with 15 by CW, 9AW 4 messages.

#### ATLANTIC DIVISION

C. H. Stewart, Mgr.

In Western New York there has been relay work of the highest calibre due to the efforts of 8AWP whose signals were reported 150 miles west of Vancouver Island; 8BUM who was reported by 6XAD; 8WO, 8AYT and 8CG. Two new stations have been installed at Elmira. Altho much traffic was handled by New York City stations there were only a few reports sent in. 2DI copped the honors with the greatest number of messages. 2XK handled some messages. A daylight route from New York to Poughkeepsie thru 2XK, 2BJO, and 2DA has been the means of reliable relaying between those points. 2AUY, 2ALG, and 2AJD were the business end of southern New York City traffic.

2FG is back again after a little difficulty. 2PV moves quite a bit of traffic.

The DX men in Northern New Jersey keep the ball rolling and new CW stations are reaching the dead spots which the sparks could not reach. As predicted by the T.M., 2VA is back in the game again and his assistance is welcomed. 2OM is using both spark and CW and, contrary to rumors, the spark has not been junked. CW traffic handlers were 2ACQ, 2AOS, 2AF, 2AQU, 2AXH, 2AOG, 2IA, and 2EJ while the spark stations were 2OM, 2AIM, 2ALY, 2DX, 2ARB, 2BDG, 2AQI, 2BBN, 2VE, and 2SQ. According to reports from Newark and Hoboken everything is "duck soup."

2EL, 2OE, 2AJW, and 2BGR have been knockin' 'em dead with their CW sets and traffic does not hang on their hooks long. 2BSC has purchased the transmitter of 2AID and bumps right along. 2FD is heard but no report from him. 2BRS and 2CY handled some traffic.

8XE has fallen for CW which will be an addition to the spark set. 8BQ continues to reach out very well. 8FZ is the only station in Wilkesbarre that is doing anything. The only other station heard from was 8HR.

Traffic out of Baltimore has shown a decided increase due to the steady operation of several CW stations and the consistent work of 3AHK, 3AC, 3SQ, 3HG, 3EM, 3AJD, 3ZN, and 3UC. 3ZN maintains a schedule with 3ZO. There was no report from District of Columbia, but 3ALN and 3IW have turned to CW. 3ZY holds his pace in traffic. Reports from superintendents and city managers in the Southern Section, especially the above districts, have been coming in too late for forwarding to headquarters. In the future, reports not in the hands of the A.D.M. by the 20th will not be accepted.

Western Pennsylvania has had its troubles with many of the ops going to school and deserting their stations. 8CH and 8PT have taken some traffic for Grove City, Pa. 8BRL cleared 142 messages with spark and CW. Pittsburgh is represented by 8BPL, 8NN, 8OW, 8XH (how about Sunday nights, Wigg?—T. M.), 8BPJ and 8AIO. In Warren we have 8BIL who operates a joint station, at home and at school. 8LX, 8LF, and 8EW of Crafton have had so much other business that required their attention they did not handle many messages.

If those fellows in Philadelphia who are complaining would send in a report, we could report their activity and they would eliminate reasons for complaints. Practically all of the traffic reported was handled by 3FM, 3VW, 3BG, 3HJ, and 3ZO. An error in last month's report is hereby corrected: F. G. Delong is city manager of Reading, Penn. Message traffic for Reading was handled by 3GX, 3LP, 3AUW, 3BJ, and 3AHF. 3AIC is installing a CW set, and the Reading Club is installing a rock crusher. (Funny how this old game goes, one cans the spark for CW and the other sticks to the spark—T. M.)

#### ROANOKE DIVISION

W. T. Gravely, Mgr.

A great improvement in traffic handling thru the division is noticeable. More C.W. stations have been added with the result that there is less QRM and greater distances are being reached. A number of messages have been routed incorrectly which has delayed traffic in some cases. Follow the routes over the short jumps which makes for speedier delivery of messages.

8SP, 8EF and 8AFD did some nice work when they maintained communication for the power company while the lines were be-

ing repaired which came down during the sleet storm. The efforts on the part of these amateurs made it possible for the power company to get back in shape 24 to 48 hours ahead of schedule. Stations QRV for traffic are 8BDB, 8IH, 8AQV, 8AUE, 8BPU, 8ACY, and 8YH. All these stations can be relied upon for quick delivery.

New stations are being installed in Richmond and Petersburg to assist 3MO and 3TJ, which stations have moved some messages. Practically all of the stations in this section have given up their radio for some reason or another. There is not the old active crowd that we used to have on the air every night since most of the real DXers have quit the game. 3ZZ seems to be the only one who is on most every night. 3ACE is doing some work but little traffic handling. 3MK and 3BLG are heard once in a while. DF-1 is the leader in this section but no report has been received.

Southwest Virginia continues to move its traffic without much difficulty through 3ZX, 3ZAB, 3RF, 3CA, 3BIY, 3BHS, 3AAL, 3BKX, 3BNM, 3HL, 3AOV, and the twins, 3BZ and 3AEV. Many new stations are reported in and around Danville. In general, conditions have shown a great improvement in this section and such improvement will continue.

In the North Carolina District a fair amount of traffic was handled without any delay. Kramer and Bunker have resigned and other names will be announced next month to fill the offices of District Superintendents. 4EY has closed down for the season, a good station that will be missed very much. 4EA was the leader in this district with 87 messages to his credit. 4BX, spark; 4XD, C.W.; 4CQ, spark; 4CX, spark; 4GN, spark; and 4EN, C.W. did much toward boosting the total messages for the division. 4ID is a new C.W. station as is 4DC. 4DQ uses both spark and C.W. 4CK jumped off the brink of single blessedness. (Congratulations OM, and we hope she will permit radio.—T.M.)

#### EAST GULF DIVISION B. W. Benning, Mgr.

During the Christmas holidays the operators from 5XA scattered out over the state and tried to see what they could do towards getting some of the other stations in the state to working. Their efforts are beginning to bear fruit.

H. S. Brownell of Birmingham visited all the stations he could locate there to see what the possibilities were for a real DX station. The immediate possibilities were very discouraging, there being only one station with much chance of "getting out" right away. That was 5GI. Mr. Brownell got right down to work helping to readjust

the apparatus of this station, tuning him properly with a wavemeter from 5XA, and results were almost immediate. 5GI has successfully worked 5XA, 5YI and 4GU and has received numerous cards reporting his signals heard elsewhere. 5UI at Montgomery was properly tuned, but due to lack of time other very necessary improvements could not be made. 5AR at Bay Minette has plenty of good spark transmitting apparatus but nothing with which to receive amateurs properly. 5ON at Anniston hears a number of amateurs, but so far has been unable to get a condenser to hold long enough to enable him to do any work. 5XA has been doing practically all of the work, even tho having much condenser trouble. We have at least managed to keep one of our numerous transmitting sets in operation all the time.

FLORIDA: Supt. Harrod states that he has been up against it on account of the failure of City Managers, etc., to send in any report. In fact, City Manager Clark of Jacksonville was the only man to send in a report. Fellows, we MUST have better co-operation. Take your calendars and mark the due date of your report with a great big mark, and when that date comes around sit down AND MAKE UP YOUR REPORT AND SEND IT IN! Without your help the old East Gulf Division will never attain the goal for which we are so earnestly striving.



ONE REASON WHY BUX'S  
OUTPUT OF CARTOONS HAS  
DROPPED OFF 50 % LATELY

In spite of the lack of proper reports, however, Supt. Howard states that Florida has taken a decided forward step during the month. Jacksonville handled 44 messages, these being equally divided between 4ZE, CW, and 4DK, spark. 4FS is working on a 20-watt CW set. 4BP and 4EZ have been busy building new radio "shacks," 4EZ will soon be on the air again, 4AH is trying out a 1 KW, and 4CI has a ½ KW spark. In Orlando, the habitat of our District Supt., the Electrical Society has taken

a great interest in radio, and preparations are being made to make Orlando a leading center of radio activity. In St. Petersburg stations 4JY and 4IW are now complete, and they will greatly assist in handling Florida traffic. 4DZ and 4BC, of West Palm Beach, spark stations, are doing DX work regularly, 4DZ being in direct communication with 4II.

**NORTH GEORGIA DISTRICT:** 4BQ's CW signals have been reported as far west as Gray Bull, Wyoming. A counterpoise has been installed and the radiation of both spark and CW sets very materially increased. Several first class receiving sets have been installed in and near Rome, 4BQ is preparing to add a chopper to his CW set to make it easier for him to raise DX stations. He reports no trouble working them once he gets them, but a good deal of trouble making the first connection. In Atlanta 4AU handled 32 messages, and 4CG 15 messages. 4XC romped in ahead with a record of 52 messages. 24 messages were handled by various other stations. 4HW has been heard in southern Florida on his 10 watt phone set. Several stations have been working with 2FP quite frequently, and the ether between Atlanta and Florida points is constantly agitated by passing traffic. The Atlanta bunch is getting down to business and have determined to handle 500 messages by next report time. Their motto is "We can if we will," We'll watch 'em!

**MIDDLE GEORGIA DISTRICT:** 4DH of LaGrange shows he is right on the job by handling 30 messages. He is installing a CW set. Macon, Ga., where our Dist. Supt. gives 'em official instructions when putting up power lines to avoid interference with radio stations! 4AS has sold his 1 KW spark thunder-bus and installed a 10 watt CW set. 4GU has sold his ½ KW QR-Emmer and gone from bad to worse by replacing it with a 1 KW coffin. Messages handled by 4BK total 60. The D. S. suffered from temporary aberration a while back and sold his radio set. The shock cured him however, and he bought the blamed thing back at about half as much again as he sold it for. Once bitten by the "Bug" there is no cure! Midville, Ga., here's where we have two real good stations of the spark type. 4GN has been appointed City Manager. This station handled 135 messages, which is a mighty good showing, nearly half of these being handled with 5XA. 4GN states that it is still difficult to work Florida stations but traffic was handled with 4BC, 4DZ and 4ZC. 4FD handled 9 messages, five of these being spark and four CW. We cannot hold this record against him, however, as he has been experimenting with a little 5 watt CW set—as a starter and succeeded in working 4GH, 4GX, 4CO, 4FR

and 5XA, after which he "shot" the filament of his tube.

**SOUTH GEORGIA DISTRICT:** There are four CW stations in Savannah which can work simultaneously WITHOUT any local QRM whatsoever, 4GL, 4BY, 4EL and ? The South Georgia District has only three stations at present capable of, and doing real DX work. But, fellows, those three sure DO the work! Conditions as to connections with other Districts and states unchanged. Mr. Dooley and Prof. Funk have their new high power CW set working with 4 amperes radiation, and Ship Owners' have installed a DeForest telephone. Both are awaiting call assignments to begin operating. For the first time in many years 4AG has had to almost entirely abandon his pet hobby, in consequence of which 4AG has created very little QRM since August. A 20 watt CW set is a possibility at 4AG, and should this materialize SOME of these boasting stations had better close the muffler cutout and put the clamps on tighter on the old headset.

#### NEW ENGLAND DIVISION

G. R. Entwistle, Mgr.

Glad to be able to report a general reduction in wave length in this district. Most of the DX men are on 200 meters or below with no apparent lessening of distance. Every official relay station must be on 200 meters or lose his appointment.

Radio Inspector C. C. Kolster and Assistant Radio Inspector, Walter Butterworth have been active recently in the enforcement of wave length requirements with the results mentioned above.

1SD (spk) cops the tin wreath this month with 300 msgs. Closely following him are: 1DY (spk) 292; 1BVB (spk) 280; and 1TS (CW) 233. 1BJE and 1ASF (both spk) helped boost the average with 200 each. In addition, five of the "Old Guard" have reports in three figures: 1AEV (CW) 172; 1RV (Spk) 155; 1ZE (CW) 154; 1BRQ (CW) 121 and 1ANQ (CW) 119.

A. D. M. Mix (1TS) reports a complete re-organization in his section. Twenty-one new appointment certificates have been sent out to date and the working out of new schedules is progressing rapidly.

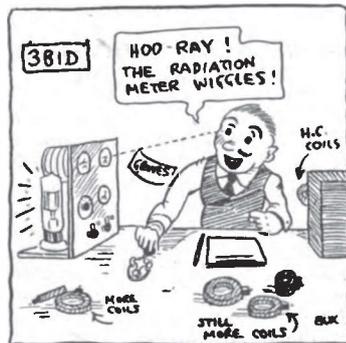
The station of the Worcester County Radio Association, 1BKQ, has been working DX in great shape, using two 5-watt tubes. It has been reported moderately QSA at Columbia, Mo., and has worked seventeen states and Canada.

Robinson (1CK) reports increased activity in his section with eleven stations reporting a total of 1384 msgs. 1BJE reports a good daylight route to New York via 1AZW (CW) at Newport, R. I. A.D.S., Randall (1ANQ) reports an increase over last month in msgs. handled.

**DELTA DIVISION**  
Hubert E. deBen, Acting Mgr.

The past month has been a booming one for relay work in this division. More messages were handled and more stations interested than ever before. Willing and ready co-operation, on the part of each and every one, both in spirit and in actual work, made this month the most successful seen so far. In this connection special mention is due 5ZL and 5ZAB—these stations handled over half of the total traffic.

ARKANSAS: A. W. Kinsolving, Supt. reports improved conditions prevailing throughout the district. 5MA of Arkadelphia is now handling traffic with his new 100 watt CW fone set. 5RO is also now in the traffic handling biz. 5UE, Conway, has a ½ KW and Amrad quenched and is reaching out in fine shape. R. L. Pemberton has been appointed C.M. of Scotts and contemplates the installation of a 500



cycle set as soon as he sells some more Airedale pups. (A little ad in QST ought to do the trick—DS). 5SP of England will soon open up with a 1 KW and CW set. Dr. L. M. Hunter, 5SM, was elected and appointed C.M. of Little Rock at a recent meeting of the ARRL men of that place. Doc Hunter will have his hands full doctoring up traffic conditions out that way. 5JD is doing remarkable work. 5ZL showed his usual superior form—465 was his lot for the month.

LOUISIANA: W. L. Barrow, Supt. reports steadily improving conditions. 5ZAB, manned by the Pullen Klan, keeps things humming out Louisiana way and easily outworked the rest of the division by a large majority. Their splendid work cannot be too highly appreciated. 5LA has been appointed C.M. of New Orleans. Mr. Manard is a youth of high ideals and exceptional ability. 5KC, Plaquemine, La., is stepping out and gives a very good account of himself. 5ZAC is operating on a temporary aerial with 10 watts CW. Baton Rouge is back on the map in red letters

with a ¼ KW and 1 KW sparkers and a 10 watt CW set.

MISSISSIPPI: W. L. Kennon, Supt. reports 5YE still out of operation due to extensive remodeling in progress.

TENNESSEE: Supt. Hutcheson informs us that conditions continue to show improvement in his district. Knoxville is showing considerable activity and the ether is beginning to boom. 5XK until recently has been the only station able to do DX work, but during the month 5UU, 5LF and 5PY succeeded in getting their transmitters in operation and are now doing fine work. S. W. Wilkinson has been appointed City Manager of Knoxville. He has put into effect rules and regulations for the purpose of minimizing interference and improving general operating conditions. Mr. Wilkinson is at present operating station 5UU and handling considerable traffic. 5ER reports very little traffic handled during the month. 5MB's transmitter was out all of the month. 5EK says that considerable activity is being shown around Memphis. Memphis has now a new club and several of the members are installing CW sets. 5DA with characteristic modesty, fails to mention his station; however his good work stands out too far to be overlooked and we sincerely wish to commend him.

**MIDWEST DIVISION**  
L. A. Benson, Mgr.

The next issue will contain a complete list of new officers together with full details relative to the re-organized Midwest Division.

MISSOURI, 9ZAD, Supt. 9EX reports that most of the traffic thru St. Joseph is being handled by C.W. in the early morning. He has written 15 or 20 stns. that are heard in daylight and would form reliable routes from Iowa to Oklahoma and from Illinois to Colorado. 9EX at present is using a 100 watt tube set. Traffic thru K.C. is being handled mostly on C.W. by 9AQR, 9ASD, and 9AVN. 9DZI and 9AOJ of Columbia are working early mornings. 9BNO is reaching out well with his fone. Msgs. are being handled by fone entirely between 9BNO and 5MA. 9MA and 9DAZ of Jefferson City will be ready for any traffic thru central Missouri. Two good daylight routes are in operation between Columbia and Kansas City, one thru 9SJ and the other thru 9BMN of Sedalia and 9AVK of Holden.

IOWA, 9JA, Supt. Bloomer reports for southern Iowa all routes working in good shape. 9JN is installing CW but lately has been handling a great deal of traffic by spark. 9AMU proves to be coming thru with his C.W. 9YAE is burning up the air in the wee hours of the morn. He forms a dependable link in the northern route.

Other stns. doing good work are 9ARZ of Clear Lake, 9DOF of Hampton and 9AXU at Boone. Breene of 9JL reports an increase in traffic. 9BAP at Waterloo with a ten watt set is working twos and threes every nite. 9CS of Clinton is on the job regularly. Cedar Rapids has three live stns., 9AVE, 9DVO and 9SG. At Davenport the honors are about divided between 9MS, 9AWX and 9UG. 9OZ and 9PL at Ottumwa with the help of 9ABY and 9SL make the southern route complete. 9YO has four operators and maintain a watch until midnight. At Des Moines we have three stations that are putting the state on the map—9IY, 9DEH, and 9OA.

NEBRASKA: 9HT, Supt.—9VE of Omaha is still working his ten watt set and obtaining great results. 9DUP of Wahoo is doing good work on C.W. and has been reported QSA at a distance of 850 miles. Mr. Harvey of David City, Nebr., reports traffic moving thru his section in great style. Several sevens have been worked consistently and traffic west can be cleared thru 9AMB and 9DTM. A great deal of traffic south and west is cleared thru the old standby, 5ZA. 9AIF clears most of the South Dakota traffic while 9DNC is handling a great deal on C.W. 9EW has also been handling traffic on C.W. and is working rings around many spark stns. in his vicinity. 9WI of York deserves great credit for his constructive work in the forming of routes and the handling of traffic. All stns. in the state of Nebraska should communicate immediately with J. G. O'Rourke, 6406 Maple Ave., Omaha, and obtain a quantity of station report blanks.

#### WEST GULF DIVISION Frank M. Corlett, Mgr.

All Asst. Div. Managers have reported on time, made excellent reports and covered the ground so thoroughly that there is nothing left to be said by the Division Manager except to express my appreciation for the good work. Fine work, fellows, let's keep it up.

#### SOUTH TEXAS SECTION

District Supt. Nettleton of Eagle Pass reports traffic moving nicely in all directions except west, and that condition being due to congestion of the few available relays west of his section. 5ZAK continues to be the busiest station in west Texas. 5ZAN comes second, and as Asst. Supt. is energetically building interest in his vicinity. Altho 5ZAE at San Antonio has been constantly handicapped, he has broken thru and his sigs are reaching to Houston. 5ZR is again in the air after an extended absence.

District Supt. Tilley at Austin briefly states that his district is very much on the map with reliable short relays in every

direction in operation; representative stations being 5KP at Elgin with C.W. and spark; Rockdale with 5NH and 5PR; New Braunfels 5YK; Victoria 5TG. Altho Texas University station is still rebuilding, it continues to be the best station in the district. 5ZU is constantly receiving splendid reports on his C.W. from points as far east as Pittsburgh, Pa.

Altho new stations are opening up constantly in the Houston district and the usual number rebuilding, some of the old faithfuls are always on the job to keep things moving, being especially true of our star station 5XB. 5MX is a new station in the northern portion of this district and located at a point badly needed. 5QJ has been of value to this section in opening up a relay north. Asst. Dist. Supt. Hatry reports that traffic is tied up thru breakdown of 5KN. Galveston is now well represented with 5TT, 5CQ and 5VY who take turns in keeping a good long watch. That's the stuff, fellows!

#### NORTH TEXAS SECTION

District Supt. 5XJ, reports the North Central District gaining and many new stations are being installed in places that will help open up short jump routes, still there are many places such as Baird, Cisco, Albany, Mineral Wells and Eastland that need good C.W. or spark sets that will reach out and help traffic. The D.S. would like to hear from some one in the following places: Gatesville, Balanger, Coleman and Quanah. The Dublin territory is still hammering away with DX and again leads in messages handled, 5XJ being their star, and 5IR handling a few by voice. 5QS has been putting his small C.W. set through, working an eight on 5 watts. 5QT is reaching out. 5AO is back in the ring. 5RP is still using a spark coil.

5NY at Abilene is doing some good work handling traffic west. 5VB and 5VE are constructing a one-half and a 1 KW respectively which will help 5NY with traffic going west.

Currie Cladwell, D.S. Northeast Texas District, reports his district moving off in first class shape. 5ZAM, Commerce Territory A.D.S., reports a decreased handling of messages in that territory, and would like to hear from all amateurs in the following counties: Fannin, Hunt, Lamar, Delta, Hopkins, Rains, Wood, Franklin, Red River, Titus, Upshur, Morris, Bowie, Cass, Marion, Harrison and Gregg. Frank Cane, 5IS, Greenville is doing some fine work with his one-half KW and is also using C.W. 5TH at Paris with his spark is handling a great deal of traffic. 5ZAF, Waco Territory A.D.S. reports traffic speeding up through his territory. Despite the fact that 5ZAF's transmitter has been undergoing a few slight changes he is the star station. Mr. Clark would like to hear from

all amateurs in the following counties: Johnson, Ellis, Hill, McLennan and Bell, 5PJ, City Manager of Ft. Worth reports a marked increase in number of messages handled. Other activities missing from his report.

5IF Dist. Supt. Northwest Texas does not report much activity. C. A. Akers of Happy, Texas, is trying to get in shape to do relay work; he is limited to power input there being no electric plant in his city. 5IF would like to have the names, call letters and description of each amateur station in his territory which includes the following counties: Andrews, Martin, Howard, Mitchel, Coke, Nolan, Fisher, Stone-wall, King, Gottle, and all stations north and west respectively, to the state line.

#### NEW MEXICO SECTION

The new station of the University of New Mexico at Albuquerque has been heard in the air and sounds like business. The installation consists of a 2 KW sink set. Call is 5YO. Another new station, 5AW at El Paso, Tex., has made communication with El Paso possible. For a long time traffic for that city has been going thru Las Cruces, a connection with El Paso being impossible. 5AW uses a 10 watt C.W. and it surely shows how efficient C.W. is as compared with spark. 5ZA is working mostly with C. W. and I.C.W. now.

#### OKLAHOMA SECTION

5BY and 5LB are going again now and are to be heard most any nite. We are glad to note that 5BY is getting out, for we have long needed a good station at Lawton. 5JR of Enid and 5ZZ of Blackwell are heard regularly. 5FO is going strong as ever. 5HK of Oklahoma City is on the job every nite and handles a large portion of the Oklahoma Traffic. No report from 5LO, 5QH, 5PU and others of that section. 5EF of McAlester is selling his spark set and will be using CW. 5OO and 5AN, also of McAlester, are still at their posts. 5AN is working with a 5 watt fone set. 5BM of Muskogee is troubled with QRM from high tension power lines but manages to work some when it is not so bad. Too bad, OM. 5TJ is still working with his 20 watt fone. The greater portion of Oklahoma traffic is being handled by 5FO, 5HK, and 5ZZ.

#### CENTRAL DIVISION

R. H. G. Mathews, Mgr.

MIAMI VALLEY DISTRICT OF OHIO: Quite a few stations were out of commission the entire month and a few others failed to report this month. A tendency is noticed among the stations not to report their messages unless they have a fairly large number to report. The District Supt. would like to announce that it is just as important

to report the few messages as the large numbers and even more so, because no report brings no credit, while a small report gets whatever credit is due. All stations seem to be doing excellent work and the City Managers are hoping some day to get their relayers educated to keep accurate records of the traffic handled.

Although the number of C.W. stations are on the increase the number of C.W. messages reported is less than last month but the number of spark messages is also far below last month's. This decrease is no doubt due to the fact that several of our best stations were out of commission during a part or all of the month while others failed to send in their reports. No reports received from Dayton, Xenia, or Sidney, and from only two of the Cincinnati and one of the Springfield stations.

DISTRICT OF ILLINOIS: A.D.S. Burke, 9NQ, has little to say about conditions around Galesburg. 9CA, Dwight, Ill., is the keystone in the route to Chicago from southern Illinois and reports that new ones are springing up every day. 9APG in Cazenovia is coming to life and getting out on the air. Champaign now boasts of a real O.W. in Miss Helen Long who has become ensnared by the pastime and is delving into the deeper mysteries of oscillators and regenerators, having deserted the feminine realm of the order of "hair-pin". A.D.S. Smith, reports 9DDY spark-coil-C.W. station rapidly building up records with one 5-watt tube, and reports a reliable route to Chicago day or night via 9CA, Dwight, to 9UU or 9DBZ. 9CA has been appointed concentration point for all Chicago-bound messages. 9JV reports things as usual in his vicinity.

NORTHERN INDIANA: The tube set of 9II is getting out in great shape. F. S. Libbee, South Bend, reports activity on the increase and several tube sets being installed. The fellows there are trying to minimize QRM by installing C.W. sets. Mr. Libbe formed schedules with 9XI west and 9AIO, 8BOX and 8BK east. L. B. Wilcox reports a fine branch line established from Detroit to Fort Wayne via 8BXA (Lansing), 8YN (Battle Creek), 9DF (Angola), and 9II (Fort Wayne).

KENTUCKY DISTRICT: 9UH reports that his territory is going strong. It is gratifying to learn that the dead spot between Louisville and Newport has been overcome by 9YC.

DISTRICT OF WISCONSIN: 9TO reports several good operators at Thinlander and Mattoon but ND on transmitters. 9YAC claims that the weather was so poor the past month that DX work was very erratic. The nearest stations they work are at St. Paul and Baudette, both around 150 miles. 9QS of Superior is installing 9PN's sink gap.

9GP misses the traffic from the north and west and claims that there is no where near the amount there was last season (9ZL's fault). 9AXA has been doing excellent work and is in a position to handle traffic for all points east and west, particularly fine for Madison. 9ACM claims that the fellows of Sheboygan are asleep on the job. There are a number of good stations there but they do not seem to take any interest in relay work. 9DHG, has also been doing excellent work. His station appears to be about the only DX station in his city. R. O. Hartin, City Manager of Kenosha, has been forced to resign because of the fact that he is moving from Kenosha. Mr. Junior Vincent will handle this position in the future.

**TOLEDO DISTRICT OF OHIO:** 8ZN complains of the lack of co-operation from the stations. It seems that after one of the smaller stations work a long distance station, they would rather spend the night calling DX in vain hope of sending their traffic over the greatest jump, and do not try to get their traffic off as quickly as possible by utilizing the stations who want the traffic and who can handle it, even if by short jumps. 8BEP has got in the relay game in earnest. This station is QRK over a wide range, and is well equipped. 8ZY is back in again, though rather on and off as he is making changes to put station in maximum efficiency. 8AQZ at Loudonville has been handling his share of traffic with a fine C.W. set. He maintains a regular schedule with the east.

8IZ has been able to locate no more than a galena detector station in Port Clinton and the other towns he was appointed to cover, excepting in Sandusky the well known C.W., 8BOZ, who as near as can be found out is doing excellent work on 20 watts.

9ACW, Traffic Manager Waukegan and North Chicago, reports that he is now on every Friday and Saturday night, with ½ k.w. spark set. 9AVP was on for about two weeks this month with ½ k.w. spark set in Waukegan. 9UY on most any night, ½ k.w. spark set in Waukegan. 9OF, Waukegan, on with ½ k.w. set that does not seem to reach out as the first three do. 9BBR, North Chicago, on with five watt C.W. set.

Prof. Achatz reports 9YB of Lafayette, Ind., now has power until midnight on Mondays, Wednesdays and Fridays and occasionally on other nights.

City Mgr. of Akron reports no trouble in relaying traffic from Kansas and Nebraska directly to the Atlantic coast. No spark station of much activity in operation in Akron at present. C.W. in favor about 3-1 at present. Local QRM is under control through the co-operation of the Executive

Radio Council of Akron and the respective radio clubs.

#### DAKOTA DIVISION Boyd Phelps, Mgr.

Traffic is moving in great shape and club activities are the liveliest ever seen. More C.W. stations are opening up in the small towns which should mean short jump relaying next summer. The difficulty now is that there is comparatively little working between spark and C.W. stations resulting in a decrease in the speed of relaying where stations are scarcer.

9ZC, of Baudette, Minn., reports more new stations in his District, notably 9DHG of Cloquet and 9BAF of Brainerd who are clearing traffic for their vicinity. According to 9EA, City Mgr. of Duluth, there were last month five times as many msgs. handled out of Duluth on C.W. as were handled on spark, 9EA and 9AEZ leading with promise of good competition from 9ADF and 9CO.

9YAJ, of St. Olaf College, Northfield, Minn., has been very active in his District. 9BBF of New Ulm has been doing great DX on one 50-watter in daylight or night. 9YAJ does good work on spark and has recently added two 100 foot steel masts, a fan aerial, and a counterpoise. In the Twin Cities 9XI, 9HM, and others by spurts handle traffic. J. F. Carpenter of 9XI has been appointed City Mgr. of Minneapolis and with the aid of J. A. Hall, City Mgr. of St. Paul, and the Twin City Radio Club, the Twin Cities have been divided into districts for closer supervision of traffic and tuning.

Stations in western North Dakota are still missing. 9WU-9ZX, District Supt., and 9EE-9ZX have been our reliable links to North Dakota and the west. This makes Ellendale the distributing point for msgs. to this territory. 9AGN and 9DOC have strong sigs but special mention this month is due 9FX at Jamestown and 9LW at Wahpeton for their constant and persistent relay work.

The good effects of a state convention are already being felt in South Dakota according to N. H. Jensen, Box 894, Sioux Falls. This has brought in many queries concerning the League from those new in the game. Such meetings do more for radio than 'most anything else. C.W. is slowly but surely coming to the prairie of South Dakota.

#### ALASKAN DIVISION Roy Anderson, Mgr.

7IP, our first real Alaska station, failed to send in a report. The operator on the U.S.L.H.T. Cedar heard 6AK, 9YAK, 9WU, 9AAU, 7YL, 7XJ, 7XY, 9XAQ, 9AMO, 7CE, 6ZR, and 9DTM, showing that it is

possible for us to hear stations in the States.

We have 9 members in this division, but we intend to stick together until such time as we can establish real communication for Alaska.

**PACIFIC DIVISION**  
J. V. Wise, Mgr.

This division has been divided into districts which are given herewith. District "A" includes the entire State of Arizona, with H. L. Gooding, 6ZZ, of Douglas, Ariz., in charge as District Superintendent.

J. F. Gray, 6MZ, of Del Mar, Calif. is District Supt. of district "B" which includes the counties of San Diego, Orange, San Bernadino, Imperial, and Riverside, Calif.

"C" includes the California counties of Los Angeles, Gern, Ventura, Santa Barbara, San Loui Obispo, Kings, and Tulare. B. H. Dennis, 6ZN, of San Fernando, Calif. is District Supt.

District "D" takes in the counties of Fresno, Inyo, Mono, Madera, Mariposa, Tuolumne, and Alpine. The office of District Supt. is vacant at this writing.

District "E" includes the counties of San Mateo, Santa Cruz, Santa Clara, Stanislaus, Merced, San Benito, and Monterey. No appointment has been made for this district.

District "F", San Francisco, Marine, Mendocina, and Sonoma. District Supt. will be announced later.

"G", Alameda, Napa, Solano, and Contra Costa. No appointment.

"H", Sacramento, San Joaquin, Sutter, Eldorado, Placer, Yolo, Sierra, Nevada, Yuba, Calveras, and Amador. No appointment.

"I", Del Norte, Humboldt, Siskiyou, Trinity, Glenn, Lake, Colusa, Shasta,



Tehama, Modoc, Lassen, Plumas, and Butte. No appointment.

"J" includes the entire State of Nevada with G. M. Lewis, 6QR, of Reno, Nev., as District Superintendent.

Pacific Division amateurs are requested to note in which district they are located and to get in touch with their superintendents immediately, informing him of the number of messages handled during the month, whether spark or C.W., and any other activity that is of interest to the amateur fraternity.

District A—Last month has been one of heavy QRN with very few nights for DX traffic work. 6AAH is handling all traffic for Phoenix. 6TV is now in Tucson doing good work. 6ZZ continues to move all east bound traffic thru QRN. Yuma will be represented by 6ZAK which will open another route east from California.

District B—Stations heard nightly moving traffic are 6KC, 6ZB, 6AKL, and 6AEH. However, no report was received from 6MZ.

District C—6AIF has taken practically everything from 5ZA for two months. 6JD, 6KA, and 6AIF operate both spark and C.W. Traffic is continually on the move through the fine work of 6OD, 6LC, 6MH, and 6ZN.

District D—6ALE has been the only station heard from in this district and he has been on the job with his 250 watt C.W. set. More information is wanted from the amateurs in this district.

District E, F, G, H, I.—Our traffic report is taken from these districts for this month. San Francisco Bay traffic is handled easily by 6AS, 6AH, 6TU, 6VX, 6EX, 6XH, 6HC, and others. 6ZK is back again with the old coal burner which is second to none. (Come on, 6ZK, let some ship use it for an anchor and stick in C.W. We at 1AW have been listening for your sigs—but nil. A new hat that C.W. will put them over.—T.M.) In Central California the old gang is back after sticking up the poles that heavy southeaster took down.

District J—6AJR at Reno has installed a kilowatt spark and will be a big help to 6QR in moving traffic east or west over the central route. 6ZO peddled the spark and is using 10 watts of C.W. in keeping the traffic off his hook. 6UO has both spark and C.W. Traffic for the east via 6QR and 6ZAM is rather uncertain. From Reno via 7LY, 7OT, 7LU and 6ZZ it moves consistently. 6ANK is using 10 watts of C.W. after having junked the spark.

**NORTHWESTERN DIVISION**  
H. F. Mason, Mgr.

Traffic in the Eastern Section has been heavy and it has been moving more consistently than in the past because QRN has been nil. 7ZU was the busiest traffic station. A CW set is being installed that will help the old spark. 7XB continues to reach the DX traffic for Montana. 7LY and 7VZ did their share this month.

Stations handling traffic in and out of Portland are 7BB, 7BJ, 7BR, 7GJ, 7JW, 7ZT, and 7ZJ. CW sets are being installed at 7JW and 7ZB. 7ZJ has a regular daylight schedule with 7YS which proves a good means of moving traffic. Communication has been established with 9WU, 9YAK, 9AYE, and 5XU, a distance of 1800 miles.

(Chalk down another one for the sparks, OM.) 7ED is back again after a long time out. 7ED was the official delegate at the Pacific Coast Conference, having been sent by the Northwestern Radio Association.

7PO, 7IY, and 7BK have been taking all traffic for Seattle and more messages were handled than ever before, probably on account of the Xmas rush. (Do your message rushing early—T.M.)

Messages have been ground out in Tacoma by 7BA, 7BC, and 7CE. We know it because we heard them but they sent no report.

The success of the handling of traffic in the eastern part of the state is due to the consistency of 7FI, 7NL, 7ZS, and 7GE who are pushing 'em along in fine shape.

There are many vacancies that we want filled by good live amateurs who are full of pep and who will co-operate in a way that will put this division out in front.

**WINNIPEG DIVISION**  
Boyd Phelps, Acting Mgr.

The best station in Saskatchewan by far is that of Mr. Jack E. Maynard, 4CB, District Superintendent at Morse, Sask. 4CB uses up to 15 watts of CW and has worked 7ZJ, 7ZT, and Canadian 9BD on the Pacific Coast, also more than 40 U.S. stations including five in Denver. Regular schedules are maintained with 9AIG so U.S. traffic may be routed thru this station. 4AO, Moose Jaw, has been getting to 4CB on a straight gap. 4BR, Geo. Shadick of Regina, is working on his 30 watt CW set as is 4BV, Paul Socolofsky, of Loreburn. 4CB is having lots of trouble raising spark stations west to handle traffic and not locating any CW. Who can help?

4BG has been working 9AGN every day so this traffic route is at all times open to Winnipeg. A movement is now on foot to get thru a Trans-Canadian test and route but possibly we may have to ask for assistance of one American station to span the space from Ontario to Manitoba.



The fellow with a 300 meter wave

**A SPARKCOIL C.W. TRANSMITTER**

(Concluded from page 28)

500-cycle tone. While this lowers the radiation a trifle it makes it much easier to raise 'em.

I did not obtain any results at all with a three terminal Ford coil (when one terminal of the secondary and one of the primary are connected to the same tap) at least when the same battery is used for filament and high voltage. A regular four-terminal one-inch spark coil was used instead.

As to the radiation: on 200 meters a little over 0.5 amp. is obtained, while it is about 1 amp. on 300. I am at present using a 4-wire counterpoise 15 feet from the ground but this did not help the radiation a great deal.

And as to the results obtained: I was reported QRK by 9NX, Wichita, Kansas, a little over 550 miles, and have worked 9BBF, New Ulm, Minn., over 400 miles. Also worked 8BOX who reported me QSA and heard several times. Also worked 9MC, broad daylight, a distance of 160 miles, who reported me fairly QSA. Beside these, over 70 locals have been worked and I seem to raise anyone within 100 miles in daylight, about as well as a 1/2 K.W.

I think this is a solution to the spark coil ham, for this set costs very little (in my case about \$10) and the advantages are obvious.

I will say in conclusion that if anyone desires further information on the above I will be glad to accommodate and would be more than pleased to have a card from anyone who hears me.

**AN IMPROVED PRIMARY CONDENSER SWITCH**

(Concluded from page 27)

connection. With the wheel raised (handle lowered) spring A is forced away from spring 2, breaking the direct circuit from the aerial to the inductance, and forcing the energy through the condenser on its way to inductance and ground. This gives a series connection, with the condenser in the aerial lead. Should it be desired to place the condenser in the ground lead at any time it is simply necessary to reverse the aerial and ground leads, reversing the inductance leads at the same time if for any reason it is desired to keep the polarity of this latter unchanged. This operation will not affect the parallel or plain connections in any way.

This switch has been used successfully by the writer, and has commended itself to him by its simplicity in operation and economy of space.



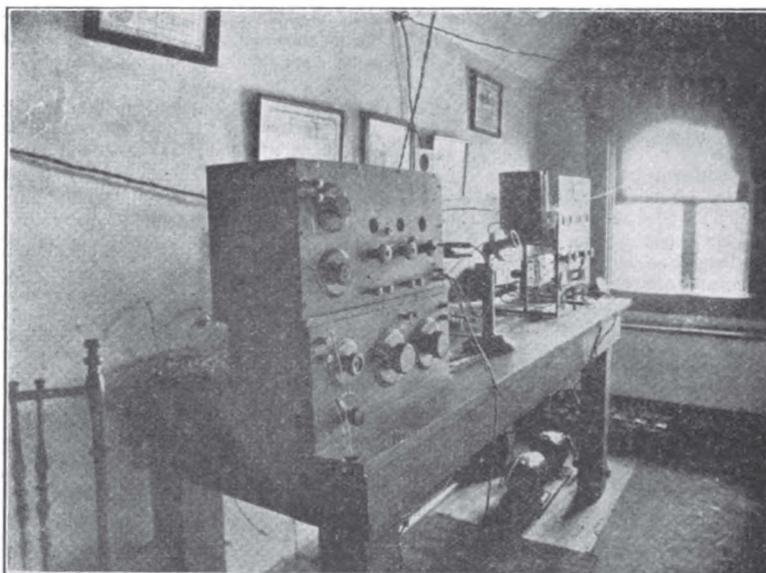
# Amateur Radio Stations



## 8LF, Crafton, Pa.

The CW transmitter at 8LF constructed by Mr. W. K. Thomas is most interesting and deserves much praise for its phenomenal work in the past few months. As announced in our last issue its signals have been heard in the Pacific by a ship opera-

are mounted on a sub-panel, below the tube shelf. The controlling switches for selecting phone, buzzer modulated or straight CW are mounted on the main panel as well as controls for filament current and plate supply. The main antenna inductance



The Interior Arrangement at 8LF

tor at a distance of 5500 miles from Crafton, Pa. West coast stations have repeatedly heard it and its relay work has been of the highest order.

The antenna consists of six wires 65 feet long supported by two masts at a height of forty five feet. A counterpoise is used, being a duplicate of the antenna and supported 10 feet from the ground by the antenna masts.

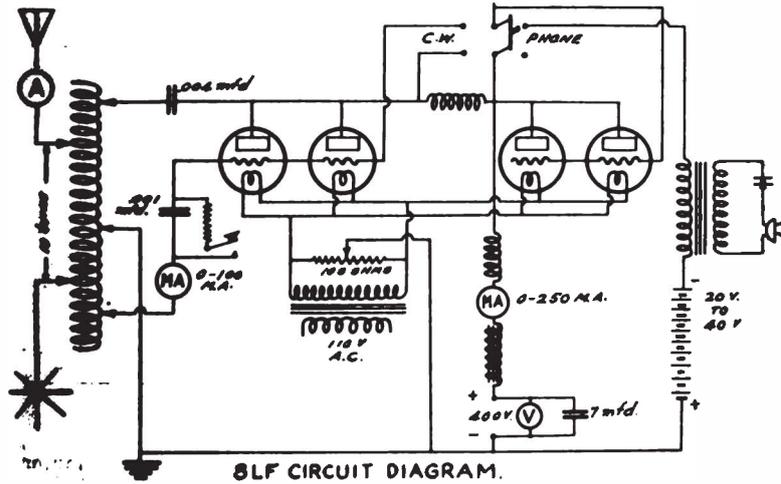
The tube transmitter is mounted on an open panel and uses four 5-watt Radiotrons. The tubes are mounted on the upper shelf to the rear of the panel and the condensers, chokes and modulation transformer

may be seen mounted back of the tubes. The source of plate supply has been an ever-changing feature and good success has been had with both motor-generator supply and chemically rectified alternating current. The rectifier consists of twelve pint jars connected in the usual circuit, the construction of which is similar to those that have been described in the past issues of QST. Mr. Thomas, however, finds that the aluminum plates when made three times the size of the lead plates give better rectification. The antenna current with the rectified alternating current plate supply is approximately 2.4 amperes, corres-

ponding to an output of 46 watts the arrangement of which is clearly shown in the accompanying circuit diagram.

The receiving equipment consists of a Grebe CR-2 with a detector and two steps

of audio amplification, also a Westinghouse single-circuit receiver with detector and two step audio. Mr. Thomas finds a single circuit receiver much better for continuous wave reception.

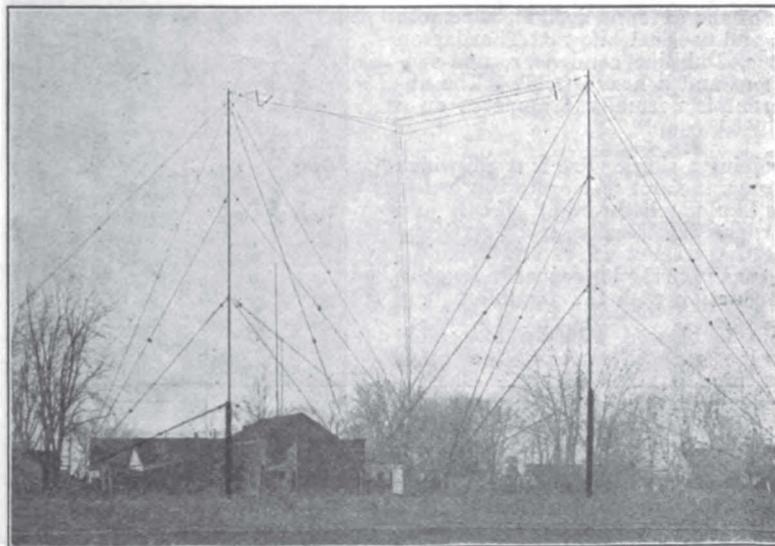


## 9MC, Roodhouse, Illinois

The accompanying photographs show the efforts of Mr. A. H. Cain in producing a most successful station. Some very exceptional distances have been covered for

a spark station, 9MC having been heard in Maine, New Hampshire, Oregon, Idaho, Nevada, and Arizona.

The antenna is supported by two iron



9MC's Antenna



Mr. Cain and his transmitter

pipe masts 80 feet high and consists of a five-wire flat top T, 65 feet long. The lead-in drops straight down to the secondary of the O. T. without any crooks or bends. The whole system has been very carefully laid out and each guy wire is insulated at frequent intervals. The ground system was installed at the suggestion of Mr. M. B. West and consists of twelve galvanized rods five feet long driven into the ground and a buried counterpoise using 7000 feet of wire in a radial form.

The transmitter, located in a hut under the center of the antenna system, is remote controlled and uses a 1 kilowatt Thordarson transformer, Dubilier condenser, non-synchronous gap and a heavy O. T. The antenna current is normally 4 amperes on a Jewell thermo couple.

For receiving a single wire is used, which Mr. Cain says is far superior to any other and gives him much stronger signals and tunes sharper, with less strays. A Grebe CR-2 is used for short waves and a honeycomb-coil tuner for the longer wave lengths, both in conjunction with the amplifier.

Mr. Cain is blessed with an extremely fortunate location, there being no other stations within 45 miles of him. The receiving set and transmitting controls are located in Mr. Cain's garage office and the only QRM he experiences is from customers, which he terms "commercial QRM."

9MC is one of the important stations in the Central Division and handles considerable traffic. It is one of the most consistent stations in its territory and Mr.

Cain's fist is a very familiar one to operators in the middle-west. It is evident from the photographs that nothing has been spared to make 9MC a real station and Mr. Cain can well be proud of his efforts.



## With Our Radiophone Listeners

### *Getting Started Listening*

**T**HE really good radiophone broadcasts now being put out have brought thousands and thousands of people into the amateur radio game who would never have made the plunge for the telegraphic features of the art and whose major interest at present lies in the reception of the radiophones. We have had many hundreds of requests for advice in getting started in the listening game and it is in the hope of being of help that we present the following.

The most bothersome feature of the whole business is the aerial or antenna, yet it can be reduced to a very simple problem. This aerial is a kind of "collector" against which the advancing radio waves impinge, inducing in it a feeble voltage which maintains a minute electric current oscillating at high frequency. To best serve as a collector our aerial should be of the proper dimensions so as to cover the right range of wave lengths, should be located where the waves can impinge upon it effectively, should be of low electrical resistance so that the losses in it are at a minimum, and should be well insulated from its supports and kept away from other objects so that its small energy may be conserved and delivered to the apparatus.

Aerials work better as they are made higher but fortunately this is more pronounced in transmitting aerials than in those for receiving, and furthermore a lower aerial picks up decidedly fewer "strays" or atmospheric disturbances ("static"). It is also fortunate that, while an aerial for transmitting has to have numerous wires arranged in intricate formation and supported by complex "spreaders" or cross-members, incidentally necessitating sturdier supports, a receiving aerial may consist of but a single length of wire. In fact we feel that there is not the slightest to be gained in using more than one wire. This simplifies things considerably—we now know that a single length of wire, not unduly high, and capable of support by light masts, will suffice.

Now for the dimensions. Amateurs get results on almost anything—the clothes-line, the telephone line, bed-springs, the

kitchen range, twenty feet or so of wire run thru the house or hung on a picture moulding, etc. But the better way, of course, is to run a wire outdoors where it can effectively "collect" our signals. For best results it ought to be about 50 ft. high if possible, but excellent results are had at 30 ft. and very fair reception accomplished at as low as 20 ft. Of course the higher it is, other things being equal, the louder the signals and the greater the distance over which they may be received. The length of the wire, within available space, will depend upon the wave lengths to be received. The standard broadcasting wave is 360 meters and our aerial should be of a length that will give best results at that figure and if possible still be capable of getting up to the ship wave length of 600 meters and down to the amateur waves in the vicinity of 200 meters. From practical experience it may be said that the best over-all length for an aerial for this purpose is around 175 feet. Good results can be got with much shorter aerials if necessary, and aerials of 200 ft. will give slightly better results on the concert wave, perhaps, but at the expense of 200 meter reception. By over-all length is meant the length from the tuning apparatus to the far end of the antenna. For example, for 175 ft. over-all the aerial may run 10 ft. across a room, thru a window and up 40 ft. to the start of the horizontal portion, and then stretch away for 125 ft. to the far support.

The aerial wire may consist of solid copper, No. 14 or 12 B&S gauge, or of the stranded copper wire available for that purpose. Bare wire is preferable to insulated, altho the latter can be used. Phosphor-bronze wire is desirable for especially long spans or where winter sleet is heavy, its chief advantage being superior tensile strength.

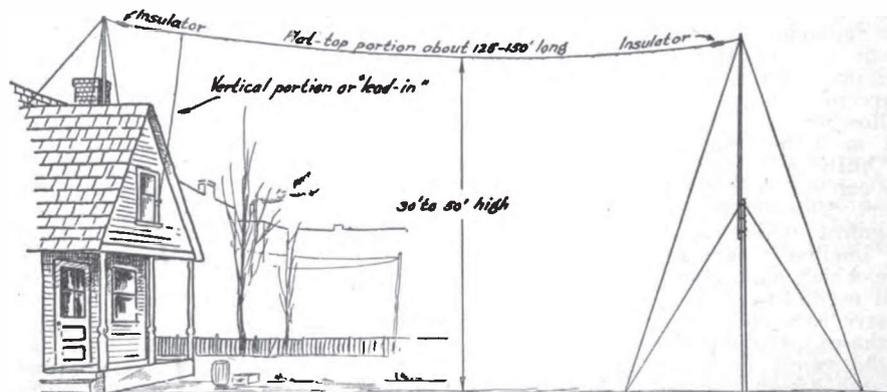
For best results the aerial should be run in a straight line between two supports, and not run around corners via intermediate supports, altho slight changes in direction will not particularly detract when unavoidable if care is given the insulation at the intermediate supports. Differences in height at the opposite ends of the aerial do not make much difference but it is pre-

ferable, where possible, that the "far" end be as high as or higher than the "station" end. The sketch herewith will give some ideas on the rigging of an aerial. Often a short mast may be put on the house and used to support one end, and a similar mast on another house or garage, or even a special light mast or a tree used for the far end. The wire should be run in a direction where it will be as far as possible from trees and buildings, particularly structures having metal roofs, etc. And whenever possible it should run at right angles to power and lighting wires, so that the latter will not induce a "hum" in the apparatus.

The aerial should be carefully insulated at both ends. Standard insulators are available for this purpose, or glazed porce-

by connecting to the cold water supply, preferably as near the street as possible. It is impossible to solder a wire to a cold-water pipe, but little "ground clamps" can be had in the supply stores which make this unnecessary. The pipe should be carefully scraped all around at the desired place, until the metal is bright and clean, and the clamp tightened down snugly. While the lead-in wire should be carefully insulated, and a bare No. 14 wire will do nicely. It should be soldered at its far end to the ground clamp previous to placing the latter around the pipe.

In our next issue we will give further suggestions along this general line.



lain "eggs" or porcelain cleats may be used, preferably several in series at each end. The lead-in or vertical portion of course is attached to the flat-top portion, next to the insulator, and should be a soldered joint.

The underwriters' present regulations require that the lead-in should be run to the blade of a single-blade double-throw switch outside the building, so arranged that in one position it connects the aerial to an insulated wire running inside the house and in the other position grounds the aerial to earth thru a special out-door ground connection for lightning protection. These regulations are in process of revision at the present time and it is believed that the new regulations will abolish the necessity for such a switch and permit the use of a minute "knife-edge" air gap to earth, instead. More about this later.

In addition to an aerial, wireless sets require a "ground" or connection to earth. Transmitting stations require a rather elaborate ground system but this is not necessary for receiving alone. Connection to the radiator system or gas pipes will give fair results, but better ones will be had

#### Wireless Market Reports Used by Many Agencies

The wireless is now being used by State and Federal agencies to broadcast national and local agricultural market reports throughout virtually the entire country. Reports on the national markets are dispatched daily by the United States Department of Agriculture from wireless stations of the Post Office Department at Cincinnati, Omaha, Washington, North Platte, Nebr., Rock Springs, Wyo., Elko, Nev., and Reno, Nev. These reports are received by hundreds of amateur wireless operators. National market reports are also received by State bureaus of markets and agricultural colleges, supplemented with local market reports, and relayed by wireless telegraphy and telephone to farmers, shipping associations, newspapers, banks, and other agricultural interests.

The St. Louis University at St. Louis, Mo., was perhaps the first among educational institutions to broadcast market reports by wireless. These reports are received by hundreds of farmers, shipping associations, banks, and other agricultural

interests, and a telephone company in eastern Illinois which receives the reports telephones the news regularly to its 5,000 subscribers.

At Lincoln, Nebr. the University of Nebraska and the Nebraska Wesleyan University are co-operating in broadcasting crop and market reports furnished by the State Bureau of Markets. Both radio telephone and telegraph are used. At Wisconsin the State Department of Markets broadcasts national and local market reports from the University of Wisconsin wireless station at Madison. At Minneapolis, crop and market reports are broadcasted from the University of Minnesota radio station. The Minnesota College of Agriculture has also assigned an extension representative to instruct the farmers in the use of wireless receiving apparatus. The College of Agriculture of Cornell University has assigned an expert for similar work, and to assist rural radio clubs that are being organized in New York.

A high-powered transmitting wireless telephone has been installed in the office of the Missouri State market bureau at Jefferson City, Mo., and started disseminating market information about January 10. Government reports from the larger market centers of the country will be received by means of a "drop" from the leased wire system of the United States Department of Agriculture, and transmitted by radiophone to all sections of Missouri. Demonstrations intended to interest farmers, dealers, and shippers in installing the necessary wireless receiving apparatus will be held in various rural communities of the State, and it is anticipated that telephone offices, newspapers, chambers of commerce, county agricultural agents, banks, high schools, and co-operative marketing associations will be among the first to install receiving sets.

A most complete program in the dissemination of market reports by wireless is being planned by the State bureau of markets in Ohio, a specially constructed radiophone transmitter of the most improved type being installed in the radio station of the University of Texas markets and warehouse departments are also planning a market news service by radiophone for farmers, dealers, and shippers in Texas, arrangements being made to use the radio equipment of the University of Texas at Austin.

The first national market report to be broadcast by wireless anywhere in the world was sent out by the United States Department of Agriculture from the radio station of the United States Bureau of Standards only a little over a year ago. The department soon demonstrated the practicability of utilizing the radio for disseminating market information, and rapid progress in expanding the work has been

made possible through the cooperation of State and Federal agencies. To make the American farmer the best informed farmer in the world is the aim of these agencies, and equal progress during the coming year will go far toward securing that result, say officials of the Federal department.

#### NOF-NSF Concerts Again Started Through Washington Cooperation.

At the suggestion of Mr. A. J. White of White and Bover Co. a collection was taken at a recent Washington Radio Club meeting and sixty dollars raised in ten minutes to purchase a phonograph for "LC" Young so that he could again send radiophone concerts from NSF.

Mr. "Call-me-Henry" Lansburgh of Lansburgh and Brother not only was for the idea but refused the sixty dollars entirely and presented Young with a \$75 Victrola and advised the club to use the money for records. This is being done, Young acting as trustee.

NSF now has two calls. NSF is used for official business and NOF for broadcasts. The concerts are given Tuesdays, Wednesdays and Fridays.

Amrad WGI of Medford Hillside, Mass., is running a repeat broadcast of the Public Health Service lectures as given from NOF, at 8:15 pm Eastern Standard Time on 310 meters.

The Seattle Post-Intelligencer, a large morning daily of Seattle, has installed a complete radiophone transmitter and is broadcasting concerts daily including Sundays from 9:00 to 9:30 pm. These broadcasts, in addition to music, include late news items of the day with special features as available. The transmission is on 325 meters and the power at present is but five watts. In spite of the low power their signals have been heard repeatedly at distances up to 1500 miles, Spokane, Washington, reporting them consistently every evening, a distance of about 350 miles. Arrangements have recently been completed for increasing the power to one hundred watts and the erection of a better antenna. The new transmitter will be in operation very shortly, having a much greater range.

The station of the Atlantic Pacific Radio Supplies Company, located at the California Theater in San Francisco has been removed to Oakland and installed in the home of Mr. H. M. Shaw, President of the Atlantic Pacific Radio Supplies Co., where it is planned to make extensive experiments in the broadcasting of music.

The transmitter is of 500 watts capacity and is a DeForest Oscillion transmitter. It has been reported from all points on the Pacific coast and at Wailuku, Maui, Hawaii.

(Concluded on page 51)



THE A. R. R. L. has the pleasure of announcing the completion of affiliation of the following societies as of Jan. 14, 1922:

Hackensack Radio Club, Hackensack, N. J.  
Totem Radio Club of Seattle, Seattle, Wash.  
Northern Wayne Radio Club,  
Williamson, N. Y.  
The Chelsea Radio Ass'n, New York City  
The Ion Radio Ass'n of Milford, Mass.,  
Milford, Mass.  
Radio Club of Hudson County,  
West Hoboken, N. J.  
Newark Radio Traffic Ass'n, Newark N. J.  
The Pawcatuck Valley Radio Ass'n,  
Westerly, R. I.  
Poultney Executive Radio Council,  
Poultney, Vt.  
Radio Institute of Binghamton,  
Binghamton, N. Y.  
The Hotchkiss Radio Club, Lakeville, Conn.  
Roselle Park Radio Club, Roselle Park, N. J.  
St. Thomas Radio Club, St. Thomas, Ont.  
St. Joseph's College Radio Society,  
Philadelphia, Pa.  
Lansdowne Radio Ass'n, Lansdowne, Pa.  
Carson Amateur Radio Ass'n,  
Carson City, Nev.  
New London Radio Club,  
New London, Conn.  
Lewisburg Radio Club, Lewisburg, Pa.  
Tesla-Marconi Club, West Allis, Wis.  
The Harrisburg Radio Club, Harrisburg, Pa.  
The Rose City Radio Ass'n,  
Springfield, Ohio  
The Logan County Radio League,  
Bellefontaine, Ohio  
Champaign County Radio Ass'n,  
Urbana, Ill.  
Radio Engineering Society, Salem, Mass.  
The Wooster Radio Club, Wooster, Ohio

Clubs wishing information on how to become affiliated with the A. R. R. L. can secure same by addressing a letter to the Traffic Manager, A. R. R. L., 1045 Main St., Hartford, Conn., who will be glad to furnish the necessary application blanks. Every radio club, association, or society is eligible for affiliation and information will be given to those who desire it.

The Mystic Valley Radio Club of Malden, Mass., has been re-organized and new officers elected: Earl Baker, pres.; Mr. Ham-

ilton, vice-pres. Meetings are held weekly at the YMCA. A complete station has been installed with watches kept every night except Sunday.

The Flint, (Mich.) Radio Association was organized in October, 1921, with a membership of 35. This number has been increased to 61. The association is operating under a governing executive council interested in traffic control and promotion of radio. Demonstrations, with carefully selected programs, are given regularly for the benefit of amateurs in and around Flint. The Board of Education of Flint has introduced radio into the night courses and prepares students for government examinations.

Nearly one hundred new members were added to the roster of the Providence Radio Association when a radio fone concert was given for the benefit of the Boy Scouts of America. The transmitter was at 1CIV and a four step amplifier was used in the large hall where the meeting was held. After the demonstration memberships were solicited and the above number secured.

At a recent meeting of the Ann Arbor, (Mich.) Radio Association, Dr. N. H. Williams of the Univ. of Michigan read an interesting paper on "How Our V.T. Circuits Oscillate." A heated discussion was held on the subject, "Simplified Versus Triple-Tuned Receivers." The membership of the club has grown during the past year and several instruments have been purchased which may be borrowed by any member.

Amateurs on the Pacific Coast have adopted a plan known as the "Pacific Plan," which is similar to the Chicago Plan in its purposes. There are five divisions of operating hours each day:

6:30 A.M. to 6:30 P.M., free air, work of any kind except DX.

6:30 P.M. to 7:30 P.M. or up to concert time, for local traffic only, using minimum power.

7:30 P.M. to 9:00 P.M., concert period when concerts are broadcasted or in districts where there will be QRM from 200

meter stations. This is under individual control of clubs in their locality.

9:00 P.M. to 10:30 P.M., long distance testing and messages to DX stations only. Stations working in this period cannot work again until after midnight.

10:30 P.M. to midnight, DX message traffic only, for stations having regular traffic except those who worked during previous period.

12:00 A.M. to 6:30 A.M. DX testing and DX free air.

Each radio club has appointed a traffic officer whose duty it is to supervise traffic regulations in his territory.

**The Cleveland (Ohio) Radio Association** has adopted and enforced traffic regulations so perfectly that not one case of QRM was reported during the concerts given by the Association. A prize is given each month for the best message report turned in by a member of the C. R. A. The members meet in the Hotel Statler. One of the novel features of eliminating QRM or rather proving that a station caused QRM is the use of a dictaphone which records everything. The records are at the disposal of the traffic committee and every record is authentic. At one of the meetings some of the records were played. The signals were heard all over the hall and some of the fellows fearing exposure started to leave the room. In addition to the dictaphone record, a complete log is kept which is sworn to by the operator making it. Team-work is the motto of the C. R. A. and in spite of the fact that there are several hundred transmitters in Cleveland, QRM is almost nil.

**The Radio Club of Hartford** held its annual election of officers on January 9th, electing F. H. Schnell, president; J. C. Randall, vice-president; R. C. Higgy, secretary-treasurer. An executive committee consisting of the above officers also includes C. D. Tuska, K. B. Warner, R. S. Miner, and Perry Briggs.

**The Southern California Radio Association (Los Angeles)** has a membership of 200. Meetings are held the second and fourth Mondays of every month in a large hall capable of accommodating 500 people. Membership drives have not been held, but the membership has grown because of the fact that the meetings are of such interest that every member brings a member. A banquet is held every few months which always brings out a large enthusiastic crowd. Much of the success of the S. C. R. A. is due to the untiring efforts of Lex Benjamin, its president.

## WITH OUR RADIOPHONE LISTENERS

(Concluded from page 49)

Alian Islands, a distance of 2100 miles. Arrangements have been completed for the broadcasting of phonograph music, late news items and concerts. Every afternoon and evening except Sunday news and music will be transmitted at 3:30 to 4:30 p.m. and from 7:00 to 7:10 p.m. On Wednesdays a concert will be given from 2:30 to 8:15 p.m. and on Saturdays from 8:15 to 9:00 p.m.

The California Theatre station was installed in April, 1920, by Lee DeForest, Inc., and had the distinction of being the pioneer station in the world for the sole purpose of broadcasting, having transmitted some 1500 concerts before its removal to the more efficient location in Oakland.

### BROADCAST SCHEDULES OF NOF

(Eastern Standard Time)

(Aircraft Radio Laboratory, Naval Air Station, Anacostia, D. C.)

FRIDAYS: Wavelength—365 Meters

8:30 to 9:00 P.M.—Musical Program

9:00 to 9:15 P.M.—Lecture by U. S. Public Health Service (By distant control from Public Health Offices)

9:15 P.M. to 9:45 P.M.—Musical Program

TUESDAYS: Wavelength—1100 Meters

4:00 P.M. to 4:15 P.M.—Musical Program

4:15 P.M. to 4:30 P.M.—Lecture by U. S. Public Health Service (By distant control from Public Health Offices)

WEDNESDAYS: Wavelength—365 Meters

8:30 P.M. to 9:00 P.M.—Musical Program

9:00 P.M. to 9:15 P.M.—Repeat Lecture by U. S. Public Health Service (By distant control from Public Health offices) on wavelength of 365 Meters.

9:15 P.M. to 9:30 P.M.—Musical Program

### Radiotelephone to Send Weather Forecasts and Warnings

Beginning January 16 the air mail radio station in the Post Office Department at Washington has been broadcasting weather forecasts and warnings of the Weather Bureau, United States Department of Agriculture, by radiotelephone instead of by radio telegraph. These reports are sent out for the District of Columbia, Virginia, Maryland, West Virginia, eastern Pennsylvania, and Ohio. In sending out this information a wave length of 1160 meters is used and all receiving instruments as far west as Ohio if properly tuned receive the reports, which are sent out at 10 a.m. and 9:50 p.m. Experience has shown that the radiotelephone gives better and more rapid service than the radiotelegraph.

# Strays



Numerous requests have been received asking that a spark coil column be inserted monthly in QST. We would like more suggestions and material for this column in order that we may start this in an early issue.

Arthur Lillie, canadian 3HB, recently put on a radio program at the Pacific Hotel in North Bay, Ontario, reproducing music from Pittsburgh and Newark loud enough to be heard by the entire audience.

Dr. S. J. Blum, 9FM, asks that we make note of the correction of his address as 3930 Campbell St., Kansas City, Mo., and not Collegeville, Minn., as in the latest call book.

In the article "Comments on the Sure-Fire C.W. Circuit" by Mr. Shaw in the January QST a very serious error was made in the circuit diagram of Fig. 3. A blocking condenser of around .002 mfd. should be inserted between the antenna inductance and the plates of the tubes. Otherwise the high voltage generator is short-circuited.

Our printer must have been standing on his head when that page was printed, as this diagram is upside down in some of the copies.

E. T. Cunningham of the Audiotron Manufacturing Company has issued a friendly warning calling attention to the fact that imitation two-filament audiotrons have appeared recently bearing the same label as the good old audiotrons of the past, the manufacture of which was stopped October 1920. Beware!

S. Kruse has left the Bureau of Standards and is now located at Cruft's Laboratory, Harvard University, engaged in experimental work for John Hays Hammond, Jr.

Division Manager Corlett of the West Gulf Division and Porter T. Bennett, Secretary of the Dallas Radio Klub, deserve much credit for their enthusiastic boosting and getting new members for our A. R. R. L. They even have brought in new mem-

bers from Mexico, Rip's Spanish seeming to produce some wonderful results.

In a recent patent controversy between the Radio Audion Company and the Radio Corporation of America a decision was given by Judge Hugh M. Morris, for the District of Delaware, giving the Radio Audion Company the right to continue the manufacture and sale of three-electrode amplifiers and oscillators. The Radio Corporation claimed an infringement on the Fleming patent for two electrode rectifiers. The result of prior litigations based on the same patent has been that the Radio Corporation was the only firm permitted to manufacture three-electrode tubes.

"Calls Heard" has become one of the important features of QST and enough material is received monthly for a hundred pages. Only lists submitted before the tenth of the month preceding the date of issue and containing calls heard in the previous calendar month are acceptable for publication. Get your lists right!

5ZT, Mr. I. S. Roberts of Houston, Texas, requests that we make note of the fact that his old call 5AN, has been assigned to A. W. Phillips of McAllester, Oklahoma, after receipt of his special license.

"Radio Questions and Answers" (92 pp., pocket size, McGraw-Hill) by Arthur R. Nilson, Director of the East Side Y. M. C. A. Radio School, New York, is a valuable book for the man preparing to take the commercial operator's examination. It contains eight chapters of questions and answers and general information as to license requirements and grading. The questions cover the theory of radio and electricity and all other matter contained in the government examinations. It is available from QST Book Department at one dollar postpaid.

9ASU says that calls are getting scarce, so much so that the Government has issued half calls. If you don't believe it look up 8IS ½ in the new call book.

Edwin C. Adams, QST's advertising manager, was married on Jan. 18th to Miss Hazel O. Haynes, of Hartford. And still February QST got out on time!

SDE has been reassigned, City Manager R. F. Palmer of Akron having got married without warning and pulling up stakes for Los Angeles, from where he advises us that he has to look after the O.W. and has no more time for radio. How long do we give him, fellows?

#### Read 'Em and Weep

4BY was reported QSA in Long Beach, Calif., by 6ALP, Mr. H. M. Brown. 4BY and 4GL have been heard on board the S. S. Kokimaru by F. L. Jones while 1275 miles west of Portland, Ore. Mr. Jones reported them nightly while proceeding up the west coast from Lower California to Portland.

XF1 has been copied in Hawaii by 6ZAC. 3EM, Duvall of Baltimore, was copied by 6XAC of Avalon, Santa Catalina Island using one fifty watter.

6KA, Nikirk of Los Angeles, reports 8XV, 8AGZ, and 8BK, all QSA.

1BOX reports hearing 6ZA, latter using one 50-watter.

8XV has been copied at 6EN, Los Angeles, for a period of two weeks.

8AGO of Pittsburgh was heard by 6XAD of Avalon.

6AHP in Pomona, Calif., reports 8DR, 8BUM and 8BRL during January.

5ZAK, at Camp Travis, San Antonio, Texas, 5-watt phone, has been heard on voice in New Rochelle, N. Y.

SAGK got a 500-watt tube recently and built a C.W. set, then took a shovel and ousted the spark. All went well until the key was pressed the first time. The loud explosion you heard was what happened. Now he's after a grave-digger to get back the coffin he buried.

Lester F. Bather, loyal member and supporter of the A. R. R. L. and secretary of the Detroit (Mich.) Radio Assn., departed this life on Nov. 10th at the age of nineteen, following an unsuccessful operation for appendicitis.

We join with Detroit amateurs in the deepest sorrow at this loss. Bather was an exceptional lad, competent as a club officer, a proficient amateur, enthusiastic in all co-operative endeavors, beloved of his associates. Our sincere sympathy is with his parents in their bereavement.

The wonderful distances now being accomplished by short-wave CW make one wonder where the end is. That limit, friends, shortly will be determined only by the maximum distance on earth, roughly

12,000 miles. The greatest distance from any point on this sphere is the point diametrically opposite it on the other side of the earth, known as its antipodes.

In view of the successful Transatlantics and Transpacifics it isn't out of order to study a globe a bit and pick out a hard task for our next tests. Peculiar radio conditions are known to exist at antipodal points, and it is anticipated that reception there will be much better than at many intermediate distances. So we have dusted off our old globe and take a look-see. The general territory in which we are interested is roughly that lying between Australia and Africa, in the South Indian Ocean. Unfortunately there is but little dry land there, unless it is uncharted islands, so we suspect we will have to send a ship expedition when the time comes. However, we do find the Amsterdam Islands and St. Paul Islands (French), located in the antipodes of western Kansas, and the Island of Desolation (also French) roughly in the antipodes of Saskatchewan and Montana. Western Australia unfortunately is the antipodes of a point in the Atlantic ocean roughly midway between Porto Rico and Bermuda, while no dry-land antipodes can be found for the north-eastern portion of our country in which many excellent CW stations are located.

Are there among QST's readers any ship operators who traverse this territory—or any readers who would care to move to Desolate Isle in quest of signals?

With deep regret we chronicle the accidental death on December 3rd of William Dawson, of 8PW, Charlerio, Pa. Mr. Dawson was electrocuted while erecting an aerial at Fayette City, when an aerial wire he was stringing came in contact with a 6600-volt line, notwithstanding that some two hundred feet of aerial between him and the line remained in contact with the ground. Mr. Dawson was a very active amateur for the last several years and lately his voice had become a familiar one thru his radio-phone. His many friends mourn his loss. Let this accident be a warning to all of us who are frequently exposed to these dangers.

#### New Apparatus

Notable in the way of low-priced apparatus is the Harko Senior receiver of the Crosley Manufacturing Co. A cabinet with formica panel contains a non-regenerative three-tap tuner, a Crosley variable condenser, and a Crosley socket for the tube, the wave length range being 150 to 600 meters. Remarkable results are obtained on this set, KDKA, WJZ, ships at sea, and countless nearer stations being clearly heard in Cincinnati without amplifiers.

# Calls Heard



## HEARD AT SEA

Ex-1AVA—At Port au Prince, Haiti: 1BCG, 1XM, 2AAB, 2OM, 3HJ, 4GL, 8AML, 8BOX, 8ZAC.

SN—1650 miles N. E. New York, Dec. 25: 1AKB, 1ARY, 1BCF, 1AFV, 1CAK, 1ZE, 2AAB, 2FP, 2NZ, 3BEZ, 3IW, 3MO, 4BY, 4GX, 4GL, 8AIL, 8AWP, 8BFX, 9AJA.

EX-2AFT Dec. 6.-Jan. 15.—Crystal off Hatteras: 1AW, 1GM, 1ARY, 2EL, 2OM, 3AHK, 3AQR, 3BME, 3AK, 3BG, 3LL, 3XM, 4BX, 4CX, 4FD, 5DA, 5YL, 8AFD, 8AHH, 8AJT, 8AYN, 8BRL, 8SP, 8VL, 8YM, 8ZN, 9AOE, 9DCX, 9DHZ, 9HR, 9LF, 9MC, 9TL, 9TR, Off Cape Henry, Va.; 2AFR, 2EL, 3AHK, 3AQR, 3BG, 3VS, 4BX, 8DP, 9GX, Off Charleston, S. C.; 1BDT, 2FP, 3AHK, 3XM, 4BI, 4BY, 4CX, 4XM, 5XA, 5XU, 5ZL, 8ACF, 8YAA, 8UC, 8XE, 9AAW, 9ACB, 9DCX, 9UU, 9YM, Off Jacksonville, Fla.: 2EL, 2FP, 4FD, 4YB, 5DA, 5XA, 5ZL, 8BVA, 9ACB, 9ACR, 9MC.

## Canadian 2BT, Montreal, Que.

Spark: 1GM, 1OJ, 1ABY, 1AEV, 1AMD, 1APO, 1ARY, 1BIR, 2BY, 2FP, 2OM, 2XQ, 2AJE, 2ASL, 3AN, 3BG, 3NB, 3PU, 3HB, 3XM, 3ARB, 3AFK, 3AQR, 3XU, 3JJ, 3SP, 3TT, 3UY, 3VN, 3XE, 3ZAA, 3ZAC, 3ZP, 3AFD, 3AFG, 3AKQ, 3AMS, 3ASL, 3AXO, 3AXQ, 3BXC, 3CA, 3GO, 3H, 3UU, 3UW, 3ZJ, 3AAW, 3ACY, 3DSO, 3DWP, Can: 3BP, 3KG, C.W.: 1GV, 1QN, 1RZ, 1TS, 1UN, 1AFV, 1AIP, 1ARY, 1AZW, 1BCF, 1BDI, 1BEA, 1BEP, 1BKQ, 1BQE, 1BWS, 1BYK, 2RM, 2TJ, 2VH, 2AAB, 2AIL, 2AKO, 2ALR, 2ANZ, 2AWF, 2BGH, 2CBT, 3CG, 3HG, 3MO, 3SM, 3TJ, 3ZO, 3ZM, 3ZY, 3AAE, 3ADT, 3AQR, 3ASV, 3BEC, 3CBW, 4BQ, 4BY, 4EL, 4GL, 4ID, 5FR, 5UU, 8BK, 8DE, 8HJ, 8II, 8JL, 8RZ, 8UJ, 8UK, 8ZG, 8ZAE, 8ABV, 8AGO, 8AGZ, 8AV, 8AML, 8AMS, 8AXO, 8AZV, 8AZX, 8BFX, 8BOX, 8BRC, 8BRZ, 8BO, 8DV, 8PC, 8TV, 8US, 8YC, 9AAS, 9AAY, 9ACN, 9AKD, 9ANG, 9BBF, 9F1, CF2, Can. 9AL.

## 3GN, Ingersoll, Ont.

Spark: 1ZE, 1AEV, 1APO, 1ARY, 1AZK, 1BCF, 1BDI, 1CNI, 2BM, 2CI, 2FP, (2OM), 2XQ, 2ZL, 2AJE, 2ARK, 2BJO, 3AN, 3CC, 3CN, (3HJ), 3LP, 3NB, 3OU, 3PU, 3QN, (3QW), 3TA, (3XM), 3XQ, 3YV, 3ZA, 3ZL, 3ZO, 3ABB, 3ACE, 3AFU, 3AHK, 3AJD, 3ANE, (3AQR), 3BFU, 4AG, 4EA, 4GN, 5ER, 5FJ, 5ZZ, 5ZL, 8AY, 8CH, (8CP), 8EA, 8EB, 8FI, 8HS, 8IP, 8JJ, 8JW, 8LB, 8LQ, 8NO, 8OE, 8OI, 8PL, 8SM, 8SP, 8VH, (8VW), (8WD), 8WE, 8WO, 8XE, 8XS, (8YM), 8YN, 8ZP, 8ZW, (8AAV), (8AFB), 8AFD, 8AFG, 8AHH, 8AHQ, 8AIZ, 8AJK, 8AKQ, 8APP, (8ARD), 8ASQ, 8AUE, 8AWZ, 8AXN, 8AYN, 8AYX, 8BAZ, 8BBI, 8BCK, (8BYD), 8BEP, 8BFH, 8BGT, 8BHV, 8BQC, 8BRL, 8BZY, 8CGX, (8ZAC), 9AS, 9AV, 9CA, 9DF, (9ET), (9FS), 9CG, 9HI, 9JN, 9JQ, 9LW, 9MC, 9OX, 9PI, 9SM, 9UU, 9YQ, 9ZC, 9ZJ, 9AAP, 9AAW, 9ACL, 9ACN, 9ACY, 9AEK, 9AIU, 9AJP, 9ALP, 9AMQ, 9AOE, 9AOU, 9ARZ, 9ASJ, 9ASK, 9ATV, 9AUV, 9AVP, 9DCX, 9DHZ, (9DKV), 9DQQ, 9DWD, 9DYU, 9DZL, 9YAC, Canadian (3AX), (3BA), 3BP, (3DL), 3EP, 3GE, 3JL, 3JO, 3KE, 3LI, 3LP, (3MN), (3NV), (3NZ), (3OV), (3PM), 3QC, (3QH), (3QJ), 3RH, (3RV), 3RY, (3TA), 3TB.

C.W.: (1TS), 1XE, 1ARY, 1AYL, 1BDI, 1BKQ, 1BJW, 2ZL, 2AAB, 2BEB, 3CA, 3GH, 3MO, 3RF, 3TJ, 3AAD, 3AHK, 3ASV, 4BQ, 4BY, 4EL, 4GL, 4ID, 5FV, 5UU, 8BK, 8CD, 8DR, 8HJ, 8IQ, 8IV, 8JW, 8OL, 8OS, 8SP, 8UJ, 8VY, 8XK, 8AFB, 8ABO, 8AGL, 8AGZ, 8AIO, 8ALB, 8ALD, 8AWP, 8AWY, 8AWZ, 8BBK, 8BEX, 8BFX, 8BOX, 8BZL,

8BZO, 8CAZ, 8CEP, 8XAV, 9LL, 9ZL, 9AII, 9AJA, 9AJF, 9AKR, 9ALS, 9ARK, 9BAP, 9BBF, 9DZQ, Canadian (3FM), (3LW).

## SCZ, Vancouver, B. C.

Spark: 6ARD, 6KI, 6KG, 6LX, 6QR, 6ZAM, 6ZK, 6ZX, 7BH, 7BJ, 7BR, 7HF, 7BZ, 7BC, 7CH, 7CN, 7CK, 7FL, 7GE, 7IW, 7JR, 7KJ, 7KE, 7KB, 7LY, 7MU, 7MF, 7MP, 7NN, 7NL, 7NW, 7OJ, 7TJ, 7TL, 7VZ, 7VX, 7YA, 7YJ, 7ZJ, 7ZT, 7ZY, 7ZU, CL-8.

C.W.: 5AK, 5AU, 5EN, 5ZX, 5ZA, 6AAT, 6AAC, 6AK, 6ATG, 6BCJ, 6EN, 6PP, 6VV, 6XAC, 6XAD, 7AAV, 7CF, 7EN, 7FT, 7IL, 7KV, 7KZ, 7NN, 7OG, 7RN, 7UZ, 7XF, Can. 4CB, 9AMB, CL8.

## 1BET, Worcester, Mass.

1ABY, 1AMD, 1AMG, 1AMS, 1AMY, 1ARY, 1ASJ, 1AVI, 1AVR, 1AZW, 1BDC, 1BEA, 1BES, 1BIR, (1BKQ), 1BKR, 1BQE, 1BRJ, 1BYN, 1CAK, 1CAN, 1CGS, 1CIR, 1CKR, 1CLI, 1CLZ, 1CNF, 1CNR, 1CUF, 1DZ, 1HE, 1PT, 1QN, 1TS, 1UN, 1XM, 1XX, 1YD, 1YK, 2AAB, 2AHK, 2AJR, 2AYV, 2BAK, 2BCR, 2BEA, 2BG, 2BJZ, 2BIR, 2WP, 2ZV, 3ARB, 3AF, 3AHK, 3AJD, 3AQR, 3ASV, 3CA, 3CC, 3DH, 3FS, 3GN, 3HG, 3KG, 3KM, 3TJ, 3XM, 3ZM, 3ZO, 3ZY, 3ZZ, 4AEX, 4BQ, 4BY, 4BZ, 4EU, 4GE, 4GL, 4RD, 5FV, 5UU, 8ADQ, 8AGO, 8AGZ, 8ALD, 8AMD, 8AQF, 8AQV, 8AQY, 8AWP, 8AWY, 8AWZ, 8AXO, 8BEP, 8BK, 8BTJ, 8BUM, 8CW, 8DR, 8EA, 8IV, 8JE, 8JS, 8JU, 8LJ, 8LI, 8NI, 8OW, 8PX, 8QM, 8SP, 8VF, 8VV, 8XE, 8XM, 8XX, 8ZAC, 9AJH, 9AL, 9ALS, 9AMY, 9DR, 9DV, 9IO, 9MC, 9PQ, 9YK, 9ZJ.

## J. W. Robinson, London, N. H.

Spark: 1AGO, 1ADP, 1AHD, 1AMQ, 1APO, 1APS, 1ASE, 1ANZ, 1AWO, 1AXI, 1BCA, 1BCF, 1BDT, 1BHR, 1BJS, 1BKQ, 1BNN, 1BPF, 1BQA, 1BQL, 1BSR, 1BUV, 1BVR, 1BVR, 1BVS, 1YG, 1CHJ, 1CM, 1CNF, 1FB, 1FS, 1GW, 1HK, 1ON, 1RV, 1RX, 1SJ, 1WJ, 1YO, 2ADR, 2AER, 2AJD, 2AOM, 2ASL, 2AWF, 2BBN, 2BGD, 2BJP, 2BM, 2BRS, 2BXW, 2BY, 2CT, 2DN, 2FP, 2GV, 2JU, 2OO, 2QE, 2TJ, 3ACE, 3AJD, 3BFU, 3DM, 3FB, 3GN, 3PU, 4EA, 8AOT, 8BAC, 8BUM, 8BY, 8BQ, 8CCU, 8OD, 8WD, 8WE, 9AD, 9AF, 9AGR, 9UH.

C.W.: 1AFV, 1AVU, 1BDS, 1BKD, 1BUU, 1CAE, 1CP, 1CXU, 1DF, 1DH, 1WF, 2AVU, 2AWS, 2CCE, 2MB, 3AAO, 3AIO, 3AXN, 8BDH, 8K1.

## 1BLI, East Bridgewater, Mass.

C.W.: 1AB, 1AIP, 1AJR, 1AMS, 1ARY, 1AZD, 1AZW, 1BAZ, 1BCF, 1BCX, 1BDC, 1BDI, 1BEA, 1BES, 1BH, 1BIR, 1BKQ, 1BKR, 1BLA, 1BMY, 1BPE, 1BQE, 1BSD, 1BWJ, 1BYX, 1CAE, 1CAK, 1CDR, 1CKG, 1CKS, 1CIV, 1CLI, 1COD, 1FB, 1FF, 1JN, 1RH, 1TS, 1UN, 1XAD, 1XE, 1XM, 1XX, 1ZE, 2AAB, 2AAX, 2AB, 2ADV, 2AFV, 2AJF, 2AJW, 2ALR, 2AWF, 2BCF, 2BEA, 2BEB, 2BNZ, 2BTW, 2CDA, 2FD, 2KP, 2NZ, 2OF, 2OM, 2VA, 2VH, 3AAO, 3AAY, 3ADT, 3AJD, 3ANJ, 3APQ, 3BA, 3BE, 3CA, 3CG, 3KM, 3MO, 3ZO, 3ZY, 3ZZ, 4BY, 4EN, 4GL, 4GX, 8ADR, 8AHR, 8AMQ, 8AOU, 8AQV, 8AQZ, 8AWP, 8AXC, 8BFX, 8BJV, 8BRC, 8FQ, 8HJ, 8HW, 8IB, 8IH, 8IQ, 8JU, 8LJ, 8NI, 8SP, 8UK, 8UY, 8VJ, 8YAC, 8ZG, 9AJH, 9AKR, 9HW, 9WC, Canadian 2BG, 9AW.

## 1BRQ, Lewiston, Me.

Spark: 1AAB, 1ABZ, 1ACQ, 1ADP, 1AHL, 1AJS, 1AKG, (1APO), (1APT), 1ARY, 1ASF, 1AWS, 1AYR, 1AZK, 1BKR, 1BDR, 1BDT, (1BHR), 1BR, (1BJE), 1BOQ, 1BQA, (1BQL), 1BV, (1CCH), 1CHJ, (1CIB), 1CNF, 1COK, 1AP, 1AW, 1BA, 1CH, 1CK, 1CO, 1DH, 1DN, 1DZ, (1FM), 1FP, 1GM, 1HG, 1HO, 1IA, (1OE), 1OV, 1PV,

1QO, 1RV, 1SN, (1UL), 1XM, 1YB, 1YD, 1YX, 2ACW, 2AEP, 2AEB, 2AJE, 2AJW, 2APE, 2ARB, 2ARK, 2ASK, 2ASL, 2ASM, 2ASR, 2AVK, 2AVU, 2AWF, 2BEA, 2BFU, 2BJO, 2AQ, 2AR, 2BF, 2BJ, 2BK, 2BL, 2BM, 2BQ, 2BY, 2CE, 2DH, 2IK, 2KM, 2OM, 2PU, 2PV, 2QY, 2RS, 2TA, 2TS, 2XQ, 2YF, 3AFK, 3AHF, 3AHK, 3AJD, 3AJE, 3AUW, 3AVK, 3AWT, 3AC, 3BT, 3FP, 3HJ, 3NC, 3OU, 3UC, 3UQ, 3VW, 3XM, 3XQ, 3RJ, 3AFB, 3AFG, 3AJL, 3AKO, 3AKQ, 3AOE, 3AOD, 3APB, 3APD, 3ARD, 3ASV, 3AXO, 3BEP, 3BRL, 3AG, 3AT, 3BE, 3GC, 3DN, 3FP, 3GC, 3HL, 3LQ, 3AOE, 3PL, 3PT, 3QN, 3QM, 3SP, 3XE, 3YN, 3ZG, 3VP, 3AQL, 3UP, 3GE.

C.W.: 1AFV, 1AMQ, 1ARW, 1ARY, 1AVR, 1AZW, (1BAS), 1BDC, 1BDI, 1BEA, 1BES, 1BKQ, (1BLJ), 1BQE, 1BSD, 1BTL, 1BUU, 1BWU, 1CAC, 1CGS, 1CIK, 1CJH, 1CKE, 1CLX, 1AQ, 1BE, 1CG, 1DF, 1FI, 1II, 1PT, 1QM, 1RD, 1RQ, 1TS, 1UN, 1VR, (1XM), 1YK, 1ZE, 2AAB, 2AAX, 2AJF, 2ALR, 2AWL, 2AYN, 2AYV, 2BBB, 2BGM, 2BJO, 2BRB, 2BYS, 2BG, 2FD, 2FP, 2NZ, 2OE, 2UD, 2VA, 2VH, 3ADT, 3ALE, 3ANJ, 3ASV, 3BL, 3DF, 3GO, 3HA, 3LR, 3MO, 3OM, 3RN, 3ZO, 4GL, 4TJ, 5GN, 8AIR, 8ALB, 8AMQ, 8AQF, 8AQV, 8AVM, 8BFX, 8BNQ, 8BUM, 8BXH, 8BZC, 8AC, 8AR, 8BK, 8BV, 8RX, 8DR, 8EW, 8HJ, 8IV, 8JS, 8NI, 8OU, 8OW, 8UK, 8VY, 8WC, 8WY, 8XE, 8XV, 9AJH, 9ALS, 9BV, 9PG, 9DWJ.

2AQU, Newark, N. J.

Spark: 1AMD, 1APO, 1ASF, 1AVI, 1AW, 1AZK, 1BQO, 1BRW, 1BVB, 1BVH, 1CK, 1COK, 1OJ, 1RV, 1WQ, 2AID, 2BM, 2SZ, 2XQ, 3AC, 3ACE, 3AGT, 3AHF, 3AHK, 3AJD, 3ALN, 3ARM, 3ARN, 3ATZ, 3AUW, 3BG, 3CI, (3CK), 3FP, 3GX, 3HJ, 3LP, 3NB, 3RV, 3RW, 3UC, 3UD, 3UX, 3XM, 3ZA, 4AU, 4BQ, 4CX, 4EA, 4EY, 4GN, 5EW, 5PY, 8AAV, 8AFA, 8AFB, 8AFG, 8AHS, 8AIB, 8AMB, 8APB, 8ARD, 8AXO, 8AYN, 8BEP, 8BFH, 8BRL, 8BUM, 8BZZ, 8FT, 8IN, 8KY, 8LH, 8LQ, 8NO, 8PT, 8SP, 8UC, 8VL, 8VQ, 8VW, 8WE, 8XE, 8YM, 8ZAC, 8ZP, 8AGR, 8AOE, 8AU, 8AZE, 8BP, 8CP, 8DKV, 8DWP, 8DYU, 8HK, 8LF, 8MC, 8OX, 8RC, 8TL, 8UH, 8UU, 8YB, 8YC, 8YQ, 8ZJ, Can.: 3BP, 3GE, 3GN, XG1.

C.W.: 1AA, 1AFV, 1AKB, 1ALP, 1ANQ, 1ARY, 1AVR, 1AZW, 1BDC, 1BDI, 1BES, 1BH, 1BI, 1BIR, 1BKA, 1BKQ, 1BWJ, 1CAK, 1CEC, 1CGS, 1CY, 1FF, 1PM, 1PT, 1UN, 1XM, 1ZE, 2AAB, 2HI, 3AAD, 3AAD, 3AAO, 3ADT, 3AEV, 3AHK, 3AJD, 3ALE, 3ANJ, 3AQH, 3ARV, 3ASO, 3BKA, 3BLF, 3DH, 3HG, 3HJ, 3JH, 3MO, 3OT, 3QV, 3RW, 3SM, 3TJ, 3ZO, 3ZY, 3ZZ, 4BY, 4EH, 4EL, 4FT, 4ID, 4II, 4YA, 4ZE, 5FV, 5UU, 8AC, 8ADG, 8AFS, 8AGO, 8AGZ, 8AHR, 8AIO, 8AMB, 8AMK, 8AMQ, 8ANA, 8AND, 8ANR, 8AOG, 8AOD, 8AQF, 8AQH, (8AQV), 8ASB, 8ASV, 8AWP, 8AWY, 8AWZ, 8AXK, 8BBK, 8BDB, 8BEF, 8BEX, 8BFX, 8BK, 8BNT, 8BNZ, 8BO, 8BOX, 8BRL, 8BTO, 8BUM, 8BUQ, 8BYA, 8CHG, 8IQ, 8IV, 8JL, 8JQ, 8JS, 8LJ, 8LX, 8NI, 8QB, 8RQ, 8SP, 8UJ, 8UK, 8VY, 8WA, 8XH, 8XV, 8ZG, 9AJH, 9AMB, 9ARK, 9BED, 9BIK, 9BLO, 9DV, 9DWJ, 9FM, 9HW, 9II, 9ZL, Can. 2BG.

2KV, Bronxville, N. Y.

Spark: 1APO, 1ARY, 1ASF, 1AW, 1AZK, 1BCO, 1CHJ, 1ES, 1LZ, 1RY, 3AC, 3AGT, 3AHF, 3AJD, 3ALN, 3AUW, 3BHX, 3GN, 3HJ, 3IM, 3NB, 3OU, 3UD, 3UQ, 3UX, 3XM, 3ZM, 4AB, 4EA, 4CX, 5FJ, 5FV, 5XA, 7ER, 8AEC, 8ACF, 8AGO, 8AMB, 8APB, 8AYN, 8BBC, 8BHV, 8BRL, 8CAY, 8CZB, 8EV, 8EW, 8JJ, 8MZ, 8OI, 8PT, 8RC, 8SP, 8UC, 8VL, 8VQ, 8WU, 8YAA, 8YN, 8YM, 8ZAC, 8ZP, 8ZW, 9AFP, 9AIP, 9AMQ, 9ASJ, 9AWU, 9DCX, 9DYU, 9FT, 9GX, 9HR, 9OX, (9UH), 9UU, 9WT, 9YC, Can. 3BP, 3GE, 3GN, 3KG.

C.W.: (1AFV), 1AKB, 1ARY, 1AVR, 1AXB, 1AZW, (1BDI), 1BEA, 1BIR, (1BKQ), 1BSD, (1CAC), 1CJH, 1FF, 1FV, 1QN, 1XM, (1RD), 1RZ, 1ZE, (3ADT), (3AHK), 3AIS, 3ANJ, (3AQR), 3ASV, (3AWI), 3BAI, 3BZ, 3CA, 3CG, 3FS, (3HJ), 3LR, 3TJ, 3ZK, 3ZO, 3ZY, 3ZZ, 4AI, 4BQ, 4BY, 4GL, 4GX, 4ID, 4IL, 4XC, 4ZF, 5KU, 5UU, (5ZAB), 6EN, 7MO, 8AQ, 8AGZ, 8AIO, 8AML, 8ANZ, 8AOG, 8AQV, (8AWP), 8AWY, 8AXC, 8BBK, 8BFX, 8BK, 8BLT, 8BNW, 8BNY, 8BO, 8BQM, 8BRX, 8BZJ, 8DR, 8HJ, 8IQ, 8IV, (8JL), 8JQ,

8JS, 8KH, 8LX, 8NI, 8OC, 8OW, 8PX, 8QB, 8UJ, 8UK, 8UO, 8UY, 8VV, 8WR, (8XF), 8XH, 8XV, 8ZG, 8ZK, 8ZZ, 9AAU, 9AAV, 9AJA, 9AL, 9ALP, 9ALR, 9AWP, 9DOJ, 9DWJ, 9FM, 9NX, 9PG, Can. 9AW, 3BP.

2GK, Schenectady, N. Y.

Spark: 1ABB, 1AEV, 1ALK, 1APO, 1ARY, 1ASF, 1ASR, 1AW, (1AZK), 1AZW, 1BCF, 1BDM, (1BEA), 1BKA, 1BQO, (1BUA), 1BVH, 1DY, 1FU, (1GM), (1IA), 1RU, 1RV, 1SN, 1WQ, 1YD, (2ABM), 2AER, (2AIJ), 2AIM, 2AQI, 2AR, 2ASI, 2AZY, 2BAK, 2BIR, 2BJO, 2BJP, (2BK), (2BM), 2BXZ, 2DA, 2DN, (2DO), 2DR, 2DX, 2EL, 2FP, 2IQ, 2JU, (2JZ), (2LX), 2MJ, (2OM), (2OO), (2RF), 2QR, 2TS, 2UD, 2UK, 2WB, 2WM, 2XK, 3AC, 3ACM, 3ACS, 3AGT, (3AHF), 3AHK, 3AIG, 3AIW, 3AJ, 3AJD, 3ALN, 3AQR, (3ARM), (3ARN), 3ASH, 3AUP, (3UW), 3BA, 3BFU, (3BG), (3BGT), 3BJR, 3CE, (3CN), 3FB, (3FQ), 3EM, 3GN, 3GX, (3HJ), 3IW, 3JO, 3KT, 3LI, 3LM, (3OU), 3PB, 3PU, 3QB, (3QP), 3RW, 3SQ, 3UC, (3UQ), 3VW, 3XM, (3ZA), 3ZO, 3ZV, 3ZZ, Can. 3BP, (3GE), 4CX, (4EA), 4FD, 4FP, 4GN, 5FV, 6ZA, 8AAV, 8ACF, 8AEC, 8AFA, 8AFB, 8AGB, 8AHH, 8AHS, 8AJT, 8AKQ, (8AMZ), 8ANO, (8AOT), 8APB, 8AQV, (8ARD), 8AUE, 8AV, 8AVD, (8AVT), 8AWP, 8AXO, 8AXN, 8AXX, 8AYN, 8AYS, 8AZV, 8BCO, 8BDY, 8BET, 8BEP, 8BHV, 8BGT, 8BM, 8BOK, 8BPY, 8BRL, (8BUN), 8BVA, 8CAK, 8CD, 8CI, 8OP, 8EB, 8EW, 8JE, 8JJ, 8JL, (8MJ), 8MR, 8MZ, 8NO, 8OH, 8QN, 8SP, (8TJ), 8TK, 8TT, (8VW), 8WD, (8WE), 8WO, 8WZ, 8XE, 8XM, 8XR, 8YAA, 8YN, 8ZAC, 9AAP, 9AAW, 9AC, 9AGR, 9AJ, 9AZE, 9BER, 9AJE, 9ANZ, 9AVP, 9DLX, 9DWJ, 9DWJ, 9DWP, 9FM, 9HM, 9IO, 9ME, 9MH, 9OX, 9TL, 9UH, 9UL, 9XF, 9ZJ, 9ZN.

C.W.: 1AFV, 1BCG, (1BEA), (1BUA), (1CAK), 1UN, (1XM), 1ZE, 2AAB, 2AAX, 2AZW, 2AJF, 2AJW, 2AWL, 2AYS, 2BAK, (2BML), 2BRK, 2CCL, (2EH), 2FD, 2FP, 2KL, 2OM, 2XB, 3AN, 3DH, 3HG, 3IH, 3ZZ, 4EL, 4GL, 8ADG, 8ADN, 8AGZ, 8AIL, 8AMN, 8AOA, (8APH), 8AQV, 8AWP, 8BA, 8BAD, 8BBK, 8BUM, 8CF, 8BMA, 8IQ, 8JL, (8TB), 8UJ, 8XK, 8XV, 8ZV, 9ARK, 9AW, Can. 9AL.

3AFU, Washington, D. C.

C.W.: 1QD, 1QN, 1ZE, 1AFV, 1ANQ, 1AQW, 1ARY, 1AXD, 1AZW, 1BDI, 1BEA, 1BIR, 1BKQ, 1BSD, 2LO, 2NQ, 2TP, 2WI, 2ZE, 2BV, 2AWF, 2AVY, 2BAK, 2BCF, 2BEA, 2BEB, 2BES, 2ZGH, 2BGM, 2BRB, 2BYS, 3BG, 3CG, (3EM), (3FQ), 3FS, 3GH, 3HG, 3JY, 3MA, 3RL, (3SK), (3SQ), 3SS, 3TJ, 3ZN, 3ZO, 3ADT, (3AHK), 3AJE, 3AJD, 3AQR, 3AWF, 2EC, 3BLF, 4BY, 4EH, 4GL, (4GX), 4HW, 4LE, 5AN, 5FV, 5GV, 5KU, 5NZ, 5UU, 8AR, 8BK, 8BO, 8DR, 8EB, 8GV, 8HJ, 8IH, 8IQ, 8IV, 8JL, 8JQ, 8JU, (8LJ), 8NI, 8OS, 8OW, (8PN), 8PX, 8SE, (8SP), (8UK), 8VJ, 8VY, 8XV, 8ZG, 8ADG, 8AGG, 8AGO, 8AGZ, 8AHR, 8AIF, 8AIO, 8ALB, 8AOA, 8AOG, 8AOD, 8AQC, (8AQV), 8ASV, 8AUO, 8AWP, (8AWZ), 8AXC, 8BBW, 8BCA, 8BCL, 8BEF, 8BEX, 8BFX, 8BLT, 8BNJ, 8BOX, 8BUM, 8BWZ, 8BXA, 8BZJ, 8CFP, 8ZAE, 8CP, 8DV, 8HW, 8II, 8IO, 8IZ, 8KR, 8NZ, 8PG, 8SJ, 8WC, 8ZY, 9AAS, 9AAU, 9AAY, 9AJA, 9AJH, 9AKH, 9ALS, 9ANF, 9AOS, 9ARK, 9BBF, 9BDW, 9BED, 9BLO, 9DCR, 9DDW, 9DWJ.

Spark: 2JU, 2OM, (2AHU), 2ASJ, (3AC), 4XC, 5ZL, 5XA, 5XU, 8PT, (8RQ), 8XE, 8AFD, 8AHH, 8AIZ, 8AJT, 8APB, 8ARD, (8AXY), 8BEP, 8BQC, 8BRL, 8YAC, 8ZAC, 9CP, 9YM, 9ACN, 9ACY, 9AEK, 9AFP, 9AIR, 9AMK, 9AOE, 9AVP, 9DYF.

3CA, Roanoke, Va.

C.W.: 1ARY, (1BDI), 1BEA, 1BFQ, 1BII, 1BKQ, 1BRZ, 1QN, 1ZE, 2AB, 2AAB, 2ADV, 2AJR, 2AKO, 2AYV, 2BEB, 2BNZ, 2BRG, 2CCD, 2OM, 2VH, 2WP, 3AAE, (3AEV), 3AFU, 3AHK, 3ANQ, 3AQR, 3BLF, 3BG, (3BP), (3BZ), 3CC, 3FS, 3HG, 3HJ, 3HX, 3IO, 3KM, 3LR, 3MO, (3OT), 3RW, 3TH, 3TJ, 3WP, 3XAA, 3XC, 3ZN, (3ZY), 3ZV, (3BK), 4BQ, (4BY), 4CY, 4EB, 4EL, 4FT, 4GL, 4GN, 4II, (4XD), 4XM, 4ZE, 5DZ, 5EK, (5FV), 5OS, 5UU, 5XJ, 8ADG, 8AFS, 8AGZ, 8ALB, 8APH, 8APN, 8APT, 8AQH, 8AQF, 8AQO, 8AQV, 8AQZ, 8ARW, (8AWY), 8AWZ, 8AXC, 8AXO, 8BCR,

8BEP, 8BEX, 8BFK, 8BFX, 8BG, 8BLT, 8BOF, 8BOX, 8IQ, 8IV, 8JS, (8SP), (8XE), 8XO, 8XV, 8YAC, 8ZA, 8XAE, 8ZQ, 8ZV, 8ZZ, 9AAS, 9AAV, 9AIF, 9AKD, (9AKR), (9AWR), 9AYS, 9BED, 9CAB, 9DKP, 9FM, 9HK, 9II, 9IL, 9IO, 9IZ, 9KX, 9NX, 9ZL, Canadian 2BG, 3BP, 9AL.

Spark: 3AAA, 3AAB, 3ALN, 3ARB, 3CN, 3KM, 3XM, 3ZAA, 3ZV, 4EA, 4CG, 4GG, 5KX, 5XB, 5ZL, 8AIR, 8AYP, 8BEP, 8BNP, 8CP, 8DCX, 8FI, (8XE), 8YM, 8ZA, 9ABH, 9AIU, 9DF, 9DCX, 9FS, 9PB, 9VL, 9YC.

#### 3KK, Wilmington, Del.

Spark: 1AV, 1AEV, 1ALK, 1APX, 1BC, 1DZ, 1FR, 1NC, 1TK, 1WQ, 2BK, 2EL, 2FR, 3CD, 3HJ, 3BG, 3BK, 3RW, 4AG, 4GN, 5KU, 5XA, 8AC, 8AFD, 8AJK, 8AOB, 8APB, 8BM, 8CAY, 8LQ, 8XE, 9DF, 9DDQ, 9DP, 9OE, 9OX, 9UH, 9YC, 9ZN.

C.W.: 1AF, 1AFV, 1AEV, 1ARY, 1ANQ, 1APX, 1ARD, 1ALK, 1AZW, 1BEA, 1BDC, 1BLK, 1BDI, 1BKQ, 1BTE, 1BD, 1BW, 1EZ, 1FF, 1FR, 1FA, 1GV, 1LR, 1NC, 1PM, 1QN, 1RK, 1US, 1UN, 1XM, 1ZE, 2AA, 2AAB, 2AAC, 2AK, 2AJF, 2AWI, 2AYV, 2BV, 2BCG, 2BFZ, 2BGH, 2BRZ, 2CAM, 2CEC, 2CT, 2FD, 2HI, 2KV, 2NS, 2RF, 2VI, 2XK, 3ADT, 3AQF, 3AAF, 3AFB, 3AQU, 3AH, 3AJB, 3AR, 3ATW, 3ANJ, 3AAD, 3AAE, 3AAN, 3AEV, 3AQH, 3BC, 3BZ, 3BCI, 3BFQ, 3BO, 3BBR, 3BMJ, 3CC, 3CA, 3DC, 3FS, 3GR, 3HD, 3IF, 3KM, 3LO, 3LR, 3MC, 3QN, 3PR, 3OT, 3SH, 3TJ, 3ZV, 3ZY, 3ZZ, 4AA, 4AS, 4BQ, 4BY, 4CY, 4DC, 4EL, 4ET, 4FD, 4GL, 4GX, 4ID, 4II, 4KC, 4LE, 4TR, 4UF, 5FV, 5GU, 5UU, 5AAM, 5ABG, 5AHR, 5AQU, 5AVH, 5AGO, 5AMK, 5AWY, 5AZF, 5BO, 5BQ, 5BK, 5BRF, 5BF, 5BFX, 5BOX, 5BRL, 5BZJ, 5CI, 5CAY, 5DR, 5ET, 5GV, 5IV, 5JL, 5JS, 5LO, 5LX, 5OC, 5OW, 5SP, 5TC, 5UJ, 5UF, 5VD, 5VY, 5ZG, 9AY, 9AJH, 9AY, 9BBF, 9BED, 9BSD, 9DWJ, 9ZO, 9ZY.

#### 3YV, University, Va.

1ARV, 1GN, 1ZE, 2AAB, 2BJ, 2BM, 2BWE, 2OM, 2XI, 2XJ, 3AC, 3ADT, 3AFK, 3AGR, 3AHK, 3BAB, (3BHL), 3CC, 3FM, 3GN, 3HA, 3HJ, 3HO, 3JW, 3JT, 3RF, 3SQ, 3ZO, 3ZY, 4GL, 4BQ, 5FM, 5NZ, 8AAV, 8ABV, (8FO), 8AFD, 8AGZ, 8AGO, 8AHR, 8IM, 8AJT, 8AJA, 8AKW, 8ARD, 8ASB, (8AUC), 8AXC, 8BFH, 8BK, 8BOX, 8BRL, (8BWI), 8BZZ, 8CBR, 8DZ, 8EA, (8HJ), 8IH, 8IV, 8NI, 8SP, 8UC, 8XV, 8YN, 8ZAA, 9AJA, 9CA, 9CMN, 9DHz, 9DKV, (9UU).

#### 4GE, Savannah, Ga.

Spark: 2XM, 3XM, 4AS, 4AH, 4BC, 4CX, 4DZ, 4YA, 4GU, (4ZC), 5DA, 5BC, 5XA, 5XB, 5NH, 5XU, 5ZL, 5ZZ, 5YL, 5ZAB, 8AFB, 8AFD, 8BEP, 8CP, 8UC, 8YA, 9ACL, 9AMS, 9AMQ, 9AMK, 9DQ, 9MC, 9OX, 9ME, 9YC, 9YM.

C.W.: 1ARY, 1AZW, 1FF, 2AAX, 2BEB, 2NZ, 2WP, 3BZ, 3BL, 3CA, 3CG, 3HG, 3RF, 3ZZ, 4AS, 4BQ, 4BK, 4CO, 4CY, 4EN, 4EH, 4GX, 4ID, 4II, 4ZE, 5EK, 5LA, 5NZ, 5KU, 5UU, 8AGL, 8ALB, 8AQV, 8AOA, 8AXC, 8AWZ, 8BEX, 8BFX, 8BK, 8DR, 8IQ, 8JU, 8HJ, 8SP, 9AAV, 9AAS, 9BG, 9BIK, 9AKD, 9BLO, 9DKI, 9NX, 9ZB, 9ZY.

#### 4HJ, South Jacksonville, Fla.

Spark: 2FP, 2OM, 2AHK, 3BG, 3FB, 3XM, 4AG, 4AS, 4AX, 4BC, 4BQ, 4BY, 4CG, 4CP, 4CX, 4DH, 4DZ, 4EA, 4FB, 4GH, 4GN, 4GU, 4HS, 5AA, 5BC, 5BY, 5DA, 5EW, 5FJ, 5FO, 5GI, 5HK, 5IS, 5KD, 5NH, 5XA, 5XB, 5XK, 5XU, 5YL, 5YM, 5ZA, 5ZL, 5ZK, 5ZZ, 8ACF, 8HP, 8LQ, 8UC, 8XE, 8YM, 8ZP, 9AEK, 9APS, 9DCX, 9DHz, 9DQ, 9LF, 9MC, 9PS, 9UU, 9YC, 9YM, 9ZL.

C.W.: 1IV, 1UN, 1XM, 2AAB, 2FS, 3AAV, 3AHK, 3AQR, 3AWW, 3BIJ, 3BL, 3BL, 3CA, 3CC, 3MO, 3RF, 3ZY, 4AS, 4BK, 4BQ, 4BY, 4EH, 4EL, 4EN, 4FF, 4FR, 4FL, 4GL, 4HW, 4II, 4ID, 4ZF, 5FV, 5KU, 5LA, 5UU, 8AGO, 8AGZ, 8AIO, 8ALV, 8AXC, 8AQF, 8AQV, 8BFX, 8BK, 8BRL, 8DR, 8II, 8IQ, 8IV, 8JJ, 8JP, 8SP, 8VJ, 8ZA, 9AAS, 9AJA, 9AKR, 9AMB, 9ARK, 9BBF, 9BLO, 9DKI, 9FG, 9SJ, 9ZB.

#### 4AB, Wilmington, N. C.

1DF, 1DY, 1XK, 1XM, 1SD, 1AEV, 1AFV, 1ARY, 1BEA, 1BJE, 1BCF, 1BRW, 2BJ, 2BK, 2CF, 2EL,

2FP, 2OM, 2OO, 2PU, 2TJ, 2WB, 2XJ, 2XM, 2AAB, 2ACE, 2AER, 2ARB, 2AWK, 2DRK, 3AH, 3BG, 3DG, 3DH, 3FS, 3IE, 3MO, 3PB, 3PD, 3PU, 3QN, 3QW, 3SQ, 3UD, 3UH, 3US, 3XG, 3XM, 3AGB, 3AGT, 3AHK, 3AQK, 3AQR, 3BFN, 3BFV, 4AS, 4BC, 4BI, 4BK, 4BY, 4CX, 4EA, 4EY, 4DZ, 4GL, 4GN, 4GS, 4GU, 4HS, 4XE, 5DA, 5FO, 5FV, 5KA, 5ZA, 5ZS, 5XA, 5BA, 5BR, 5BT, 5BX, 5EY, 5FB, 5FT, 5JS, 5IQ, 5ML, 5OI, 5SP, 5UC, 5VN, 5XE, 5ZA, 5ZL, 8ACF, 8AFD, 8AFT, 8AHS, 8ANW, 8APB, 8ARB, 8AWY, 8BSY, 8BYE, 8BVL, 9AF, 9DR, 9IC, 9LQ, 9LF, 9MC, 9MO, 9UL, 9ACZ, 9AGR, 9BED, 9DCX, 9DWP, 9DWU.

#### 5AX, Birmingham, Ala.

Spark: 5DA, 5DF, 5FV, 5GI, 5LO, 5UP, 5XA, 5XB, 5XU, 5YL, 5ZA, 5ZW, 5ZZ, 8YAF, 8YM, 8XE, 9AY, 9ME, 9NR, 9YA, 9YB, 9YC, 9YM.

C.W.: 4BY, 4BZ, 4CY, 4EB, 4EL, 4EL, 4II, 4LT, 4XB, 4ZF, 4ZO, 5KA, 5KP, 5NZ, 5XJ, 5XP, 5NZ, 5XJ, 5XP, 5ZAB, 5ZAC, 7BR, 8AU, 8BR, 8BRF, 8XK, 8ZG, 8ZZ, 9AKR, 9AL, 9AOF, 9AVN, 9AS, 9BIK, 9BL, 9DFL, 9BRM, 9HK, 9II, 9KA, 9TV.

#### 5KC, Plaquemine, La.

1BCG, 2FP, 2QR, 2RK, 4AS, 4BQ, 4CG, 4CO, 4CS, 4CX, (4DH), 4GL, 4ID, 4II, 4LE, 4TQ, 4ZF, 5AE, 5AL, 5AN, 5BI, 5BN, 5BQ, 5BX, 5BY, 5DA, 5DW, 5ED, (5EK), 5EW, 5FO, 5FV, (5HK), 5HZ, 5IC, 5IR, (5JD), 5JI, 5JR, 5KK, 5KP, 5LB, 5LO, 5MT, 5MY, 5NK, 5NS, 5QS, 5KA, 5RL, (5SM), 5TG, 5TP, 5UG, 5UJ, (5XA), 5XB, 5XI, (5XJ), 5XL, 5XQ, 5XT, (5XU), 5YA, 5YE, 5YE, 5YK, 5YM, 5YN, 5ZA, 5ZB, 5ZC, 5ZE, (5ZL), 5ZO, 5ZR, 5ZS, 5ZT, 5ZU, 5ZV, (5ZW), 5ZX, (5ZZ), 5ZAF, 5ZAI, (5ZAK), 5ZAN, 5ZAX, 6AIF, 8AA, 8AJ, 8VJ, 8XI, 8XM, 8YM, 8ZU, 8BOX, 8ZAC, 9AC, 9AK, 9AP, 9AY, 9DW, 9ET, 9FM, 9FU, 9FY, 9FZ, 9GN, 9HI, 9HM, 9HR, 9HT, 9IV, 9JN, 9JQ, 9JK, 9KF, 9KO, 9LO, 9MC, 9NR, 9OX, 9PG, 9PS, 9QJ, 9RR, 9TQ, 9TV, 9UG, 9VL, 9WI, 9WJ, 9WT, 9WU, 9XI, 9XJ, 9XM, 9YA, 9YB, 9YC, 9YK, 9YM, 9YO, 9YR, 9ZF, 9ZH, 9ZJ, 9ZN, 9AAP, 9ACB, 9AEG, 9AEK, 9AEY, 9AIG, 9AMA, 9AMK, 9AMO, 9AMR, 9AMS, 9ANF, 9AOJ, 9AOU, 9AVD, (9AQE), 9AQM, 9AEX, 9AIN, 9AVC, 9AVE, 9AVK, 9AVP, (9AXU), 9AYK, 9AZA, 9BBF, (9DEH), 9DHz, 9DQ, (9DSD), 9DWJ, (9YAE), 9YAK, 9ZAC.

C.W.: 2ZL, 4BQ, 4BY, 4EB, 4EL, 5BL, 5XB, 5YI, 5ZA, 8XB, 8XY, 8ZG, 8BFX, 9AO, 9AR, 9FM, 9HK, 9JD, 9LQ, 9LZ, (9NX), 9XI, 9XM, 9XR, 9ZY, 9AAS, 9AAV, 9ACO, 9AKR, 9AVN.

#### 5PO, Houston, Texas

1ARJ, 1TS, 2FP, 2VP, 3CA, 3ZD, 4BK, 4BY, 4CY, 4DY, 4EL, 4FT, 4GL, 4GU, 4ID, 4II, 4XC, 5BC, 5BY, 5FO, 5HK, 5IF, 5IQ, 5JD, 5KP, 5KU, 5LA, 5LB, 5LO, 5MT, 5NC, 5OI, 5UG, 5ZAB, 5ZA, 5ZAK, 5ZL, 5ZU, 5XA, 5XU, 6TV, 6ZZ, 7RD, 7ZA, 8CFP, 8DFX, 8ED, 8BOX, 8GR, 8IV, 8ZL, 9AAZ, 9ARK, 9AKR, 9AKV, 9ABV, 9AC, 9AIF, 9AMA, 9AJA, 9HM, 9AYS, 9AWX, 9ACB, 9AXU, 9BBF, 9BIG, 9XI, 9XM, 9XAK, 9NX, 9DFX, 9DVA.

#### 5DA, Wind Rock, Tenn.

Spark: 1AW, 1AEV, 2AJE, 2BK, 2OM, 2WB, 3AOV, 3XF, 3XM, 3YO, 3ZO, 3BP, 4AS, 4AU, 4BI, 4BQ, 4BX, 4CP, 4CX, 4DH, 4DZ, 4EY, 4FB, 4FD, 4GG, 4GH, 4GN, 4GU, 4GX, 4HS, 4YA, 4YB, 4XC, 5AA, 5AI, 5BM, 5BY, 5EK, 5ER, 5FJ, 5FO, 5GI, 5HK, 5IH, 5JD, 5JI, 5JO, 5PH, 5PY, 5UG, 5UJ, 5XA, 5XB, 5XC, 5XJ, 5XK, 5XU, 5YL, 5YM, 5ZA, 5ZAB, 5ZAA, 5ZD, 5ZL, 5ZS, 5ZZ, 8ACF, 8AFD, 8AFG, 8AL, 8AYN, 8BDN, 8BEP, 8EF, 8JS, 8LA, 8SP, 8TK, 8UC, 8UD, 8WZ, 8XE, 8YAA, 8ZA, 8ZR, 9AAU, 9AEG, 9AEK, 9AGH, 9AGR, 9AIR, 9AJA, 9AJN, 9ALC, 9AMS, 9AMU, 9ANO, 9AOJ, 9APB, 9APS, 9AQN, 9ARG, 9ARZ, 9ASE, 9AWE, 9AYW, 9AYY, 9AZA, 9BEE, 9DCX, 9DHD, 9DHz, 9DKV, 9DQ, 9DQU, 9DYC, 9DYU, 9DZI, 9DZE, 9DZK, 9EK, 9FM, 9GS, 9GX, 9HG, 9HI, 9HP, 9HR, 9JN, 9JQ, 9MC, 9MH, 9OU, 9OX, 9PT, 9PW, 9TU, 9UU, 9UH, 9VZ, 9WT, 9YA, 9YAK, 9YB, 9YC, 9YM.

C.W.: 1AAH, 1ARY, 1BKQ, 2BEB, 2BUL, 2WP, 2TW, 3AHK, 3AWI, 3BEC, 4BK, 3BQ, 3BZ, 3CA,

3CG, 3LR, 3MO, 3RF, 3ZN, 3ZO, 3ZZ, 4ASM, 4BK, 4BQ, 4BY, 4CO, 4CG, 4CY, 4EA, 4EB, 4EH, 4EK, 4EL, 4EN, 4GL, 4GU, 4GX, 4HW, 4ID, 4IL, 4LE, 4XD, 4XH, 5LA, 5LA, 5LF, 5UU, 5ZA, 5AGS, 5AGL, 5AGZ, 5AQF, 5AU, 5AWP, 5AWY, 5AXK, 5BBK, 5BEX, 5BFX, 5BO, 5BOX, 5BRC, 5BRI, 5BVD, 5BVR, 5DR, 5HJ, 5HP, 5IH, 5IQ, 5JH, 5JS, 5PN, 5SP, 5UA, 5UK, 5VJ, 5VW, 5WR, 5ZAE, 5ZG, 5ZP, 5ZZ, 9AAS, 9AII, 9AJH, 9AKR, 9AVN, 9AYS, 9BAF, 9BED, 9BIG, 9BLD, 9BNO, 9DAD, 9DAX, 9DCX, 9DKP, 9DYU, 9DZQ, 9EI, 9HK, 9RC, 9XK, 9XAQ.

5KP, Elgin, Texas.

Spark: 4BK, 5AA, 5AL, (5AO), 5AS, (5BM), (5BY), 5CA, 5CQ, 5EH, 5EK, (5EW), (5FA), (5FI), (5FO), (5GS), (5HF), (5HK), (5HZ), (5IC), (5IF), (5IN), (5IQ), (5IS), (5JD), 5JI, (5KC), (5KK), (5LB), 5LC, 5LM, 5LO, 5MF, (5MG), (5MX), 5NC, 5NF, (5NH), 5NJ, 5NK, (5NS), 5OH, 5OI, (5PD), (5PE), (5PP), 5PR, (5PX), (5QA), (5QI), (5QQ), (5QS), (5QY), 5RA, (5SA), (5SM), (5TC), (5TG), 5TM, 5TO, (5TT), (5TU), 5UC, (5UE), (5UF), (5UG), (5UJ), (5VO), (5WA), (5WE), 5WU, 5XA, (5XB), (5XJ), 5XT, (5XU), (5YI), (5YK), 5YL, (5YN), 5ZA, 5ZC, 5ZE, (5ZF), 5ZJ, (5ZL), (5ZR), 5ZS, (5ZU), 5ZW, 5ZL, 5ZAA, (5ZAB), (5ZAE), (5ZAF), (5ZAG), 5ZAL, (5ZAK), 5ZAM, (5ZZ), (7ZV), 9AAQ, 9AAR, 9ABU, 9ACL, (9AEG), 9AEK, 9AFX, (9AIG), (9ALM), 9ALF, 9ALH, 9AMA, 9AMB, 9AMK, 9AMU, (9ANO), 9ANT, (9AOJ), 9AOK, 9AOW, (9AQE), 9ARK, (9ARZ), (9ASK), 9AUT, (9AVK), 9AVR, 9AXX, 9AYE, 9AYE, 9DEH, 9DHz, 9DNC, 9DOQ, (9DSD), 9DTW, (9DVA), (9DZE), (9DZI), (9AEK), (9HI), (9HT), (9IF), 9JN, 9JQ, (9MC), 9MO, (9NB), 9PG, 9PM, (9PS), 9PW, 9QE, 9RY, 9SY, (9WI), (9WT), (9YM), (9YAK), (9ZAC).

C.W.: 4AS, 4BQ, 4BY, 4CQ, 4EB, (4EL), (5AN), 5CI, (5DZ), (5DQ), 5EK, (5FV), 5HH, (5IN), 5JI, (5KU), 5KV, (5LA), (5MT), 5MA, 5PU, 5RF, (5RN), 5SB, (5TG), 5TU, (5XJ), (5YI), 5ZA, (5ZAC), (5ZAG), (5ZAK), (5AMT), (5ZZ), 8AOZ, (8AQH), 8AQR, 8AKK, 8BU, (8BEX), (8BFX), 8BOX, 8IV, 8XY, 8YAA, 9AL, 9AT, 9AAO, (9AAS), 9AAU, (9AAV), (9AAZ), (9BU), 9AEO, (9AGZ), (9AJA), (9AJH), (9AJS), 9AKA, (9AKR), (9AIG), (9AMB), (9AOG), 9AOU, (9AOU), (9AQA), (9AQR), 9AQU, (9AUA), (9AUY), (9AWM), 9AYS, (9AYU), (9BAP), (9BBF), 9BBE, (9BED), (9BEN), 9BEZ, 9BIC, 9BIZ, 9DKP, 9DQ, 9DKX, 9BLO, 9BMD, 9BOQ, 9DT, 9DV, 9DAW, (9DDF), 9DFL, (9DOF), (9DPE), (9DQM), (9DTA), (9DTC), 9DTH, 9DTM, 9DTW, 9DUD, (9DZQ), 9EI, (9FM), (9GO), (9IL), 9JI, 9KX, 9NX, 9OO, 9QE, 9XM, (9XAQ), 9YAK, (9ZY), 9ZAC, 9ZNO.

5QQ, Granbury, Tex.

Spark: 5AE, 5AO, (5BE), 5BH, 5BM, (5BY), 5CF, 5EW, 5FO, (5FI), (5HF), (5HK), 5HZ, 5IF, (5IR), 5IS, 5JD, 5JI, 5JX, (5KK), 5KP, 5LC, 5LM, (5LO), 5MF, 5MH, (5NF), (5NH), 5NK, (5NS), 5PG, (5PX), (5QI), 5QU, 5RM, 5RW, 5SM, 5TC, 5TF, 5TG, 5TU, 5UE, 5UG, 5VK, (5VZ), 5WA, 5XA, (5XB), (5XJ), 5XU, 5YI, 5YK, 5YN, 5ZA, 5ZC, 5ZD, 5ZF, 5ZJ, 5ZL, 5ZN, 5ZU, 5ZW, 5ZZ, 6ZZ, 7ZU, 8ZP, 9HC, 9HI, 9IF, 9IG, 9JN, 9LF, 9MC, (9NB), 9OX, 9PS, 9RC, 9TL, 9TV, 9UU, (9WI), 9WT, 9XI, 9YA, 9YH, 9YM, 9YQ, 9YAK, (9ZI), 9ZJ, (9ABV), 9ACN, 9AEG, 9AEK, 9AEQ, 9AEY, 9AIF, 9AIG, 9ALU, 9AMA, 9ANG, (9ANO), 9AOE, 9AOJ, 9AOU, (9AQE), 9ASK, 9ASO, 9ATN, 9AVC, 9AYS, 9AYW, 9BSA, 9DKQ, 9DKX, 9DPB, 9DPE, 9DQ, 9DSD, 9DUG, 9DUP, 9DWJ, 9DZE.

C.W.: 4BK, 4BQ, 5CI, 5FV, 5KP, 5KU, 5LA, 5MA, 5MT, 5QS, 5RF, 5XJ, 5YI, 5ZA, 5ZK, 8IV, 8VJ, 8BFX, 9XAQ, 9ZV, 9ZAF, 9AAS, 9AJP, 9AMB, 9AMU, 9AOE, 9BAP, 9BBF, 9BIC, 9BMD, 9DTM, 9DVA.

6CU, Los Angeles, Calif.

Spark: 6MJ, 6XU, 6AAH, 6AAU, 6ABH, 6ABW, 6ABX, 6ACL, 6ACR, 6ADA, 6AEH, 6AFN, 6AFP, 6AGF, 6AH, 6AIF, 6AIN, 6AJF, 6AJR, 6AKL, 6ALV, 6AMK, 6ANG, 6ANH, 6AOR, 6APP, 6ARK, 6AS, 6ASK, 6ATH, 6AUC, 6AUD, 6AVB, 6BCA.

6BEN, 6BHQ, 6EX, 6FH, 6FK, 6GT, 6GX, 6HC, 6KC, 6KM, 6MZ, 6NG, 6OH, 6OT, 6PO, 6PR, 6QK, 6QR, 6SJ, 6TO, 6TU, 6TV, 6UO, 6VK, 6VZ, 6WZ, 6ZAM, 6ZB, 6ZK, 6ZU, (6ZX), 6ZZ, 7BH, 7BJ, 7BK, 7CK, 7HF, 7IN, 7JD, 7LY, 7MF, 7MP, 7OH, 7TJ, 7YA, 7YG, 7YJ, 7ZA, 7ZJ, 7ZM, 7ZQ, 7ZT, 7ZU, CL8.

C.W.: 5AK, 5ZA, 6AIF, 6AK, 6ALE, 6ASV, 6AWV, (6GY), (6PT), 6VM, (6XAD), 6XAF, 6XH, 6ZA, (6ZB), 6ZZ, 7XF, 8XV, 9AMB, 9BJI, 9DB, 9DTM, 9DVA, 9JI, 9NX, 9WD, 9XAQ, Can. 9BD, NOF, CL8.

6IV, Riverside, Calif.

Spark: 6IF, 6MJ, 6OF, 6XU, (6ZA), 6ZZ, 6AK, 6AS, 6BM, 6DW, 6EB, 6EN, 6ER, 6EX, 6FF, 6FH, 6FK, 6FT, 6GF, 6GP, (6GT), 6GX, 6HC, 6HH, 6IS, 6JW, 6JY, 6KA, 6KC, 6KM, 6KP, 6LE, 6MH, 6NY, (6NL), 6OD, (6OH), 6OL, 6OT, 6PJ, 6PO, 6PR, (6QK), (6QR), 6RS, 6SJ, (6SU), (6TF), (6TO), (6TU), (6TV), 6UO, (6VX), (6VZ), 6WZ, 6ZK, 6ZM, 6ZR, (6ZU), 6ZX, (6ZZ), 6ZAA, 6ZAL, 6ZAM, (6AAH), 6AAU, (6ABE), 6ABM, 6ABP, (6ABW), 6ABX, 6AER, 6ACY, 6AGA, 6ADF, 6ADL, (6AEH), 6AEI, 6AEY, 6AEZ, 6AFN, (6AGF), 6AGP, 6AHA, (6AHP), 6AHQ, (6AIV), 6AIA, (6AIB), 6AID, (6AIF), 6AIP, (6AIO), 6AIU, 6AKL, 6ALD, (6ALP), 6ALU, 6ALV, 6AMK, 6AMN, 6ANI, 6ANP, (6AOE), 6AOR, (6AOW), 6APP, 6ARD, (6ARU), (6ARV), (6ASB), 6ASV, 6ATF, 6ATG, (6ATH), (6ATQ), 6ATV, 6AVB, 6AVR, (6AVV), 6AWH, 6AWP, 6BAJ, 6BAP, 6BAZ, (6BBO), 6BFE, 6BGG, 6BH, 6BJ, 6BK, (6CK), 7FI, (7IW), 7JD, 7JW, 7LN, 7LY, (7MF), 7MO, 7MP, 7MU, 7QF, 7RY, 7TJ, (7VO), 7YA, 7YG, 7YJ, 7ZM, 7ZT, 7ZV, 9AEG, 9DZE, 9WU, 9ZX.

6ATH, Ephraim, Utah

5FO, 5HK, 5IF, 5XJ, 5XU, 5ZA, 5ZZ, (6AAH), (6AAU), 6AAT, 6ABX, (6ACR), 6AEH, 6AFN, (6AFP), 6AGR, 6AGU, (6AHQ), 6AIF, (6AJW), (6AKL), 6AKT, (6ALE), 6AMK, 6APE, 6APP, (6ARU), (6ATF), (6ATQ), (6BAF), (6CK), 6CV, 6EB, (6FK), 6HT, (6IV), 6JY, 6KC, 6LA, 6LC, 6LU, 6MH, 6PR, (6RS), 6SJ, 6TF, 6TO, 6TU, (6TV), 6VB, (6VM), (6VZ), 6WV, 6XH, 6ZA, (6ZAM), 6ZAL, 6ZK, (6ZR), (6ZX), 6ZZ, (7BJ), 7CK, (7HM), (7HF), 7LA, (7LN), 7LO, 7LY, 7MA, 7MF, (7MP), 7MU, 7NK, (7NZ), 7OT, 7PS, (7SB), (7VO), 7VZ, 7YA, 7ZG, 7ZN, (7ZS), 7ZU, 7ZV, 9AIG, (9AMB), 9ANF, 9AVR, 9AVU, 9AYS, 9BDF, 9BJ, 9DCI, 9DKS, 9DOC, 9EY, 9PI, (9XAQ), 9YAE, 9YAK.

6AIF, Bakersfield, Cal.

Spark: 6XU, (6ZA), 6ZZ, 6AAH, (6AAU), (6ABW), 6ABX, 6ACK, 6ADA, 6ADL, (6AEH), 6AFN, (6AGF), 6AGP, (6AH), 6AHP, 6AHV, 6AIB, 6AIO, 6AJR, 6AK, (6AKL), (6ALP), 6ALV, 6AMK, (6ANG), 6AOR, 6APP, 6ARK, (6AS), 6ATH, 6ATQ, (6ATV), 6AV, 6AVB, 6AVV, 6AWH, 6AWT, 6AWX, 6BAJ, 6BAK, 6BAZ, 6BCJ, (6BGH), 6BM, 6CV, (6EA), 6EB, 6EN, (6EX), 6FH, (6FK), (6FT), 6GF, 6GT, 6GX, 6IB, 6IS, 6IV, (6KC), (6LC), 6NG, (6MH), (6OD), 6OH, 6PJ, (6PO), 6PR, (6QR), 6SJ, 6ST, 6SU, 6TO, (6TU), (6TV), 6UO, 6VK, (6VX), (6WH), 6WR, 6WZ, 6ZAA, 6ZAL, (6ZAM), 6ZD, 6ZK, 6ZU, (6ZX), (6ZZ), 7BH, 7BJ, 7BK, 7BR, 7CK, 7FI, 7FQ, 7GJ, 7HF, 7IW, 7LO, 7MF, 7MH, 7MP, (7MY), 7TJ, 7VO, 7YA, 7YG, 7YL, 7ZJ, 7ZM, 7ZT, 7ZU, 7ZV, 8ZP, Canadian 9AX, 9BD, 9YAE, 9YAL.

C.W.: 4FT, (6ZA), 6AAT, (6ALE), (6ALU), (6AK), 6AKW, 6AOZ, 6ARC, 6ASJ, (6ASV), 6ATG, (6AUL), 6AVY, 6AWT, 6EC, (6EN), (6GR), (6JD), 6JJ, (6KA), (6KY), 6RR, (6XAD), (6XAF), (6XH), (6ZA), 6ZAF, 6ZB, 6ZT, 6ZZ, 7XF, 8AML, 8ZV, 9AJA, (9AMB), 9AYU, 9BJI, 9DTH, (9DTM), (9DVA), 9NX, (9WD), (9XAQ), Canadian 9BD, CL8.

W. C. Bridges, Loleta, Calif.

C.W. 2UD, 4FT, 5KP, 5ZA, 5BD, 5AGZ, 8BH, 8XH, 8AGL, 8JS, 8VK, 8BO, 9AKB, 9BBF, 9AJA, 9JI, 9NX, 9DTM, 9XAQ, 9WD, 9AKR, 9AYS, 9AMB, 9DTH, 9DVA, 9DWJ, 9AAB, 9BBI, 9AJH, 9ZY, 9ZL.

Spark: 5AK, 9YAC, 9YAK, 9YAE, 9ALS, 9JN, 9AIG, 9AOE.



9MC, 9PD, 9TL, 9UG, 9UU, 9WA, 9YA, 9YB, 9YC, 9YM, 9YO, 9YQ, 9ZJ, 9ZN, 9AAW, 9AEG, 9AEK, 9AHJ, 9AIF, 9ALH, 9AOJ, 9APS, 9AQE, 9ARG, 9ARI, 9AYY, 9AZA, 9BRL, 9DHG, 9DQ, 9DWP.  
 C.W.: 1QN, 1RU, 1UN, 1XM, 1ZE, 1AFV, 1AJP, 1ANQ, 1ARY, 1AVI, 1BCG, 1BDI, 1BKA, 1BSD, 1BUA, 2BB, 2DH, 2EH, 2FD, 2HG, 2KL, 2NZ, 2QK, 2RM, 2VA, 2W, 2WP, 2XQ, 2ZL, 2ZV, 2AAB, 2AAV, 2AAX, 2AGB, 2AJF, 2AKO, 2AIR, 2ANQ, 2AWF, 2AWL, 2AYZ, 2BAK, 2BEA, 2BFZ, 2BGH, 2BGT, 2BIS, 2BSC, 2BYS, 2CYS, 2BG, 2BP, 2BY, 2BZ, 2CA, 2CC, 2DH, 2HG, 2HJ, 2IW, 2LR, 2MO, 2RF, 2TJ, 2XL, 2ZO, 2ZV, 2ZY, 2ZZ, 3AAO, 3AEO, 3AJD, 3AMA, 3APA, 3AQR, 3BEC, 3BHL, 3BKI, 3BIY, 3BLF, 3ZAB, 3AS, 4BK, 4BY, 4BQ, 4CG, 4CY, 4DC, 4EB, 4EL, 4EN, 4FT, 4GL, 4ID, 4IL, 4KD, 4YA, 4ZE, 5FA, 5FV, 5LA, 5UU, 5XJ, 5ZA, 5AR, 5BK, 5BU, 5DV, 5DR, 5GA, 5GV, 5IB, 5IQ, 5JD, 5JL, 5KH, 5ML, 5NB, 5NV, 5QY, 5RG, 5SP, 5UO, 5VJ, 5WA, 5WR, 5WY, 5XB, 5XK, 5XM, 5XV, 5XY, 5ZG, 5ZL, 5ZP, 5ZV, 5ZZ, 5ADG, 5AGG, 5AGL, 5AGO, 5AHR, 5AJG, 5ALB, 5ALV, 5AMM, 5AMQ, 5AMS, 5ANP, 5AOG, 5AOZ, 5AFT, 5AQF, 5AQH, 5AQN, 5AQR, 5AQV, 5AQZ, 5AWP, 5AWY, 5AXC, 5BCI, 5BIJ, 5BJV, 5BJW, 5BLT, 5BNJ, 5BNI, 5BRC, 5BRF, 5BRL, 5BZO, 5CAB, 5CAZ, 5CR, 5DV, 5IO, 5LK, 5NX, 5OU, 5PF, 5QE, 5VG, 5WC, 5XM, 5YB, 5ZY, 5AAS, 5AJA, 5AJH, 5AJP, 5AMB, 5AMU, 5AKD, 5BAP, 5BBF, 5BED, 5BLO, 5BOW, 5DFL, 5DKP, 5DWJ, 5XAB.

8GY, Cleveland, Ohio

C.W.: 1AAN, 1AAX, 1ANQ, 1ANY, 1AFV, 1ARY, 1AZW, 1AWK, 1AWN, 1BBT, 1BDI, 1BKO, 1BKQ, 1BYK, 1CAK, 1DF, 1FF, 1QN, 1TS, 1XF, 1XAD, 1ZE, 2AWL, 2AWU, 2AUC, 2AAB, 2ABK, 2AM, 2AJR, 2AFP, 2BTJ, 2BYS, 2BFZ, 2BGH, 2BEB, 2BB, 2BAK, 2CBG, 2CCD, 2FD, 2FP, 2FZ, 2OM, 2OT, 2RB, 2RM, 2WB, 2WP, 2VA, 2XA, 2XJ, 2XQ, 2ZL, 2ZY, 3AAE, 3ADT, 3ADX, 3AHK, 3AJH, 3ALN, 3ANK, 3AQR, 3ARK, 3AWY, 3BA, 3BAY, 3BC, 3BEC, 3BIY, 3BLF, 3BP, 3BF, 3CA, 3DH, 3DP, 3FM, 3FM (Canadian), 3FS, 3HG, 3HS, 3JH, 3KM, 3LB, 3MO, 3MY, 3OM, 3TJ, 3XM, 3ZN, 3ZO, 3ZY, 4BK, 4BY, 4CO, 4CY, 4EB, 4EL, 4EN, 4FT, 4GL, 4HW, 4KL, 4LE, 4YA, 4ZE, 5AF, 5AN, 5FV, 5KP, 5MB, 5NZ, 5QA, 5UU, 5YH, 5YI, 5ZA, 5ZE, 5ZZ, 6EN, 6XAD, 6ZA, 9AAV, 9AAV, 9AAU, 9AEG, 9AFF, 9AIG, 9AJA, 9AJP, 9AJH, 9AKH, 9AKB, 9AKR, 9ALS, 9AMU, 9AOG, 9AOE, 9ARK, 9ARG, 9ARS, 9AUA, 9YS, 9BAP, 9BBF, 9BED, 9BIK, 9DCF, 9DGM, 9DPQ, 9DWJ, 9DY, 9EI, 9FM, 9HW, 9IL, 9IO, 9JD, 9JL, 9LQ, 9MT, 9NX, 9OR, 9PG, 9PS, 9RE, 9WU, 9XAQ, 9XI, 9XM, 9ZB, 9ZL, 9ZT, 9ZY.

Spark: 1AER, 1ARY, 1BKQ, 2AAB, 2ACH, 2ARK, 2CK, 2EL, 2EQ, 2FP, 2OM, 2XK, 2XQ, 3ACM, 3AC, 3AR, 3ANK, 3BP (Can.), 3BG, 3EH, 3EI, 3FG, 3KM, 3NB, 3PU, 3SG, 3VA, 3VR, 3VW, 3XF, 3XM, 3ZO, 3ZV, 3ZY, 4BI, 4BQ, 4CA, 4CX, 4DH, 4EL, 4HT, 4XF, 5AK, 5DA, 5EK, 5FJ, 5JD, 5LO, 5PX, 5UU, 5XA, 5XB, 5XU, 5YL, 5ZA, 5ZE, 5ZL, 5ZZ, 7XB, 9ACB, 9AEY, 9AFF, 9AIU, 9AIY, 9AIG, 9ANI, 9AOE, 9AQE, 9ARD, 9AV, 9AVP, 9AWX, 9AWR, 9AWZ, 9BNT, 9BYA, 9CA, 9DKV, 9DZI, 9DQ, 9DQ, 9DCX, 9DLX, 9DWF, 9DYU, 9DV, 9EJ, 9EE, 9GS, 9HR, 9HI, 9HM, 9IW, 9JN, 9JQ, 9LW, 9MC, 9MX, 9NQ, 9NX, 9OX, 9OA, 9PS, 9RC, 9UH, 9UK, 9UU, 9VL, 9WN, 9WT, 9WU, 9XA, 9XAC, 9XAE, 9XAF, 9XI, 9YB, 9YA, 9YAC, 9YAE, 9YAF, 9YAJ, 9YAK, 9YC, 9ZC, 9ZJ, 9ZN, 9ZX.

8CAB, Cincinnati, Ohio

C.W.: 1AZW, 1BEA, 1BDI, 2AAB, 2AZZ, 2BAY, 2BEB, 2BFZ, 2CCD, 2WP, 2XA, 3AHK, 3AJD, 3AQR, 3BIY, 3BLF, 3BZ, 3FS, 3HG, 3HJ, 3HX, 3LR, 3ZY, 4AS, 4BK, 4BQ, 4BY, 4CY, 4EL, 4FT, 4GL, 4ID, 4IL, 4XK, 4ZE, 5EK, 5FV, 5KP, 5LA, 5MT, 5UU, 5ZL, 5ABV, 5AGL, 5AGZ, 5AIM, 5AIO, 5AMS, 5AQF, 5AQH, 5AQV, 5ATU, 5AWZ, 5AXC, 5BDO, 5BET, 5BEX, 5BFX, 5BK, 5BMB, 5BOG, 5BOX, 5CBR, 5DR, 5IQ, 5IV, 5JS, 5QM, 5SP, 5VY, 5XE, 5XV, 5ZZ, 9AAU, 9AJH, 9AKB, 9AKR, 9AOQ, 9APE, 9AT, 9AUA, 9AVN, 9AYS, 9BBF, 9BIK, 9DCB, 9DIG, 9DKP, 9DPQ, 9DTW, 9EI, 9EL, 9FM, 9HK, 9IZ, 9JL, 9NX, 9QR, 9SR, 9UU, 9WC, 9XI, 9ZL, 9ZV.

9YAJ, Northfield, Minn.

Spark: 2FP, 3XM, 5AQ, 5BM, 5BY, 5EK, 5EW, 5FO, 5HK, 5IF, 5IR, 5IS, 5MF, 5NK, 5PG, 5SM, 5XB, 5XU, 5YI, 5ZA, 5ZL, 5ZZ, 7MP, 7ZO, 7ZU, 7ZV, 8AIT, 8AZN, 8AGZ, 8AMZ, 8AWP, 8AYN, 8BA, 8BF, 8BFH, 8CF, 8CP, 8EA, 8EB, 8JJ, 8KK, 8MJ, 8UR, 8VY, 8WO, 8YN, 8ZA, 8ZAA, (8ZF), 9AAP, 9AAS, 9ABV, 9ACB, 9ACL, 9ACN, 9ACY, 9ADM, 9AEG, 9AF, 9AFF, 9AFX, (9AFW), 9AIR, 9AGN, 9AGR, 9AHZ, 9AIF, 9AIS, (9AIG), 9AKO, 9ALS, 9ALM, 9ALO, (9ALU), 9AMB, 9AMQ, 9AMS, 9ANF, 9ANO, 9ANQ, 9AOE, 9AOJ, 9AOU, 9APW, 9AQE, 9AQM, 9ARG, 9ARZ, (9ASK), 9ASO, (9ASN), 9ATN, (9ATV), 9AU, (9AUA), (9AUL), 9AUV, 9AVC, 9AVE, (9AVX), 9AWM, 9AXQ, 9AXU, 9AYW, 9AZA, 9AZE, 9BCF, (9BCP), (9BFT), 9BJV, (9BKP), 9BP, 9CP, 9CS, 9DAG, 9DAO, 9DGT, (9DEH), 9DJB, 9DJX, 9DKQ, 9DKV, (9DOK), (9DOO), (9DOT), 9DP, 9DTB, 9DFM, 9DQ, 9DQU, 9DSB, 9DSN, 9DSO, 9DU, 9DUU, (9UG), 9DV, 9DWF, 9DXM, 9DYG, 9DYU, 9DZE, 9DZI, 9DZQ, 9ET, 9GC, 9HI, (9HM), 9HT, 9JN, 9JO, 9LF, 9LN, 9LR, 9MS, 9NQ, 9PB, 9PD, 9PI, 9PS, (9QE), 9RC, 9RY, 9TL, 9UH, (9VL), (9WF), 9WI, 9WT, 9WX, 9XAI, 9XJ, (9XI), 9XT, 9YA, (9YAE), 9YAK, 9YB, 9YC, 9YM, 9YQ, 9ZAC, 9ZAH, (9ZC), (9ZJ), 9ZN, (9ZT).

C.W.: 1AFV, 1ARY, 1DF, 1XM, 3BP, 4CB, 4BQ, 5BJ, 5FT, 5KU, 5XU, 5ZA, 5ADG, 5AGN, 5ALD, 5AMQ, 5AOG, 5AIG, 5APT, 5AR, 5ARS, 5ASV, 5BFX, 5BK, 5BOX, 5BRL, 5BUM, 5DR, 5IQ, 5IV, 5JZ, 5OW, 5QY, 5SP, 5UC, 5UJ, 5UK, 5VY, 5YU, 5ZC, 5ZG, 5AEO, 5AJA, 5AJP, 5AKB, 5AKD, 5APW, 5ADG, 5ARK, 5AVM, 5AVN, 5AYS, 5BAA, (5BBF), 5BED, 5BIK, 5BJV, 5BLO, 5BNO, 5BOW, 5DNT, 5DOF, 5DTA, (5DQM), 5DVJ, 5DUP, 5DWJ, 5DZQ, 5EX, 5FM, 5FO, 5HW, 5JL, 5JW, (5NX), 5PG, (5QE), 5VE, 5WU, 5XAL (5XI), 5XM, (5ZT).

9DUN, Caney, Kans., January

Spark: 5AQ, 5EW, 5FO, 5HK, 5JR, 5LB, 5LO, 5QL, 5XA, 5XB, 5XJ, 5XU, 5YL, 5ZA, 5ZAB, 5ZAK, 5ZAT, 5ZE, 5ZN, 5ZS, 5ZZ, 7ZU, 7ZO, 8YU, 8ZN, 9AEG, 9AEY, 9AIG, 9AJS, 9ANQ, 9AOE, 9AQE, 9ATU, 9AVC, 9AVR, 9BNJ, 9BMW, 9DHB, 9DKQ, 9DMW, 9DUB, 9DUU, 9EE, 9HJ, 9HR, 9JN, 9JQ, 9LW, 9MC, 9NR, 9PI, 9PS, 9TJS, 9WU, 9XAE, 9XJ, 9YAE, 9YAK, 9YM, 9YO, 9ZC, 9ZH, 9ZN, 9ZR.

C.W.: 4BK, 4BY, 4EL, 4FT, 4ID, 5AN, 5AM, 5BQ, 5FV, 5KP, 5UU, 5XJ, 5YI, 5ZA, 5ZAK, 5ZZ, 6WV, 8AQF, 9AQH, 8BEX, 8BIK, 8BOX, 8IV, 8KV, 8ZZ, 9AAS, 9ACB, 9AIB, 9AJA, 9AKB, 9AKR, 9AKS, 9AMB, 9AQA, 9AQB, 9ARJ, 9AUA, 9AVN, 9AYI, 9AYS, 9BAP, 9BED, 9BFX, 9BIK, 9BJI, 9BKK, 9DCF, 9DHB, 9DIG, 9DKP, 9DPE, 9DTW, 9EA, 9FM, 9HK, 9IL, 9JR, 9NX, 9PL, 9QE, 9VK, 9XAE, 9XAQ, 9XI, 9XM.

9ASN, St. Paul, Minn.

Spark: (2FP), 3AHK, 4BI, 4EI, 4DH, 4XC, 5HZ, (5JD), 5LO, 5MF, 5PG, 5PP, 5QS, 5SM, 5XB, 5XJ, 5XU, 5YE, 5YI, 5ZL, 7MP, 7YA, 7ZU, 7ZJ, (8EA), 8JJ, 8MR, 8TJ, 8TK, 8UC, 8VC, 8WD, 8YM, 8YN, 8YU, 8AMZ, 8AVO, 8ZP, (8BBU), 8BFH, 8BXX, 8ZAC, Can. 3BP, 3KG, 3GN, (9AR), (9AU), (9AV), 9BP, 9CA, (9CP), 9CS, 9EE, 9EL, 9GP, (9HI), 9IF, (9IY), 9JN, (9JQ), 9LZ, (9MS), (9NQ), (9OA), 9OX, (9PD), 9PS, 9QH, (9RC), 9RY, 9TL, 9UH, 9UU, (9VL), 9WT, 9XM, 9YC, 9YM, 9ZB, 9ZC, 9ZJ, 9ZN, (9ZX), 9ACN, 9ACY, 9AEG, 9AEK, (9AFF), (9AFW), 9AGN, (9AGR), 9AHZ, (9AIF), (9AIG), 9AIP, 9AIS, 9AIU, 9AJA, 9ALS, (9ALU), 9AMQ, 9ANO, 9ANQ, 9AOE, 9AOJ, 9APN, 9ARG, (9ARI), (9ASO), 9ATC, 9ATN, 9AVE, 9AWX, (9AWZ), 9AYH, 9AYW, 9AZE, (9BCF), 9BDS, 9BMN, 9DDE, (9DEH), 9DIW, (9DKQ), (9DKV), (9DKW), (9DLX), 9DNC, 9DPE, 9DPF, (9DRJ), 9DSD, (9DSO), (9DUG), 9DYU, 9XAI, 9XAQ, 9YAE, (9YAJ), 9YAK.

C.W.: 1XM, 2FP, 2WP, 3CY, 3EM, 3ZY, 3AQR, 4FT, 5KU, 5ZA, 5ALE, 6XAD, 5AR, 5IQ, 5JL, 5LX, 5UK, 5UO, 5VJ, 5VY, 5WA, 5XX, 5ZG, 5AGZ, 5AIO, 5APT, 5AWP, 5BEF, 5BFX, 5BRL, 5BUM, 5FM, (5HW), 5JL, 5NX, 5PG, 5QE, 5XM, 5YE, 5ZL, 9AJA, 9AKB, 9ALG, 9ALS, 9AOG, 9AQS, 9AYS, 9BBF, 9BIK, 9DVA, 9DZQ, 9XAQ.

(Continued on page 65)

# Radio Communications by the Amateurs

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## Amateur Phone QRM

—, Mass.

Editor, QST—

Up to this time I have been merely one of the vast army of readers who are willing to read and enjoy your most excellent publication without passing my own opinion as to the merits of the many articles by the editor or the radio man who from time to time bring up ideas for the betterment of Citizen Radio.

However I am now getting into the ring in regard to what I believe will sooner or later prove a real menace to relay work, which is by far the more important thing in Citizen Radio. I wonder if the radiophone stations who are springing up in all parts of the country realize that many of them during their interminable periods of testing and transmitting so-called concerts are, as a rule, causing as much interference as the worst squeak box?

There is plenty of good music in the air these nights from such stations as WJZ, WDY, KDKA, 1XE, etc. on regular schedule and who are putting on excellent talent with fine modulation. These stations do not interfere with traffic in any way as they are on 360 meters or higher. Being commercial or special amateur stations they are permitted these wave lengths which the average phone station should realize is illegal for them.

I am sure I find it hard to understand why so many of the new phone stations think it is necessary to clutter up an already over-crowded atmosphere with a jumbled-up mess of A.C. hum; some use no filter system whatever. And the modulation as a rule is so bad that when they talk it sounds as though they had a mouth full of hot potatoes. The majority seem to think that high radiation is much more important than good clear modulation.

I have night after night heard a local station transmit alleged music from eight to ten thirty P.M. when their A.C. hum was so bad owing to a poor filter and poor rectification that it was utterly impossible to tune him out on a range of from 185 meters to 550 meters. Therefore it was impossible to copy distant amateur spark stations and also impossible to listen to good music from the few good radiophone broadcasting stations. The modulation, of course, was so poor that it was hard to understand the speech.

The operator at that station on many nights is an unlicensed man who can not understand a letter of code and would not therefore recognize a QRX or QRT signal even if transmitted at one word a minute.

I will say that I believe that the A.R.R.L. should take this matter of radiophone QRM under consideration as no doubt this locality is not the only one suffering from this form of interference. In case you care to use any part of this in QST I request that my name be withheld from print as I do not wish to cause hard feelings but have the betterment of conditions at heart.

Very sincerely yours,  
A Reader.

## Intermediate Signals

NAA Control,  
Room 2629, Navy Dept.,  
Washington, D. C.

Editor, QST—

In regard to Mr. Rosebank's letter in the January QST, I may be able to let a little light in on the subject. The intermediate signal ... — is used in the place of — . . . in the new naval procedure, and is authorized and correct for any U.S. Naval station to use when using tactical signals. The attention call in this case is ... —. instead of — . —. — also. These signals are unauthorized however for commercial work, even by naval stations. For Mr. Rosebank's information, the stations whose first letter of the call is N are U.S. Naval stations. WII and WSO are not authorized to use these signals, nor is NSM for commercial work, which is almost entirely what he and NNZ handle. If Mr. Rosebank will listen to the arcs of NAA, NAO, NAR, NAW, and NAT, also NSS and NDD when working U.S. Naval stations, he will hear these signals used entirely, and also a number of other unfamiliar signals comprising the new Naval tactical procedure. This does not violate the radiotelegraphic convention, and the A.R.R.L. distinguishing signals hold good for amateur stations only. Best 73s.

H. J. Burhop,  
9ZL (when at home).

## Canadian Tubes

Wolfville, Nova Scotia.

Dear Eddie—

Thought you might like to hear some-

thing about the valves available for amateur use in Canada.

The U.S. tubes are in use at a great many stations. The most widely used type however is the British Marconi "V-24." This is a hard tube, and though primarily designed as an amplifier, is an A1 all around valve. Those who have tried it in radio frequency amplifiers have obtained excellent results as it possesses a rather low internal capacity, and on account of its amplifying properties it can not be excelled when used as a detector in a regenerative circuit. The normal filament current and voltage are .75 and 6 respectively, while a potential of 22½ volts is applied to the plate.

The Marconi "Q" type, while being as good a detector as one could wish for, is rather difficult to adjust to maximum efficiency and requires quite a high voltage on the anode so is not in general use among the amateurs. The "V-24" has very small elements. The "Q" has a large plate and small mesh grid so that a very small change of potential in the latter will cause a violent change in the plate current.

As transmitters either of the above mentioned tubes give excellent results for low power work. Then we have the Marconi "MT-5" a 25 watt tube, "MT-1", 250 watts; "MT-3", 75 watts; "MT-4", 400 watts, and "MT-2" a 1000 watt tube, and the English Mulard type "A" valve, a 30 watt tube, the filament of which draws but .8 amps. Voltages of 400 to 1000 may be used on the plate of this latter tube. Marconi rectifiers "MR-1" and "MR-4" of 150 and 400 watts respectively are also obtainable.

A large Toronto department store is stocking a full line of tubes, including some of French and Japanese make. And last but not least it is rumored that one of the largest electrical companies in the Dominion has a full line of tubes about ready for the amateur market.

Very truly yours,  
C. H. Starr.

### High Frequency Resistance

Standard Radio & Electric Co.,  
Pawtucket, R. I.

Editor, QST—

I have just read with deep interest in the November issue of a leading radio paper an article, apparently recommended to the amateur, on "Construction of a Long Wave Receiving Set."

It is the evident intention of the writer to convey in this article a method of constructing a long wave receiver of distinctive merit; and his appeal is to the amateur.

In describing the coil windings, he proposes ordinary spool-windings in multi-layers, the total primary to be wound in two sections and the secondary in three, the total making sort of a loose-coupler.

Further, advocating his method, he does not hesitate to lay claim to superiority over conventional concentrated coils while speaking of the remarkable results obtained by the method employed.

With a lively interest in the amateur, that he shall not devote his efforts along lines which I feel sure will not result in the satisfaction sought, I take exception to certain statements and will endeavor to impart views which are based on many years experience, acquired by experimentation, research, and reading in this particular field; and most especially where coils for use in radio frequency are discussed.

In the first place, it is common knowledge that coils wound in multi-layers or "spool-winding" contain a tremendous amount of distributed capacity; it is also well understood that this is to be particularly avoided, and especially in the case of the amateur, who is generally working with antennae of low capacity and who therefore requires that the capacity of his set be a minimum.

In the next case, in general or "spool-winding" it is customary for the turns to be wound close together. Here the crowding of the skin effects result in a very large high-frequency resistance which obviously result in a decided decrease in signal strength.

Again: strange, as it may seem it is nevertheless true that the D.C. resistance of a coil has absolutely no bearing or relation to the high-frequency resistance. This is not generally understood today, and has fooled many advanced students of the art in the past. To substantiate these statements I will cite a case where two coils were recently tested at Cruft Laboratory, Harvard University, and the above found unquestionably true.

#### Coil A

Coil constructed of No. 25 S.C. wire, D.C. resistance 11.26 ohms  
At 6000 meters, H.F. Res.=115.0 ohms  
" 8000 " " " = 54.0 "  
" 10000 " " " = 39.6 "  
" 15000 " " " = 23.2 "

#### Coil B

Coil constructed of No. 24 S.C. wire, D.C. resistance 9.9 ohms  
At 6000 meters, H.F. Res.=115.0 ohms  
" 8000 " " " = 77.0 "  
" 10000 " " " = 52.4 "  
" 15000 " " " = 28.7 "

Even a casual glance at the above data brings out the peculiar fact that the coil with the larger wire, and consequently of course less D.C. resistance, actually shows more H.F. resistance. Yet it is possible, and furthermore it is at present accomplished and a commercial fact, that these coils can be, and are, so wound that the larger wire will have the smaller H.F. resistance. From this it becomes evident that the method of winding must have con-

siderable to do with this matter. It is, in fact, the answer to that problem, and by a special method of winding we do bring down H.F. resistance.

Lastly, I must definitely state that, in my opinion, based on tests of course, there is nothing to be gained by spreading both the primary and secondary winding out on a long tube with the idea of producing a sort of "loose-coupler effect." At first blush it might seem to one that this method would tend to reduce distributed capacity. This is true to a certain extent, but why spread out the whole tuner into a big cumbersome unit, when the same inductance can be obtained in a small properly-constructed coil, still having less distributed capacity? Below will be found examples of actual values received by authoritative tests, and which will bear out the above statements.

Coil A, an inductance constituting 1000 turns made up of four sections of 250 turns each and wound honeycomb, these placed side by side on a long tube of 4" or 4½" diameter. Total inductance, 65.4 millihenries. Distributed capacity, 12.8 mmfds.

A properly wound concentrated inductance revealed inductance of 165 millihenries; distributed capacity, 8.4 mmfds.

Another case of lower inductance shows inductance of 31.3 millihenries, distributed capacity of 8.5 mmfds.

In the article under discussion this statement appears: "In the first tests made, while perfecting an instrument especially designed for receiving long wave lengths, 'concentrated coils' of the conventional cross-wound type were used, but, surprising as it may seem, signals were increased 50 to 75% when the layer-wound coils were substituted, one reason being that the D.C. resistance is much lower."

I take exception to the first part of the above paragraph, as this condition is absolutely contrary to any I have found in tests, and I would appreciate any actual test figures covering such an instance. However, I have already demonstrated, in figures shown above, that there exists absolutely no direct relation between D.C. and H.F. resistance.

The statement goes on to say, "losses due to varnish are less because varnish is only applied to the outer layer." I can only say that in tests actually conducted, to find possible losses due to varnish, results have demonstrated negligible losses and so small as not to be apparent on the meter.

It is to be noted that the Navy Department specify varnished coils. From this point it might be gathered that while they accept the varnish (as valuable) where salt air is encountered, they certainly would not consider it for a moment if it occasioned

losses. A summary of all my data to date proves conclusively to me that the method of winding the coil, and of course attention to the kind of wire used, absolutely controls distributed capacity and high frequency resistance.

I especially hope that this criticism will be accepted in the spirit that it is given, namely, a friendly discussion of points that are entirely at variance with the results of my own observation and what might be termed exhaustive tests on the subject. However, I do certainly insist that these values in different types of coil winding be cleared up; so that a theory on the one hand, is hereby exploded, and the above statements accepted; or further discussion be given this subject.

I gratefully acknowledge indebtedness and thank Cruft Laboratory professors for their co-operation in obtaining data herein referred to.

Thos. P. Giblin,  
Electrical Engineer.

### A New Idea

Box 1026,  
Gulfport, Miss.

Editor, QST—

While not having accomplished anything that entitles me to be listed among the amateurs I am nevertheless keenly interested in all radio matters; and it was while thinking along these lines that I stumbled upon a curious and interesting phenomenon which, if it has ever before been noted and written about, has certainly escaped my attention.

I possess a small violet ray outfit—the kind in which everything is self-contained in the handle. It is, as is well known, a therapeutic device that finds favor with many for ameliorating a wide range of human ailments—from renal deficiency to falling hair. This little panacea is built to operate on 110 volts, D. or A.C., has a fathom or so of cord to connect with the usual electric light socket, and is priced at around fifteen dollars. Now it had often occurred to me that it's spark, being obviously one of high frequency, ought to be detectable in radio receivers; so to ascertain the possibility of this I recently screwed the cord into a deck socket aft, and broke the sparking from the applicator into comprehensible dots and dashes by alternately advancing and retracting the glass while held alongside an iron stanchion. Thereupon my radio man, Mr. Wm. M. Smith, (an excellent operator and technician, by the way) reported with great enthusiasm that he had received all that I had attempted to transmit, and that it had come in "like a ton of bricks".

Encouraged by the successful outcome of the above experiment I shifted the little violet ray device to my hotel, almost a mile away but with no metal obstructions inter-

vening. In the second test I used a large screen door as an antenna operating as with the stanchion; my messages still were received strong and distinct. We propose to continue our experiments, to ascertain if varying angles of the door to the ship have appreciable effect, and to learn the absolute limiting distance at which this simple violet ray apparatus may be heard. The ship's receiving set is the Navy Standard (NSE-1420-C) and is manufactured, I believe, by the American Radio & Research Corporation.

Respectfully,  
Eoline R. Hand, H&GE,  
Comdg. Str. "Bache".

### Rotten Modulation

Cambridge, Mass.

Dear Editor—

Pursuing the subject of radiofones a bit further, is it not in order that we become more particular about our plate-power filters?

As stated in a previous letter we are entirely too careless in the matter of quality—anything that puts thru fairly intelligible speech seems to be satisfactory.

The operator of a fone need never be in the dark as to either point—a coil of wire, a variable condenser, a crystal detector and the headset make an excellent tester. If the pick-up circuit can be coupled to the sending helix so closely that the detector is on the verge of a burn-out without destroying the quality, the phone is at least not very bad. If it does not pass this test with flying colors the fone is rotten beyond expression. A good sturdy crystal detector such as carborundum or silicon-arsenic should be used.

No reliance at all can be placed on listeners' reports, for the average man seems to lack moral courage to say truthfully "Your quality is terrible" or for heaven's sake put a filter on your plate supply. That thing you use is a farce."

Last night I heard three stations tell the operator of a 150-watt fone set "That's F.B., O.M." tho his speech rattled badly and his music sounded as if it had been run thru a meat chopper by reason of a commutator roar almost as loud as the music.

Let's help the fone by being honest.

Sincerely,  
S. Kruse.

### Gen. Russel Congratulates A.R.R.L.

The University Club,  
Fifth Avenue & 54th Street,  
New York City.  
Dec. 16, 1921.

My dear Mr. Maxim:

I have followed with much interest the course of the experiments made by the American Radio Relay League in trans-At-

lantic radio transmission, and have marked with great satisfaction their success.

I congratulate you and the League on this wonderful achievement. It certainly has great significance as the forerunner of regular practice along these lines.

It is a fresh proof of the value of organization in successfully capitalizing the energy, skill and enthusiasm of our radio amateurs.

Very truly yours,  
Edgar Russel,  
Brig. General, U. S. A.

(Formerly Signal Officer 2nd Corps Area,  
N. Y.)

### More About Licenses

Bala, Penna.

Editor, QST—

I would like to say a few words on the question of grading amateur stations and charging for licenses, and bring out a few points for the consideration of those interested in the discussion that has appeared in QST from time to time.

Congress has appropriated an inadequate sum for the use of the Department of Commerce in carrying on the work of its Radio Department, and without money there will be no increase in inspectors while those now appointed are already more than busy with the more important work of inspecting ships, and have no opportunity of covering the amateur field thoroughly. The present law does not necessarily need changing; it needs obeying, and no amount of advice and urging from individuals, District Councils, A.R.R.L. editorials or local clubs will be more than half effective because there are certain amateurs who are so devoid of responsibility that nothing short of actual authority will bring them up short and start them along the straight and narrow 200 meter path.

Fancy-priced licenses or graded wave lengths only complicate the present law, without arriving at the desired end; if Commerce can't enforce the present law, what will happen by introducing more provisions which call for twice as much office work and inspection?

Commerce spends thousands of dollars annually in examining amateurs, issuing licenses, paying the salaries of clerks and inspectors who do the clerical and examination work, and what do we, the amateurs who get the most benefit, contribute toward the support of Commerce? Not a cent, except a 2c stamp for blanks, and 50c for notary's fee. The American taxpayer, who is not directly interested in amateur wireless and gets no direct benefits therefrom, pays the bill, while we bring home the bacon. The least and fairest thing we could do is to offer Commerce something in return for the work they do and make it possible for them to give us adequate inspection service.

It will not be long before the amateur novice, who listens to the radiophone broadcasts and cares nothing about the radio amateurs with the transmitting set, will outnumber the latter and then look out for legislation that will try and wipe us out, put the lid on for good. Notwithstanding this fact, there are lots of amateurs who totally and knowingly disregard the wave length and decrement regulations and their obligations to other law-abiding amateurs, and unless this kind is confronted by a government official and a shiny silver badge, they will bring the entire amateur fraternity into disrepute.

A license charge of \$2 for a transmitting set and \$1 for receiving is within the reach of everybody and yet a small nominal charge of this kind would make it possible for the Department of Commerce to appoint enough inspectors to enforce the law all over the country. When we get this, it's time enough to begin thinking of asking for wider amateur wave length bands. Without more money, Commerce can't enforce the law; without enforcement some amateurs won't keep within bounds and without keeping in bounds we're going to start trouble for ourselves. A small license fee won't hurt anybody and will do the trick for us all.

Sincerely,  
C. A. Service, Jr.,  
3ZA.

### Who's Using 8ZY?

Office of Radio Inspector,  
Federal Bldg., Detroit, Mich.  
Jan. 11, 1922.

My dear Mr. Warner—

There have been a number of complaints filed against the special amateur station of Mr. K. A. Duerk, (8ZY, Defiance, Ohio.) These complaints state that he has caused interference with the broadcasting of music from the Westinghouse broadcasting stations at Pittsburgh and Newark, N. J. Mr. Duerk is licensed for operation on 375 meters and Westinghouse are operating on 360 meters. I have taken this matter up with Mr. Duerk and he informs me that his station has not been in operation for some time. From this I am lead to believe that someone is using his call letters. It may be that this is being done to discredit Mr. Duerk and cause him embarrassment and trouble. I am inclined to favor Mr. Duerk's case and believe that he did not willfully cause any interference. This letter is to suggest that you insert in the columns of your valuable magazine a notice to the effect that if the party or parties who are using Mr. Duerk's call letters, 8ZY, are located, this office will not hesitate one moment in bringing the case to the attention of the United States District Attorney and request vigorous prosecution. Prose-

cution of such a case would be requested under Section Seven of the Act of August 13th, 1912, which we believe fully covers such cases.

No amateur should use the official call of another station. When he does so he violates Section Seven, inasmuch as he transmits a fraudulent call. There is no doubt in my mind but that the Department of Commerce can secure a conviction in such cases.

I will appreciate it very much if you will give this request as much publication as possible.

I am extending to you my best wishes for a prosperous New Year.

Respectfully,  
S. W. Edwards,  
U.S. Radio Inspector.

### C.W. Wave Length

Fort Riley, Kan.

Editor, QST:

Now that DX work on 200 meters is common practice with very little power, the staunchest supporters of the old rock-crusher are remodeling their post cards on the typewriter and if you can read through the XXXX you will learn that at one time, not so long past the writer sent blue whiskered amperes through an N-pointed rotary and that he had a lot of plate glass immersed in oil. The same man is now using the oil in a little variable condenser and his rotary is running a chopper. If you work him, he is as enthusiastic about CW as he ever was about spark and then some.

Strange to say this old verteran will have but a hazy idea of what his wave length is and bases his opinion on reports of his brother amateurs— something he never would have done when he had the old spark set. The answer is obvious; the wave length of a CW set is hard to measure.

Suggestion to Mr. Schnell: That certain stations, CW and Spk., be appointed to do as FL does,—at stated intervals, send out signals on stated wave lengths.

9DTW has a Kolster decremeter and has had many requests for this service which is rendered gladly in the communication range of the station which unfortunately is only equipt with two five-watt tubes. Such information broadcasted by high power stations would give everybody a chance to calibrate his receiver and render valuable service to others in his vicinity. It would give us a fine chance to make a correction curve for that wave-meter which fell off the top shelf last week too. A wave meter has a bad habit of exaggerating after such an experience, and its tendency to fabricate in one direction or the other is well known. Yes, the Bureau of Standards will do it but it costs money and takes quite some time.

F. M. Ende, 9DTW.

**The Reinartz Tuner**

Cambridge, Mass.

Dear Editor—

The Reinartz C.W. tuner deserves some enthusiastic booming of which this is a small share.

At 3AB1 we performed the following test. We first put in a 3-coil set and copied C.W. calls for half an hour. It was a good set and we were familiar with it. At the end of half an hour we had 18 C.W. calls thru the local QRM.

Then we put in a Reinartz tuner and copied 42 C.W. calls in the next half hour, every one of them more readable than the best of the previous lot.

The simplicity of the control is remarkable and a swinging wave can be followed with ease. For spark work I cannot recommend it but for C.W. it is the long-desired two-control tuner "on which there will be two knobs, one for tuning and one for regeneration."

I understand Mr. Reinartz has recently "simplified" the tuner. How? How? What can be simpler than a two-control tuner that knows not the meaning of "body capacity effect"?

Sincerely,  
S. Kruse, "LQ".

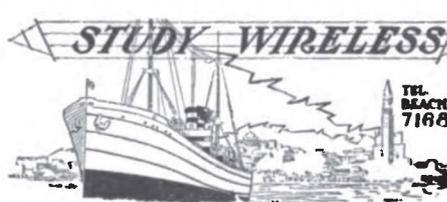
**CALLS HEARD**  
(Concluded from page 59)

**9AMZ, Evanston, Ill.**  
Spark: 1AZK, 1XM, 2BK, 2BM, 2FP, (2JZ), 2OM, 3AJD, 3ARN, 3CI, 5BY, 5FO, 5HK, 5PG, 5SM, 5ZL, 8AFD, 8AIZ, 8AMZ, 8ARS, 8AYX, 8AXN, 8BA, (8BBU), 8BBO, 8BHV, 8BRL, 8BXC, (8BZZ), 8CAY, 8CGZ, 8CI, 8CP, 8EB, 8FT, 8JJ, 8MR, 8OH, 8SP, 8TJ, 8TT, 8UC, 9ABV, 9ACB, (9ACL), 9ACN, 9ACY, (9ADI), 9AEF, 9AEG, 9AFF, 9AGH, (9AGR), 9AIF, 9AIG, 9AIP, 9AIR, 9AIU, (9ALH), 9ALU, (9AMK), 9AMQ, 9AMR, 9ANO, 9AOJ, 9APN, 9AQE, 9AQM, 9ARG, 9ARI, 9ASJ, 9ASK, (9AVP), 9AWZ, 9AXU, 9AYW, 9AZA, 9AZE, 9BCF, 9BKE, 9CA, 9CS, 9DCX, 9DFO, 9DFX, (9DKV), 9DNC, 9DQQ, 9DRA, (9DTN), 9DUG, (9DWP), 9DYU, 9DYY, 9DZE, 9DZI, 9GY, 9HM, 9IY, 9KO, 9LF, 9ME, 9MC, 9NQ, 9NR, 9OX, 9PD, (9PM), (9PW), 9UH, (9VL), 9VM, 9WL, 9WT, 9XI, Can. 3GE, 3JL.  
C.W.: 1ARY, 1BDC, 2AJF, 2FD (ICW), 3DH (ICW), 3FS, 4BY, 5KU, 8AR, 8AOG, 8AXK, 8BXA, 8CFP, 8EB, 8HJ, 8IL, 8IQ, 8SP, 8UJ, 8UK, 8UY, 8WA, 8XV, 8ZAE, 9ASD, 9AXE, 9BLO, 9DWJ, 9HW, 9IO, 9NX.

**9BER, Villisca, Iowa.**  
Spark: 4ED, 4ID, 4LT, 5ARR, 5BM, 5BY, 5DD, 5DP, 5EW, 5FO, 5HK, 5IF, 5IR, 5IS, 5MM, 5NR, 5OF, 5TG, 5TU, 5UC, 5XD, 5XI, 5XJ, 5XO, 5XU, 5YL, 5YM, 5YI, 5ZA, 5ZC, 5ZL, 5ZZ, 5ZAB, 5ZAK, 7ZO, 8AFD, 8BEP, 8BOX, 8BRL, 8BXC, 8XV, 8YM, 8YU, 8ZG, 8ZH, 8ZL, 8ZO, 8ZP, 8ZW, 8ZY, 8ZZ, 9ACB, 9ACY, 9AEG, (9AEQ), 9AEY, 9AFW, 9AGE, 9AIS, 9AJS, 9AJT, 9AKT, 9ALO, 9ALS, 9AMD, 9AMG, 9ANS, 9AOB, 9AOU, 9APN, 9AQE, 9ARA, 9ATN, 9AVC, 9AWX, 9AWZ, 9AYW, 9AYZ, 9AZA, 9BH, 9BAB, 9BDQ, 9BGG, 9BHS, 9BKG, 9BLK, 9CA, 9DBI, 9DBS, 9DFA, 9DHG, 9DHZ, 9DIK, 9DKV, 9DKX, 9DMB, 9DMW, 9DNC, 9DPB, 9DPH, 9DQQ, 9DSD, 9DUQ, 9DYM, 9DYS, 9DYU, 9DZI, 9EE, 9EX, 9GN, 9HI, 9HJ, 9HM, 9HR, 9HT, 9IF, 9IL, 9IT, 9JG, 9LN, 9LW, 9MC, 9MP, 9NR, 9PI, 9RZ, 9ST, 9TL, 9XU, 9XAF, 9YA, 9YB, 9YC, 9YI, 9YM, 9YO, 9YQ, 9YAB, 9YAE, 9YB, 9YC, 9YI, 9YM, 9YO, 9YQ, 9YAB, 9YAE.

9YAK, 9YAL, 9AM, 9YTK, 9ZC, 9ZJ, 9ZN, 9ZS, 9ZU, 9ZAA, 9ZAC.  
C.W.: 4BK, 4BY, 4EL, 4FT, 4ID, 5KP, 5MT, 5XB, 5XJ, 8AQR, 8BOX, 8RV, 8ZQ, 8ZV, 8ZZ, 9AE, 9AU, 9ACO, 9AEJ, 9AKB, 9AKH, 9AKP, 9AKX, 9AMB, 9ANI, 9ARJ, 9ARK, 9AUA, 9AUS, 9AYS, 9BED, 9BIC, 9BIK, 9BJI, 9BMD, 9BOJ, 9BOQ, 9DY, 9DPE, 9DTH, 9DTW, 9EW, 9FM, 9HK, 9JL, 9NR, 9PI, 9XI, 9XAG, 9XOQ, 9ZAE, 9ZAI, 9F1, 9DF1, 9XF1, 9XAI.

**9XAQ, University of Colorado, Boulder, Colo.**  
C.W.: 3AQR, Can. 4CB, 4FT, 5AN, 5FV, (5XJ), (5XU), (5ZA), (5ZO), 5ZS, 5ZU, (6AIF), 6ALU, (6ATG), (6JD), 6XAD, 6XAF, 6XH, (6ZA), (6ZZ), 8AGL, 8AGZ, 8BO, 8BOX, 8BZJ, 8IV, 8VY, 8XV, (9AAO), 9AAP, 9AAS, (9AAU), 9AEJ, 9AJA, (9AJH), 9AKR, (9ALG), (9AMB), 9AVN, (9AYS), (9AYU), 9BAP, 9BAY, (9BBF), 9BEM, 9BEQ, (9BEX), 9BFE, 9BIG, (9BIK), (9BJI), 9BJV, (9BOW), (9DCF), 9DFL, (9DJB), 9DOJ, 9DPE, (9DTH), (9DTM), (9DTW), (9DVA), 9DZQ, (9FM), (9HK), 9II, 9IL, (9JL), (9NX), 9PG, 9PI, 9QE, (9QL), 9RQ, 9SV, (9WD), 9WU), (9XAI), 9XI, 9XM, 9YY, (9YAC), (9ZAF), 9ZB, 9ZL, (9ZT).



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### Radio Frequency Amplifying Transformer

Made in two models. UV-1714 has a range of 200-5000 meters; price, \$4.25. UV1716 has a range of 5000-25000 meters; price, \$8.50. For radio-frequency broadcasting reception: one detector and two stages radio-frequency amplification. For general reception: one stage radio-frequency amplification, one detector, and one stage audio amplification. For extreme "DX" work: three stages radio-frequency amplification (using UV-1714) one detector, and one stage of audio amplification (with UV-712).

Aerials cannot always be conveniently set up—particularly on city apartment houses. With the new General Electric Company's Radio Frequency Amplifying Transformer, introduced by the Radio Corporation, receiving aerials can be dispensed with and indoor loops effectively used instead. At once the scope of radio is broadened.

Although the new Radio Frequency Amplifying Transformer makes it possible to receive with small indoor loops, it is more than a city-apartment convenience. Its introduction marks a great technical advance in the art of radio communication. For these reasons:

1. Receiving ranges are doubled and tripled.
2. Tube noises are eliminated.
3. Signals are heard that cannot be received with other types of amplification circuits. Hence longer ranges are possible
4. Selectivity is increased.
5. News and music broadcasted by distant stations are received with unprecedented distinctness.
6. Distortion in radio telephone reception is reduced.

Distributors: Write to Sales Division Suite 1808



ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

# Stop Those Hissing and "Frying" Noises, NOW,—With BURGESS "B" Batteries

Hissing, rattling, "frying" noises: Did you know that most of them are due to noisy "B" batteries?

When there is static and interference, why increase your troubles with a poor "B" battery? Did you know that there is at least one "B" battery which is noiseless, yet can be used to the last milli-ampere?

That battery is the Burgess. You can receive broadcasts without noises if you use only Burgess

Batteries. And when you "buy Burgess" you get high capacity and the lowest price in hours of service.

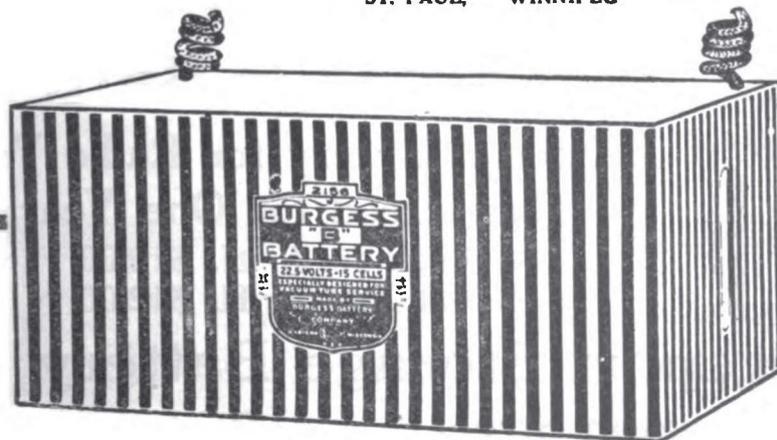
Multi-stage radio frequency and audio frequency amplification is easily possible with the Burgess "B". Weak and distant audio frequency signals can be received with multi-stage amplifiers and Burgess "B" Batteries, because Burgess Batteries do not drown out the signals.

The Burgess "B" noiseless battery is the result of years of experimenting. Careful cell construction—individual insulation, moisture-proof separators and box, substantial triple seal! All under the constant supervision of Burgess Battery engineers in the big Burgess plant.

Burgess "B" Batteries are sold by all reliable dealers in radio equipment. If you can't get the Burgess "B" from your dealer, write to—

## BURGESS BATTERY CO.

MADISON, WIS., CHICAGO, KANSAS CITY,  
ST. PAUL, WINNIPEG

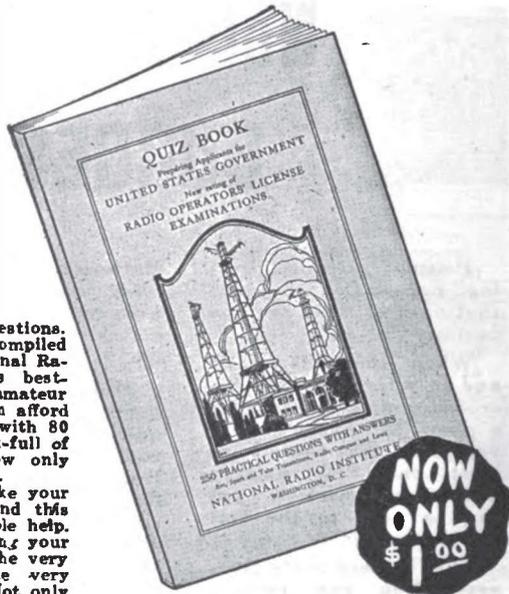


ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

67

# Just Out!

This book, "New License Quiz Book for Government First Class License Examinations," is the first edition printed with the new rules, regulations and gradings laid down by the Government on July 1st, 1921. Every amateur expecting to take examination for license needs this book. It gives the answers to 250 questions, many of which will be helpful in the examination. It gives a full description of various hook-ups, new devices, practical equations, international laws and regulations, official gradings, diagrams, definitions and other important information—invaluable to the candidate for government examinations.



**Contents**  
 106 Pages.  
 250 Questions With Answers.  
 More than 80 Illustrations and Drawings.  
 Information Concerning Method of Conducting Examinations and Places Where They Are Held.  
 Radio Symbols  
 Technical Words and Terms Made Clear.  
 Life and Duties of an Operator.  
 Terms and Definitions.  
 Radio Instruments.  
 Transmitters Covering Spark, Arc, and Tube Sets.  
 Types of Antennae and Aerials.  
 Damped Wave Receivers.  
 Latest types of undamped Receivers.  
 International and U. S. Radio Laws and Abbreviations.  
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 Exhaustive Treatise of the Storage Battery  
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 Continuous Wave Receivers.  
 Valuable information to help you in securing your license examination.

**"License Quiz Book for Government First Class License Examinations"**

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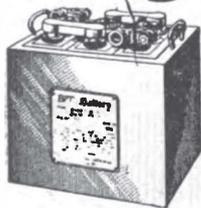
**NATIONAL RADIO INSTITUTE**  
 Dept. 1012  
 WASHINGTON, D. C.  
*Radio Headquarters*

**NATIONAL RADIO INSTITUTE,**  
*Radio Headquarters,*  
 Dept. 1012, Washington, D. C.

Gentlemen Please send me by return mail the "License Quiz Book for Gov't First Class License Examinations." I enclose \$1. It is understood that my money is to be refunded if not satisfied with book.

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 Address.....  
 City..... State.....

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6 Volts 40 A. H. \$10.00  
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## *radio necessities*

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No. 56 Phones

**M**URDOCK REAL RADIO RECEIVERS have delivered complete satisfaction, on a "money-back" basis for 14 years. Those years of experience have so simplified and perfected our production that there are today no receivers quite so good at so low a price.

The latest Murdock achievement, the No. 56 Receiver, is a highly sensitive instrument which retains all the rugged strength of previous types. Important features are, the improved comfortable headband, the "Murdock-Moulded" ear pieces shaped to exclude outside noises and the moulding of all parts into one durable unit.

All models of Murdock receivers are sold with free trial offer and money-back guarantee. Use them in direct comparison to any other phones for 14 days.

Make any test you wish. Then at the end of the two weeks, if the Murdock Phones are not entirely satisfactory, return them and your money will be refunded!

We strongly urge you to go to your dealer, and convince yourself of the quality of Murdock receivers, by actual examination, before you buy. Prices \$4.50 to \$6.00.

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**Achievement**

# the Telmacophone

Here is the height of Telmaco perfection. Equipped with Baldwin Type C Unit, Inverted horn, reflected tone. Equal to any other horn twice its length. Designed and perfected by expert acousticians. Complete in every detail.

Don't be misled into buying a loud speaker offered for less, and expect satisfaction; for a loud speaker of quality cannot be sold for less. Only after the most exhaustive tests and comparisons with the other loud speakers and only after the most thorough research, laboratory tests, and field demonstrations has the Telmacophone been perfected, and offered now, for the first time to the public. Telmaco Amplifiers, Receivers, Detectors, Variometers, and Variocouplers have earned a national reputation for quality, endurance and satisfaction not excelled by any other line. You can expect equal satisfaction from the Telmacophone.



*No extras to buy.  
Nothing to get out  
of order.*

Price  
Complete \$20.00 Fully  
Guaranteed

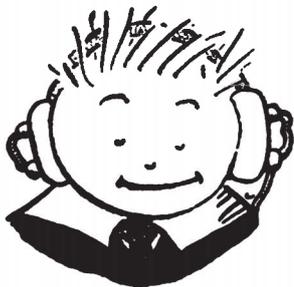
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RADIO DIVISION

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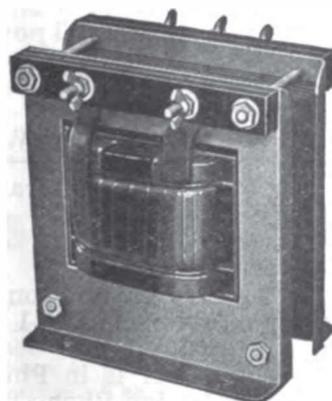
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Write for Catalog of Wireless Supplies

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**The Superiority of Shell Type Transformers  
Is Recognized**

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Capacity Watts	Sec. Volts	Unmounted	Price	Mounted
80	8.5	\$6.00		\$7.00
150	12	8.00		10.00
300	12	12.50		15.00

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100	350 and 550	\$11.00		13.00
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900	1000 " 1500	27.00		30.00

WE MANUFACTURE TRANSFORMERS DESIGNED FOR ONE  
5 WATT TUBE, WITH SECONDARY VOLTAGES OF 10 AND 650,  
BUILT SHELL TYPE, UNMOUNTED ONLY, PRICE \$7.50.

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# FACTS WORTH READING!

## EXTRACTS FROM A STRANGER'S LETTERS

Craig, Alaska, 10/21/21.

Experimenters Information Service,  
45 Pinehurst Ave., New York.

Gentlemen:

Received parts of your .160 to 1000 meter receiver, just completed the set and given same a few days tests.

Am very much pleased and wish to state that it is the best receiver I have ever worked. The latest commercial receivers (Navy Tuners) approach yours very closely in selectivity. Can copy stations 1000 miles distant thru interference by stations of equal power only 100 miles away, both tuned to 600 meters. Some of the Pacific Coast amateurs come in QSA without regeneration. Heartily recommend your BLUE PRINTS to anyone wanting a first class design.

(Signed) Winfield S. H. Wood.

Craig, Alaska, 11/22/21.

Experimenters Information Service,  
45 Pinehurst Ave., New York.

Gentlemen:

On 600 meters I get everything on the Pacific Coast. Stations 1500 to 2000 miles come in very loud. I get ships and 1KW land stations in the Hawaiian Islands fine.

The best work of your receiver is in Phone work. After a few days' test I was able to get the Avalon Phone fine and since have heard them nightly and sometimes an hour before dark. After a few nights' adjustment was able to get the bulletins and music from the Fairmont Hotel in San Francisco. Next I picked up the music from the Post Intelligencer Office, Seattle. (Note: This phone is 10 watt Output). Have never heard this feat duplicated. Everything on one bulb.

(Signed) Winfield S. H. Wood.

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**EXPERIMENTERS INFORMATION SERVICE**  
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Type C .....\$12.00	New Det. & 2 Stage Ampl.	C-W Equipment
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Headband ..... .75	Ampliformer ..... 3.75	UV202 8.00, UV203 30.00
WE ARE JOBBERS—DEALERS GET OUR PRICES—CATALOGUE 25c		
<b>STERLING ELECTRIC CO., 33 So. 5th St., Minneapolis, Minn.</b>		

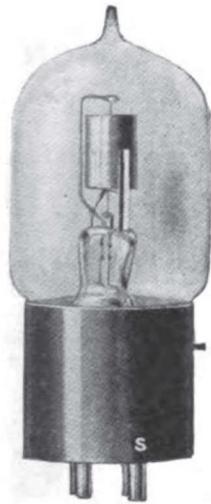
# Godley's message

With A-P tubes Paul F. Godley, American radio amateur, recently succeeding in receiving radio messages in England transmitted across the Atlantic from the U. S. After returning to America he telegraphed the A-P Co. the following message:

*"Your (A-P) tubes used exclusively in superheterodyne with excellent result tubes selected on this side remained intact and carried on throughout entire procedure also used your (A-P) tube as detector with this outfit"*

(Signed) GODLEY.

## A - P tubes hear across the Atlantic

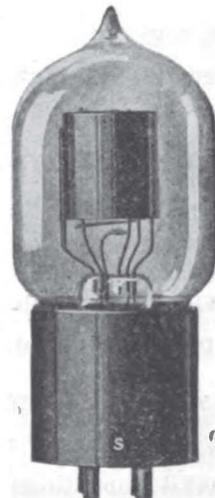


THE A-P VT  
AMPLIFIER  
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—the Amplifier used by the U. S. Navy. "Use the tube the Navy uses." Price—\$6.50.

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--the tubes that are used by those who KNOW



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A-P tubes are licensed by the Radio Corporation of America under DeForest Audion and Fleming patents for amateur and experimental use in radio communication

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**use A-P tubes for efficiency**

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Superior high gloss appearance, in all colors and sizes, to fit all B. & S. gauge wires or special shapes for special conditions.

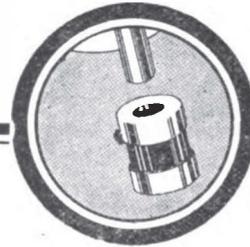
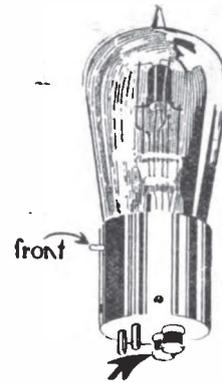
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of your bulbs against burning out is positively assured by the

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(Patent Pending)

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# 4 for \$1

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Carrying capacity  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ , 2,  $2\frac{1}{2}$  and 3 amperes. Will also protect other delicate electrical instruments.

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Boston's Oldest Exclusive Radio Store

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Demand for the Radeco Safety Fuse, as you would expect, is strong and growing fast. It yields a tidy profit and brings trade to your store. Write today for Dealers Price List.

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## Pioneer

- 1915 First regenerative receiver ever manufactured bore the name PARAGON.
- 1916 First Trans-continental Amateur Reception (California from New York; not pre-arranged) effected with a PARAGON Type RA-6 Receiver.
- 1916 First Trans-continental Amateur Transmission (New York to California; not pre-arranged) effected by PARAGON designed transmitter.
- 1917-1918 PARAGON acknowledged supreme on Western Front.
- 1921 First Trans-Atlantic Amateur Reception effected with PARAGON receiving equipment, at which time 27 different amateurs scattered thruout the Eastern section of the United States registered signals at Ardrossan, Scotland—3500 miles.

*THERE'S A REASON!*

2nd District Convention, Hotel Pennsylvania, March 7 to 11, 1922

**The Adams-Morgan Company**

*Manufacturers*

UPPER MONTCLAIR, N. J.



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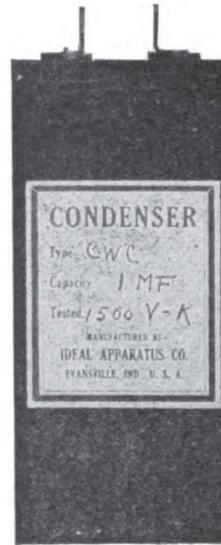
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Herewith 6 cents in stamps to pay mailing expense on my copy of your latest booklet.

Q-3-2

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## FILTER CONDENSER



Type ICC

The Ideal Condensers have met with great favor in radio circles throughout the country, all because of their super-efficiency.

Recently designed to stand potentials of 2000 Volts without puncturing, and at no increase in price.

These attractively priced condensers may be obtained from any of the dealers listed below. They will furnish you with complete information regarding the IDEAL LINE.

1 Mfd 2000 Volt Condenser . . . \$2.00  
2 Mfd 500 Volt Condenser . . . 1.50

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Klaus Radio Co., Eureka, Ill.  
Standard Radio Co., Los Angeles, Calif.  
Nola Radio Co., New Orleans, La.  
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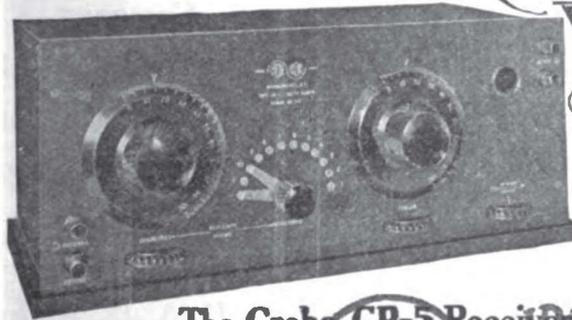
C-W CATALOG FREE  
IDEAL APPARATUS COMPANY  
EVANSVILLE,

"9XAH" INDIANA "9XAH"



Confucius has said:  
 "The accomplishment  
 of great things  
 consists  
 in doing small things  
 well."  
 Perfection of  
 detail

makes the  
 Grobe Receiver  
 what  
 it is -

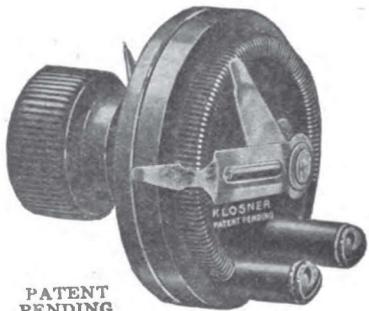


The Grobe CR-5 Receiver

Licensed under  
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**FOR THE MODERN  
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Highly finished Condensite base and  
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# The Most Popular Radio Insulation

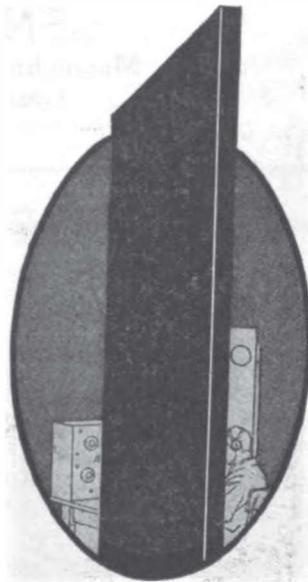
Week by week the amount of Formica used for radio insulation by amateur and commercial operators increases. It is the most popular material of its kind. This great demand for Formica is due to its high dielectric strength, and the low power and hysteresis losses with high frequency currents where it is employed.

It is due also to the handsome, good looking panels that Formica makes and to the fact that it machines easily. It is unaffected by weather conditions, oil, water, acids, alkalis. It retains its good looks and high efficiency indefinitely.

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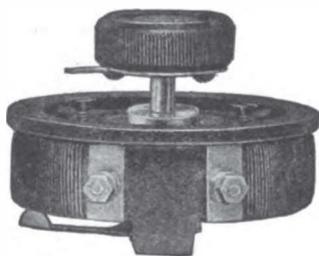
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The General Radio Company has been supplying the leading research and technical laboratories of the country with radio instruments for many years. Our instruments must justify our statements. Every instrument is guaranteed.

When you are interested in radio instruments, why not purchase those which have met with the approval of the leading radio engineers of the country? If you desire instruments for accurate research measurements, we can supply them. If you desire the best working instruments for your radio set, we can supply them.



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This is just one instrument of our complete line. Examine them all.

Send for Free Radio Bulletin 910Q

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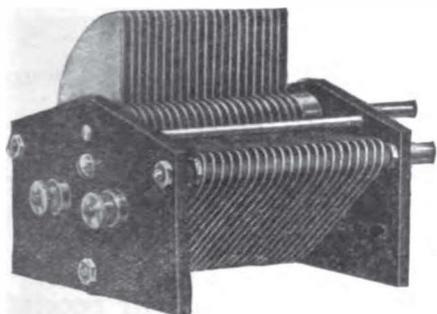
Your set looks better and works easier in a cabinet than it does strewn all over a table, doesn't it? Right!

Your copies of QST are as valuable to you as your pet pieces of "junk." Of course!

You no longer have to stack your magazines in an unhandy pile, or scatter them around where the copy you most wanted to keep will likely get lost. We are illustrating herewith the "QST Cabinet," a binder especially made up for preserving your QSTs, keeping them clean and together in order for quick and easy reference.

The QST binder is in dark red with gold "QST" on back and front. To mount your QSTs, just punch two holes through the binding edge of the magazines, string them on the two clips we furnish, and fasten through the eyelets shown in the cut.

## CESCO Amplifier, \$12.50 Variable Condenser with binding posts for \$2.10

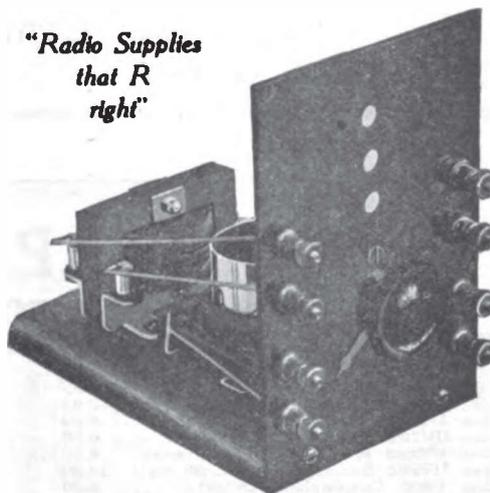


The CESCO 1-Stage amplifier, as shown below, is a winner and a wonder at the price. Neat, compact, durable, efficient, and beautifully finished. Made of XX Bakelite, the tube socket of the 4-prong type to accommodate any standard up-to-the-minute tube. General Radio amplifying transformer, Remler rheostat, and Murdock socket—standard parts, which in the careful process of CESCO manufacture brings it up to the prevailing high quality of other CESCO apparatus, and following the usual CESCO policy, marked at a price which makes it the best buy on the market. Every one fully guaranteed. Price, mailed postpaid to any address in the U. S., \$12.50.

The "Pen Brand" variable condenser has been developed to meet the needs of advanced radio for a more efficient and more convenient condenser at a lower price. The "Pen" has two binding posts to which connection can be made without soldering, the only unmounted condenser manufactured with binding posts. Another exclusive feature of the "Pen" condenser is a special adjusting screw, by means of which the plate adjustment can be stiffened to prevent the variable plates from slipping after the desired wave length has been secured. The best condenser of this type at any price, and priced the lowest of any.

3 plate—\$2.10    11 plate—\$2.60  
23 plat—\$3.45    43 plate—\$4.60

*"Radio Supplies  
that R  
right"*

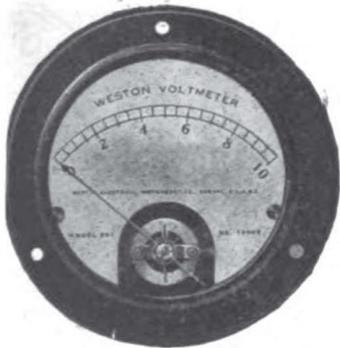


Mail your orders at once. Don't delay. The demand for this apparatus is big, and we cannot promise prompt delivery to meet the demand of both wholesale and retail trade unless orders are mailed promptly. CESCO guarantees the quality. The price speaks for itself. Enough said.

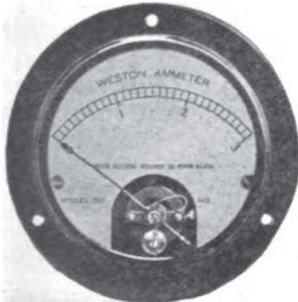
CALIFORNIA ELECTRIC SUPPLY CO.  
643 MISSION STREET, SAN FRANCISCO, CALIFORNIA

## Radio Supplies That R Right

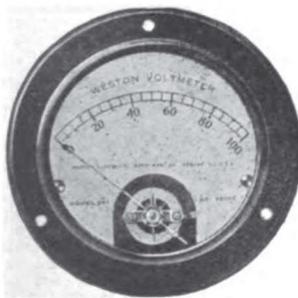




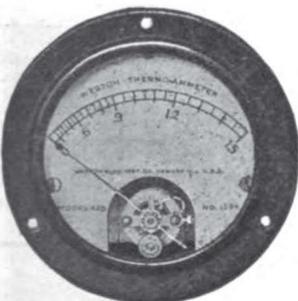
**Filament Voltmeter**



**Filament Ammeter**



**Plate Voltmeter**



**Antenna Ammeter**

## Follow the Expert Don't Blame the Tube!

If a tube fails to give the results you expect, the fault is probably your own. NO ONE can secure maximum tube life or obtain the most perfect results if control is by guess-work. Tubes function to the best advantage within exceedingly narrow limits of voltage, and there is no possible way of keeping the filament voltage within these limits except by using a thoroughly reliable voltmeter.

### Follow the Advice of Experts

When manufacturers of tubes state with unmistakable emphasis that precise control of filament voltage enormously prolongs the life of receiving, amplifying and transmitting tubes and increases their efficiency;

When every conscientious dealer who has your and his own best interests at heart recommends that you prolong tube life by use of electrical measuring instruments;

When all commercial radio workers invariably use instruments for a variety of purposes—

**WHAT REASON HAVE YOU FOR BELIEVING YOU ARE THE EXCEPTION AND CAN GET GOOD RESULTS AND MAXIMUM TUBE LIFE WITHOUT A VOLTMETER?**

The fact of the matter is you cannot do so; why then postpone investigation of this subject? Why continue to face certain tube replacement expense and inferior results?

Send today for Weston Circular "J". This circular contains a complete description of a large variety of instruments for Radio Service.

## Weston Electrical Instrument Co.

158 Weston Ave.,

Newark, N. J.

BRANCH OFFICES IN ALL LEADING CITIES

### RADIO FREQUENCY

Experimenting on our new radio frequency amplifier is now finished and the instrument will soon be on the market and at a price that you cannot afford to be without one. As everyone knows, radio frequency is **THE** amplification and gives dependable results.

### AUDIO FREQUENCY

On our audio frequency amplifier we use a high ratio transformer on the first stage, grid potential on the amplifier tubes, binding posts for use of same or separate storage and B batteries, in fact nothing is left out that improves amplification.

*Write for full information.*

If it's COLUMBIA it's AMPLIFICATION

## PATTERNS

# Something New In Radio

In building a Radio apparatus the lack of mechanical knowledge often handicaps the amateur in such a way that the instrument he builds has not the standard made appearance which is desirable in any Radio apparatus. In order to remedy this, and give the amateur a chance to turn out an efficient and handsome looking instrument, we have designed a special set of patterns enabling anyone to make a standard receiver with all the improvements that can be found in expensive ready-made apparatus.

One of the foremost Radio engineers has constructed this set for us, specially for the amateur, and by our modern, novel methods of construction, anyone is able to make an efficient apparatus for the reception of wave-lengths up to 800 meters.

Complete and very explicit directions go with the pattern which is furnished in a heavy envelope 9x12".

The set consists of two blue prints, size each 19x21 inches and a four page 9x12 in. direction-pamphlet.

**Complete short wave regenerative set.**

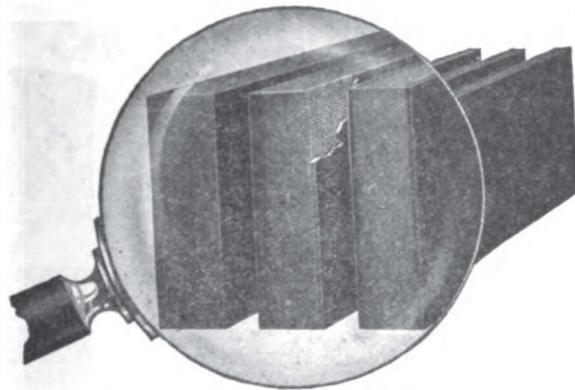
**FOR SALE IN ALL GOOD RADIO STORES**

*If your dealer cannot supply you, send your order to us.*

**Consolidated Radio Call Book Co., Inc., 98-100 Park Place, New York City**

No. 1. Complete pattern for short wave regenerative set each prepaid

50c.



# panels

*Three distinct and exclusive types*

**C**HOOSE the panel best suited to your needs and made to your own individual specifications. Any size or shape you desire—any quantity, one to a thousand—engraved or plain—polished or dull mat surface—plain blank or fully machined and ready for mounting. Diamond F Radio Panel Service gives you the choice of three distinct types of panels, each a leader in its field.

## CONDENSITE CELORON

Grade 10 is the highest type radio insulation made. Extremely high in surface and volume resistivity, high in dielectric strength and low in dielectric losses. It is handsome in appearance, extremely water resistant, machines easily, and will give long lasting, satisfactory service.

## CELORON FIBRE-VENEER

(patent applied for) is made of a hard fibre center section veneered on both sides with Condensite Celoron Grade 10. It meets the demand for quality plus low cost. We recommend it for use in receiving sets and other apparatus where very high voltages at radio frequencies are not involved. It has the same fine surface as grade 10 and similar machining and engraving qualities.

## CELORON SHIELDED PLATES

(patent applied for) are made with a concealed copper wire mesh imbedded directly under the back surface of the plate. This wire shield, when properly grounded, very effectively neutralizes all detuning effects and "howl" caused by body capacities. This type of plate is made in both Condensite Celoron Grade 10 and Celoron Fibre Veneer.

## *Send For Our Radio Panel Guide*

Write to day for our special "Radio Panel Guide", giving complete details regarding all Celoron Radio Panels. This guide quotes prices and enables you to determine just how much any type of Celoron panel will cost in either standard or special size—plain or fully machined, and engraved to your own specifications. Don't fail to get your copy of this important Guide by return mail. Write us immediately. *Dealers:* Our Radio Panel Service enables you to sell panels completely machined and finished to the buyers specifications. No waste. Write for our Special Dealers Proposition.

### DIAMOND STATE FIBRE COMPANY

Bridgeport (near Philadelphia) Penna.

Branch Factory and Warehouse, Chicago.  
Offices in Principal Cities

In Canada: Diamond State Fibre Co. of Canada, Ltd.  
Toronto.

# ANNOUNCING The "Q-R" Vernier Adjuster Price \$1.50

At last you may secure a perfect micrometer adjustment for CW and Phone work and practically eliminate capacity effect from the hands. Easily attached in a few minutes without removing the panel and works on any type of dial.



Pat. Appd. For

OUR PROPOSITION TO DEALERS IS INTERESTING

## ROBINSON SPECIALTY COMPANY

13 WALNUT STREET, "YOUR DEALER HAS THEM" KEYPORT, N. J.

# WIRE PRICES SMASHED

No. 14 Copper Aerial Wire  
35c per lb.

No.	Enamel	S.C.C.	D.C.C.	S.S.C.
20	.19	.24	.25	.39
22	.21	.28	.30	.40
24	.23	.29	.32	.41
26	.25	.32	.36	.50
28	.28	.36	.39	.55
30	.30	.47	.50	.58
32	.33	.60	.63	.75
34	.34	.86	.90	.88
36	.35	1.17	1.26	—

These prices for ¼ lb. spools. ½ lb & 1 lb. spools, proportionate prices. These prices are net and include spools and postage. We carry all sizes, and all forms of insulation. Liberal discounts in quantity lots. Dealers write.

**Wolverine Wire & Mfg. Co.**  
523 S. Main, Shelby, Michigan.

## Prepared Radio Measurements

with  
Self Computing Charts

by *Ralph R. Batcher*

A new WIRELESS PRESS book. Published as a real help to amateur radio. Oblivates the necessity of long and involved mathematical calculations. A ruler or transparent triangle takes the place of intricate figuring and the results will be correct every time.

PRICE \$2.00

### The WIRELESS AGE

*The magazine that meets  
all your expectations.*

When its new you find it in the AGE. Every step in radio progress is fully and carefully described. You miss a lot of good things unless you read the AGE \$2.50 per year, Postage outside U. S. 50c

SPECIAL OFFER ONLY

Prepared Radio Measurements & The Wireless Age 1 Year \$4.00  
Outside U. S. 50c. Extra

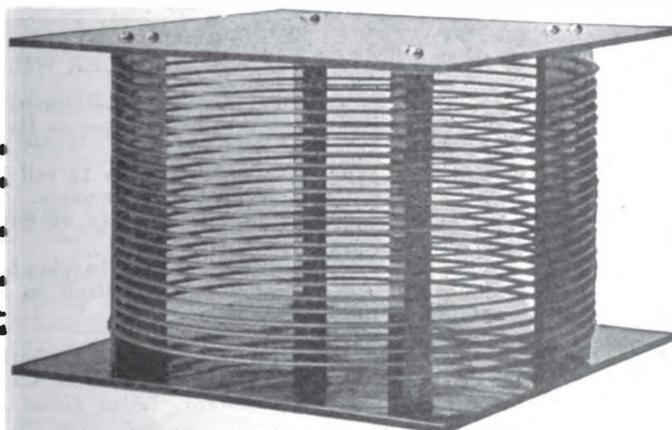
This offer expires Dec. 15, 1921.

**WIRELESS PRESS INC.**

328 Broadway, New York

**C-W C-W C-W C-W C-W C-W C-W C-W**

CW Filters  
 CW Plate  
 Transformer  
 CW Condensers  
 CW Filament  
 Transformer  
 CW Iron  
 Core Chokes  
 CW Radio Fre-  
 quency Chokes



CW Power  
 Tubes  
 CW Rectifier  
 Tubes  
 CW Sockets  
 CW Rheostats  
 CW  
 Microphones  
 CW Tone Arms  
 CW Modulation  
 Transformers

**WIMCO CW 100 INDUCTANCE**

Get the **BEST CW Inductance**. Real connection clips provided, no uncertain switches which short circuit turns. Entirely insulated on Formica, high conductivity copper, very efficient. Made in 25 and 50 turn sizes, priced at \$10.00 and \$13.50 respectively. Also sold in parts ready to assemble.

We distribute the only complete line of panel type meters in America—Thermoammeters, AC and DC Voltmeters, Ammeters and Milliammeters. You can now equip your set with a complete set of meters all alike.

Big line of high voltage generators and motor-generators reasonably priced—just what you have been looking for.

### **SPECIAL NOTICE**

Grid coils for the above CW Inductance are now supplied so that the circuit described in July QST can be employed—and take it from us it is the **REAL** amateur circuit. Grid coil for the CW 100 Inductance priced at \$2.00. Ask for our new bulletin containing full dope on this circuit—try it on your own set, it's a winner.

## **Antenna Specials**

Now is the time to remodel your antenna and we are especially prepared to supply your needs in solid copper, stranded copper and copper-weld aerial wire.

### **Ask about the New Air Gap Type**

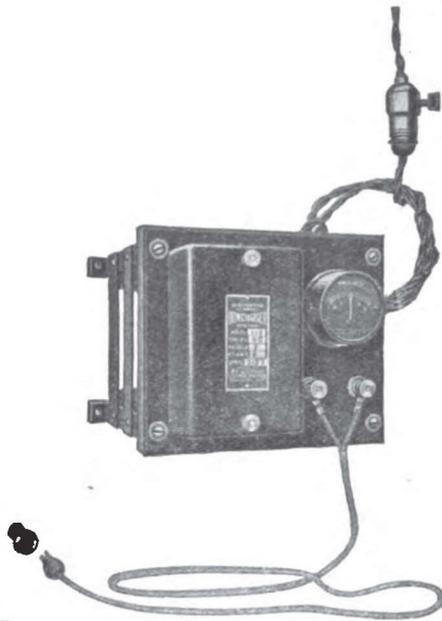
Antenna Insulators—wonderful for CW—priced right—positively superior to present forms and materials.

Send for special Antenna Material Bulletin or send 15c in stamps for catalog and complete literature.

**8ZV WIRELESS MANUFACTURING CO. 8ZV**

**CANTON, OHIO**

WIMCO apparatus is distributed in Canada by Ontario Radio Laboratory,  
 Sault Ste. Marie, Ont.



## CHARGE IT! HOMCHARGER.

WITH A  
THE HOMCHARGER WILL—

1. Charge your battery overnight at a cost of but four or five cents for current.
2. Charge a 3 to 12 cell battery at from 4 to 8 amperes.
3. Double the life of your battery.
4. Eliminate all charging bills and thereby pay for itself in a short time.

When ordering state whether for use with 50 or 60 cycles alternating current. Also direct current types.

PRICE F.O.B. LOS ANGELES OR  
OAKLAND \$20.00

### WESTERN RADIO ELECTRIC COMPANY

637 SOUTH HOPE ST.  
LOS ANGELES

CALIFORNIA

274 TWELFTH ST.  
OAKLAND

### AMATEURS, EXPERMENTERS, DEALERS

We beg to announce our appointment as distributors for  
BALDWIN, BRANDES, MURDOCK, CLAPP-EASTHAM, CHELSEA,  
FIRTH, A B C, DEFOREST, MARSHALL-GERKEN and others  
**SPECIAL THIS MONTH**

Bakelite Cut any size— $\frac{1}{8}$ ,  $\frac{1}{4}$ , and  $\frac{3}{8}$ , 1  $\frac{1}{2}$  c, 2c and 2  $\frac{1}{2}$  c per square inch.  
Mail Orders Promptly Filled.

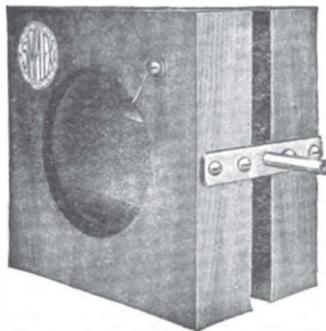
### Pittsburgh Radio and Appliance Co., Inc.

112 DIAMOND STREET,

PITTSBURGH, PA.

"Pittsburgh's Radio Shop"  
Exclusive 8th District Distributors for  
"IDEAL" C W APPARATUS

### VARIOMETERS AND VARIOCOUPLERS



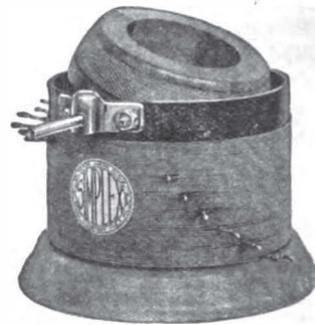
These instruments are wound with extra heavy wire to reduce the resistance, and have special long bearings with a spiral spring inserted to insure a perfect and self cleaning contact at all times. The taps on the Vario-Coupler are arranged in two groups. Furnished with round or square base. Variometer as illustrated ..\$6.00 Vario-Coupler as illustrated 6.00

Round or Square Base

Get them at your dealer's.

**SIMPLEX RADIO CO.**

1013-15 Ridge Av., Phila. Pa.





# EASTERN RADIO

TEL.  
BACK BAY  
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899 BOYLSTON ST.  
BOSTON, MASS.

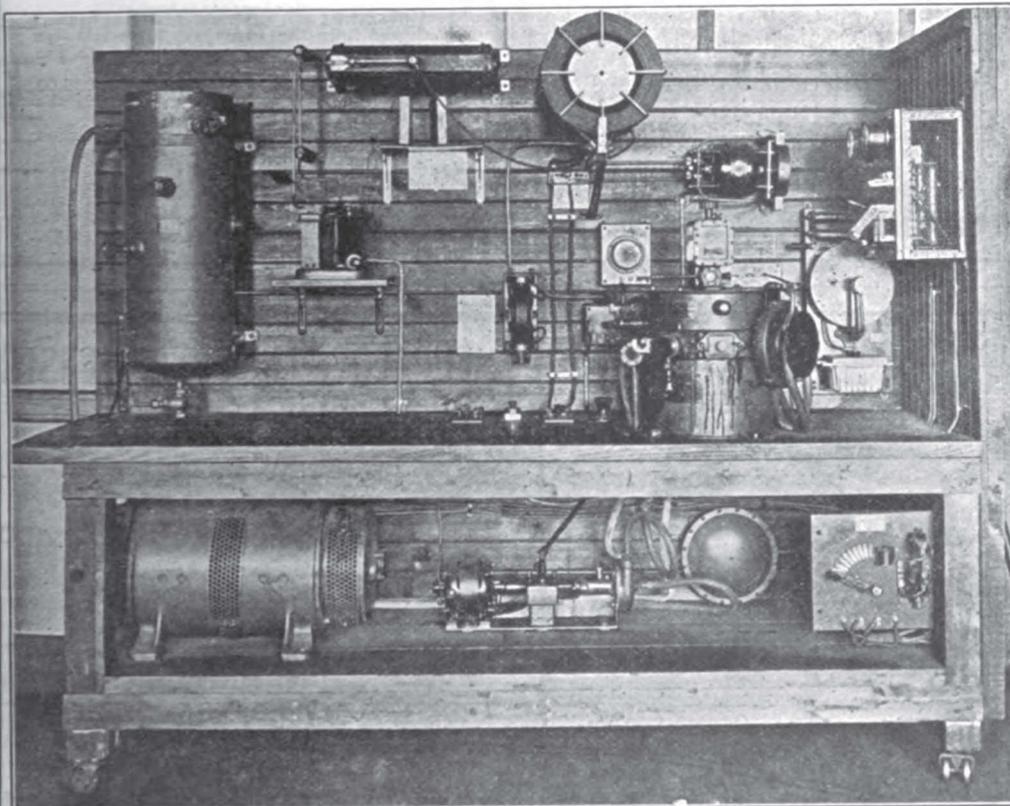
# INSTITUTE



## SPARK---A R C---VACUUM TUBE

The Revised Examination for Commercial Operators including ARC and VACUUM TUBES is carefully and fully covered by the Course of Instruction offered by the EASTERN RADIO INSTITUTE.

Intelligent students INSIST on being taught upon ACTUAL apparatus!



### "The EASTERN RADIO INSTITUTE'S 2 K.W. 'ARC' "

The EASTERN RADIO INSTITUTE is the OLDEST, LARGEST and BEST EQUIPPED Radio school in New England. The Pioneer school that has always led the way! Ask any man in Radio—he will tell you!

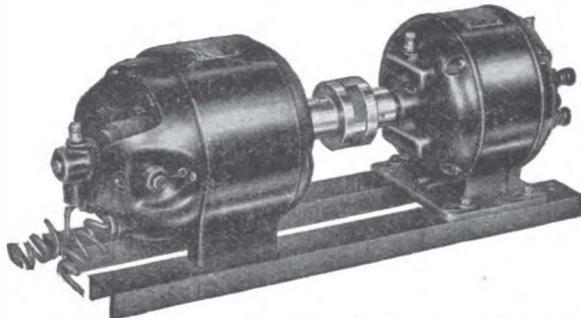
New Students can begin to advantage in the Day or Evening school on any Monday. REMEMBER:—Our ORGANIZATION with YEARS OF PHENOMENAL EXPERIENCE and SUCCESS is behind every man who enrolls! Ask any man in Radio—he will tell you! OVER 4000 satisfied graduates TELL OUR STORY BEST! Why not be one?

Our illustrated prospectus is free. If you cannot visit the Institute send for one.

## F. D. PITTS Director

# The Benwood Motor Generator

MADE FOR RADIOFONE & C.W. WORK



600 volts  
Has 82 segments in commutator, an exclusive feature. Cuts the familiar "hum" down to absolute minimum.

200 watts

### SPECIFICATIONS

**MOTOR**—1-3 hp. Runs at 1750 RPM, 110 volts, 60 cycle. Exceptionally easy running, induction type. Motors for all other standard voltages and frequencies in stock either AC or DC.  
**GENERATOR**—A great deal of thought and effort has been given to this piece of apparatus and it is the finest that has ever been manufactured for radiophone or continuous wave work. There are 84 segments in the commutator (exclusive feature). The generator is very conservatively rated at 200 watts. It will easily

stand a 300 watt load with no appreciable heating. The machine under actual load gave the following results, which are quite remarkable:

Running Cold, No load.....	610 volts
Under 50 watt load.....	580 volts
Under 100 watt load.....	560 volts
Under 150 watt load.....	530 volts

This complete outfit is fully guaranteed for a two year period against all electrical and mechanical defects. It is of the highest grade workmanship throughout and only the very best materials are used in its construction. We specialize on this one size only, thus we are enabled to quote the attractive price of \$95.00 complete.

The motor or generator can be purchased separately. Generator only, \$55.00; Motor only, \$35.00

While we cannot guarantee the generator against electrical breakdown, many stations are driving the machine at 3400 RPM. to obtain 1100 volts for the 50 watt tubes.

Send ten cents for the NEW BENWOOD LOOSE LEAF CATALOG—Contains all necessary information concerning RADIO FREQUENCY.—Shows all the new BENWOOD wireless telephone apparatus.

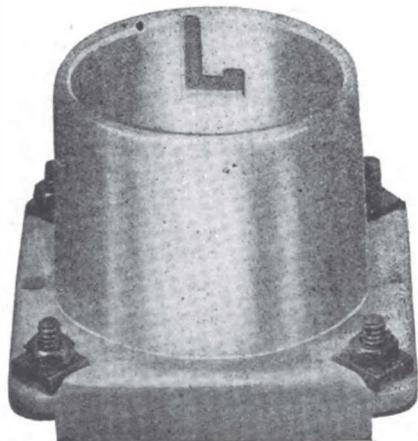
## THE BENWOOD CO., Inc.

1110 Olive Street,

St. Louis, Mo.

## The Original - At The New Price

50 cents each



The original socket with the concealed bayonet slot.

The old adage: "Imitation is the sincerest form of flattery" still holds!

Ask Your Dealer or Write Direct to:

**JOY and KELSEY**

4021 West Kinzie St.

Chicago,

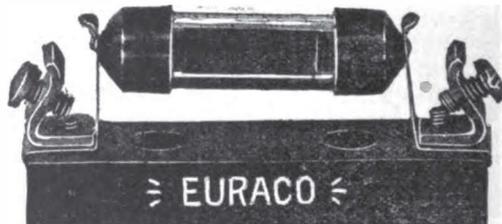
Illinois

## "EURACO" MICA CONDENSER

PRICE 60 CENTS

(.000025, .0001, .00025, .0005 MFD)

Designed to Fit Standard Grid Leak Base



Composed of Copper & Mica, Hand Made  
Compact, Interchangeable, Most Efficient

Bakelite Base with Single Mounting..\$0.40

Bakelite Base with Double Mounting.. .60

Bakelite Base with Triple Mounting.. .80

Interesting Proposition for Dealers

WE HANDLE ALL STANDARD APPARATUS  
PROMPT SHIPMENT—ALL GOODS SENT POSTPAID

**EUROPEAN RADIO CO.**

Mfrs. of Multi-Stage Amplifiers, C.W. & Special  
Apparatus

1342 East 22 St., Brooklyn, N. Y.



## THE STROMBERG-CARLSON No. 2-A RADIO HEAD SET

These Stromberg-Carlson Radio Head Sets reproduce vocal or musical sounds with unequalled distinctness. Fine tonal qualities and extreme sensitiveness, even to weak signals, are features of this high-grade piece of apparatus.

For the past eight years its makers have been recognized leaders in manufacturing professional Radio Head Sets. Back of that is twenty-eight years service in building voice transmission apparatus for telephone companies. Stromberg-Carlson Telephone Receivers and Radio Head Sets are known in every part of the world where telephones and radio stations are installed.

This wide experience has enabled us to produce a new perfected Radio Head Set combining these important requirements:

### SENSITIVENESS

Spools wound with commercially pure small gauge copper wire—this reduces maximum effective ampere turns. Total resistance of set 2000 ohms.

### COMFORT

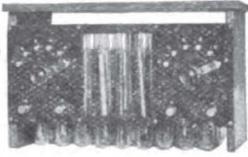
The head band and ear caps are light and correctly shaped. Covered with durable olive brown webbing.

### CONVENIENCE

Removable spring stirrups on the head band and forked cord construction permit quick separation of the receivers thus allowing simultaneous use of the Head Set by two people. Swivel adjustment insures quick and easy fitting to any shape or size of head.

If your dealer is not yet equipped with the Stromberg-Carlson No. 2-A Radio Head Set, order direct from us. Price \$7.50.

**Stromberg-Carlson Telephone Manufacturing Company**  
Rochester, N. Y.



## Storage Batteries

Designed Especially For

# WIRELESS

"Cheapest in the long run"



### KICO "B" BATTERIES

KICO storage "B" batteries will end your "B" battery troubles. YEARS of Real service, saving you money in the end. One charge lasts from three to six months while in your detector plate circuit. Short-circuiting, overcharging or standing idle DOES THEM NO HARM. Durably constructed of the best materials and highly finished making a piece of apparatus which will fit in any station. Can be charged from your A.C. line in one hour after the first charge which takes about four hours. All batteries are supplied with chemicals, rectifiers and directions for setting up. One quart of distilled water puts your battery into service. Money back if unsatisfied within three months trial. Prices as follows

	Plain	With Panels
24 cells 32 V.	\$6.00	\$11.00
36 cells 48 V.	10.00	13.00
50 cells 68 V.	12.00	16.00

### KICO "A" BATTERIES

No more ACID EATEN rugs or furniture. Truly a PARLOR battery, designed especially for wireless den, yet sturdy enough to kick over starter on Ford, Chevrolet or any car taking a battery 9 1/2" x 7 1/2". Box and jars moulded in one piece from ACID-PROOF composition much tougher than hard rubber. A Box that will NOT crack, break or leak in battery use. 6 volt 80 to 100 A.H. capacity, guaranteed for 18 months but will last for years if used only for wireless @ \$24.00

We also manufacture the following sizes designed especially for C.W. work, assembled in especially treated, durable hard wood boxes with hard rubber jars and covers with deep sealing space, sealed with great care to prevent leakage. Guaranteed 18 months.

6 volt 80-100 A.H.	\$20.50
8 volt 80-100 A.H.	27.00
10 volt 80-100 A.H.	33.00

Batteries shipped fully charged ready for use with hydrometer and full instruction for upkeep. Special sizes built to your specifications.

Circulars furnished upon request.

**KIMLEY ELECTRIC CO., 290 Winslow Ave., Buffalo, N. Y.**

# ACME

## C.W. APPARATUS

Has stood the test of time. Less than one instrument in every thousand that Acme has made has come back for replacement, or even repairs.

Take the uncertainty out of C.W. by using Acme apparatus throughout.

There is an Acme instrument for every C.W. need.

Get an Acme bulletin at your dealers or direct from us.

## Acme Apparatus Co.

194 Massachusetts Ave.,  
Cambridge, Mass.

## Using An Inefficient Radio Set Is A Disappointment

We won't disappoint you because we handle the things that are really worth while in Radio. Our stock includes receiving and transmitting apparatus desirable for Spark, C.W. and Phone made by:

Grebe	Pacent
Westinghouse	Cunningham
Acme	Tuska
Burgess	Federal
Magnavox	Clapp-Eastham
Remler	Baldwin
Chelsea	Jewell
Murdock	

Pioneer makers of Andrae Telephones. In business 60 years.

Our service is of the best and the quality of our goods unquestionable. Identified with telephone and electrical development of the Northwest since its beginning.

**Julius Andrae & Sons Co.**  
119 Michigan Street,  
MILWAUKEE

# RADIO APPARATUS

*Distributors of Reliable Radio Apparatus to Dealers, Schools, Colleges, Radio Clubs and Experimenters All Over the World!*

**"PITTSO"**

**SERVICE DISTRIBUTES  
"RADIO CORPORATION'S"  
PRODUCTS ALL OVER  
THE WORLD! TRY US  
AND SEE!**



**"PITTSO"**

**NOW HAS TWO STORES!  
BOTH CARRY "RADIO  
CORPORATION'S" COM-  
PLETE LINE. ORDER TO-  
DAY FROM THE NEAREST!**

## RADIO CORPORATION'S PRODUCTS

No. UV-200 Radiotron, Detector .....	35.00
No. UV-201 Radiotron Amplifier .....	6.50
No. UV-202 Radiotron 5 watt tube .....	8.00
No. UV-203 Radiotron 50 watt tube .....	30.00
No. UV-204 Radiotron 250 watt tube .....	110.00
No. UT-501 End-mountings for UV-204 .....	2.50
No. UT-502 End-mountings for UV-204 .....	2.50
Per Pair .....	4.50
No. UR-542 Porcelain Socket .....	1.00
No. UP-552 Bakelite Socket .....	1.50
No. UT-541 Porcelain Socket for UV-203 and UV-217 "Kenotron" tubes .....	2.50
No. UV-216 20 watt "Kenotron" tube .....	7.50
No. UV-217 150 watt "Kenotron" tube .....	20.50
No. UP-1368, 325 watt C.W. Transformer .....	25.00
No. UP-1016, 750 watt C.W. Transformer .....	38.50
No. UL-1008 Oscillation Transformer .....	11.00
No. UT-1343 Magnetic Modulator, 1/4, to 1 1/4 amp. .....	9.50
No. UT-1357 Magnetic Modulator 1/4, to 3 1/4 amp. .....	12.50
No. UT-1267 Magnetic Modulator 3/4, to 5 amp. .....	17.00
No. UP-1626 Filter Reactor, 160 Milli-amperes .....	11.50
No. UP-1627 Filter Reactor, 300 Milli-amperes .....	15.75
No. UP-415 Plate Circuit Reactor .....	5.75
No. UC-1631 Filter Cond. 1/4 MFD 750 Volts .....	1.35
No. UC-1632 Filter Cond. 1 MFD 750 Volts .....	1.85
No. UC-1634 Filter Cond. 1/4 MFD 1750 Volts .....	1.50
No. UC-1635 Filter Cond. 1 MFD 1750 Volts .....	2.00
No. UP-1719 Trans. Grid leak 5000 ohms .....	1.10
No. UP-1718 Trans. Grid Leak 5000 ohms for UV-203 and UV-204 Tubes .....	1.85
No. UM-530 Hot Wire meter, 0-2 1/4 Amps. .....	6.00
No. UM-533 Hot Wire meter, 0-5 Amps. .....	6.25
No. UQ-809 Sending key for C.W. Transmission .....	3.00
No. UP-414 Microphone Transformer .....	7.25
No. PR-535 Filament Rheostat for UV-200, 201 and 202 tubes .....	3.00
No. PT-537 Filament Rheostat for UV-203 and UV-204 tubes .....	10.00
No. PX-1638 Rotary Grid Chopper .....	7.25
Shaft Bushings for 1/4" or 5/8" motor shaft .....	.20
No. UC-1015 Antenna Series Condenser, 7500 Volts .0003 .0004, .0005 MFD 3 values .....	5.40
No. UC-1014 Plate and Grid Condenser, 3000 Volts .002 MFD .....	2.00
No. UC-1803 Special Condenser, 10,000 Volts .000025 MFD .....	5.00
No. UC-1806 Special Condenser, 6000 Volts, .002 MFD .....	7.00
No. UV-712 Amplifying Transformer .....	7.00
No. PR-536 "A" Battery Potentiometer .....	2.00
No. UC-567, .00025 MFD Grid and Plate Condenser .....	1.20
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No. UC-569, .001 MFD Grid and Plate Condenser .....	1.50
No. UC-570, .0025 MFD Grid and Plate Condenser .....	2.00
No. UP-509 to UP-527 Grid Leaks .05 to 5 megohms, each .....	.75
No. UX-543 Grid leak mounting .....	.50
Note—Radio Corporation's C.W. Instruction Book giving hookups, and complete information .....	.25

## Announcement!!!

The policy of the F. D. PITTS CO. has been and will be to render a "Superior Service", a Service based on carrying in stock for immediate delivery all desirable Radio apparatus, to serve our customers promptly and intelligently and to make them feel that we are truly grateful for their patronage.

In order to accommodate our ever increasing business we take pleasure in announcing the opening of OUR NEW STORE at PROVIDENCE, R. I. in the WOOLWORTH BLDG., at 193 Westminster Street, the very heart of the business section.

Mr. H. H. Tilley, a valued member of our organization will be in charge. His experience is wide and diversified, having in turn been an Amateur, Commercial Operator, Engineer, Instructor and Sales-Manager. You are cordially invited to visit our new store and experience real SERVICE.

If at any time you are interested in Radio to the extent of desiring instruction, Amateur or Commercial; Spark, Arc or Vacuum tube, let the EASTERN RADIO INSTITUTE train you—New England's, Oldest, Largest and Best equipped Radio School. For over six years I was Chief Instructing Engineer at this Institute, and I am in a position to know! Over 4000 satisfied graduates tell the story best! Our Organization with Years of phenomenal Results and Success is behind every man who enrolls.

F. D. PITTS  
President and General Manager

**"LET 'PITTSO' PRODUCTS, SUPER-SERVICE, AND DELIVERY SOLVE  
YOUR RADIO PROBLEMS"**

**SEND US YOUR ORDER TODAY!**

Send ten cents for Catalog No. 22. Over 100 pages, over 150 illustrations, over 600 items.

## F. D. PITTS CO., INC.

Branch—Woolworth Bldg.

12 Park Square, Boston, Mass. 193 Westminster St., Providence, R. I.

# RAY-DI-CO Reduces Prices

Increased production and volume sales makes possible the most drastic price cut this year on Radio equipment. Ray-Di-Co's high quality, workmanship and materials are upheld.

ST 4	- - -	\$64.75
	40 Watt 350 Volt	
ST 15	- - -	\$97.50
	150 Watt 500 Volt	
ST 25	- - -	\$138.50
	250 Watt 1000 Volt	

All motor generators are the four bearing type. The units are coupled together by means of flexible insulated couplings. Both units mounted on cast iron sub base insuring perfect alignment—armatures carefully balanced—no vibrations—large surface wick oiled bearing. Machine designed for continuous duty.

All standard Radio Equipment parts and accessories in stock.

## THE RAY-DI-CO ORGANIZATION

1547D N. WELLS STREET,

CHICAGO, ILLINOIS

*Prompt attention given to Mail Orders.*



Established 1868

## THE ROSENBAUM CO.

Pittsburgh, Pa.

We sell all standard apparatus from the best manufacturers. SEND US YOUR ORDERS from your catalogues.

Purchases delivered free to your nearest Shipping Point. Prompt Service.

## WE USED OUR BEAN

In Designing

THE PARKIN DIAL TYPE RHEOSTAT (Pat. pending) and by mounting the resistance element in a circular groove in the back of a 3" molded Bakelite dial eliminated one part and saved you the cost of a dial. The groove being recessed, allows the dial to clear the panel by the usual distance of  $\frac{1}{8}$ ". An off position is provided and a stop on the dial engages the stationary contact at the extreme positions. The 360 degree rotation insures fine adjustment. A brass bearing insures a true running dial and smooth action.

All figures and graduations are filled with brilliant white enamel. All brass parts nickel plated. Bakelite knob.

Resistance is 5 ohms, carrying capacity 2 amps.

No. 77 Parkin Dial Type Rheostat Postpaid \$1.75  
FOR SALE BY ALL LEADING DEALERS

Send for free catalog No. 4 describing our complete line.

DEALERS: Write for proposition.

PARKIN MFG. CO., San Rafael, Calif.



# L. P. F.

LOWEST POWER FACTOR

## G.A. Standardized Instrument Panels

**L. P. F.** should be your choice for all instrument panels not only because of its freedom from losses at high frequencies but because of its mechanical advantages.

Bureau of Standards tests show that it has the Lowest Power Factor of any sheet insulation, 0.7% against 3.5% for the best substitute material, and these tests were made at the low wavelengths at which losses are most marked.

In appearance L. P. F. has polished jet black surfaces which take a handsome grain finish and do not turn grey. In dimensions L. P. F. panels are accurate to  $\frac{1}{16}$  in., with true right angle corners, smoothly cut. You can drill, tap, file and cut L. P. F. more easily than other panels. You can throw them across the room but they will not chip or crack. You can subject them to the severest tests and L. P. F. panels will come out on top every single time.

Moreover, in buying L. P. F. you get its electrical and mechanical advantages at a lower price than is charged for inferior substitutes. You can get these panels from your local dealer or directly from the G. A. Company. And remember that every panel carries a yellow label bearing the name "L. P. F." and the G. A. trade mark. A panel which does not bear this label is not L. P. F.

Length	Width	Thickness	Weight	Price
5 ins.	2 ½ ins.	$\frac{1}{8}$ in.	3 oz.	\$0.33
5 ins.	5 ins.	$\frac{1}{8}$ in.	6 oz.	.66
10 ins.	5 ins.	$\frac{1}{8}$ in.	12 oz.	1.31
10 ins.	10 ins.	$\frac{1}{8}$ in.	1 ½ lbs.	2.62
15 ins.	10 ins.	$\frac{1}{8}$ in.	2 ½ lbs.	3.93
5 ins.	7 ½ ins.	$\frac{1}{8}$ in.	½ lb.	.99
10 ins.	7 ½ ins.	$\frac{1}{8}$ in.	1 lb.	1.97
15 ins.	7 ½ ins.	$\frac{1}{8}$ in.	1 ½ lbs.	2.97
20 ins.	7 ½ ins.	$\frac{1}{8}$ in.	2 lbs.	3.74
5 ins.	2 ½ ins.	$\frac{1}{4}$ in.	2 oz.	.24
10 ins.	2 ½ ins.	$\frac{1}{4}$ in.	4 oz.	.45

If it doesn't bear the yellow label, it isn't L. P. F.

### RADIO and MODEL ENGINEERING

Did you see the article in the December R and M on a rectifying unit for undamped wave telegraph and telephone transmitters, or the one on tuned plate receiver for 150 to 600 meters? Better send for that issue before it's too late. And you want the dope on radio telephone receiving sets in the January number. There were also some handy ideas that will take the kinks out of your shop work too.

When you send in for these back issues put in a dollar extra for a year's subscription to start in with February. R and M gives you the best in strictly practical, construction articles.

BACK COPIES PREVIOUS TO DECEMBER 1921 ARE NOT AVAILABLE

**The General Apparatus Co., Inc.**

570-T West 184th Street, New York  
 Represented in every city of the United States and Canada where radio work is done. Send 10c. in stamps for the new G. A. catalog.

# RESULTS!!

DX  
RADIO  
FREQUENCY  
AMPLIFYING  
TRANSFORMERS



WILL  
Bring in that  
LONG DISTANCE  
RADIO  
CONCERT

## ON COIL AERIAL

All U. S. Amateur

RECEIVING RECORDS BROKEN

with the

DX-1 Radio Frequency Amplifying Transformers  
Simple Amplifier Construction

Circuit Diagram Sheet 25c  
Complete data on 4½ ft.  
Coil Aerials 50c



Send Stamp for  
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Dealers being supplied

RADIO INSTRUMENT COMPANY

HUTCHINS BUILDING,

WASHINGTON, D. C.

### HYGRADE SPECIALS

Save You Money

Audiotron Tube Two Filaments	.. \$5.50
Radio Service V.T. Sockets	.... .80
22 ½ V. Cyclone Small B Battery	.. .90
22 ½ V. Cyclone Large B Battery	.. 1.60
45V. Cyclone Large Variable B Battery	..... 2.75
22 ½ V. Large Eveready Variable B. Battery	..... 2.50
Binding Posts (rubber Cap) per doz.	.. .75
.0005 MF. Grid Condensers	..... .25
.002 MF. Phone Condensers	..... .25
Variable Grid Leaks ½ to 3 meg- ohms.	
Electroze Ball Insulators 28c each, per doz.	..... 3.00

#### Marko Storage Batteries

4 Volt 40 Amp.	..... \$7.50
4 Volt 60 Amp.	..... 10.50
6 Volt 40 Amp.	..... 10.50
6 Volt 60 Amp.	..... 14.00
6 Volt 80 Amp.	..... 18.00

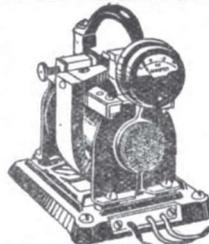
We do not charge for crating  
Above batteries are fully charged when Shipped. The above  
prices are F. O. B. New York.

**Hygrade Electrical Novelty Co.**

41 West 125th Street. New York.

### 10c. Charges Your Storage Battery AT HOME WITH AN F-F Booster

So You will never have to give up, in disgust when working a distant station. Is it not gratifying to feel that your filament battery will always be ready when you want it? You Know What its like to have friends call to "LISTEN IN" & then find your battery dead. F-F Battery Boosters are automatic and operate unattended. Screw plug in lamp socket, Snap Clips on Battery Terminals and see the gravity come up.



The AMMETER shows you just the amount of current flowing. Both waves of current are rectified thru adjustable and easily renewable carbon electrodes which maintain a constant efficiency and last for thousands of hours. Everything Complete in One Compact, Self-Contained, Portable Charging Unit. F-F Boosters are Magnetic Rectifiers for 105-125 Volt 60 Cycle Alternating Current. PRE-WAR PRICES:  
Bantam Type 6 charges 6 Volt Battery at 6 Amperes \$15  
Bantam Type 12 charges 12 volt Battery at 5 Amperes \$15  
Type 168 Charges 6 Volt Battery at 12 Amperes \$24  
Type 1612 Charges 12 Volt Battery at 7 Amperes \$24  
Type 1626 Charges Both 6 and 12 Volt Batteries \$36

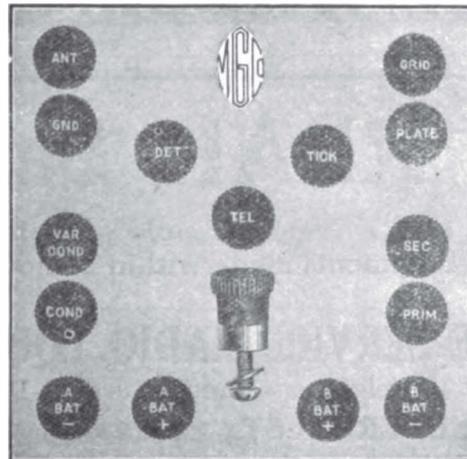
Shipping Weights Complete 12 to 15 Pounds  
Order from your Dealer or send check for Prompt Express Shipment. If via Parcel Post have remittance include Postage and Insurance Charges. Or have us ship C.O.D. Other F-F Battery Boosters charge batteries from Farm Lighting Plants, Direct Current Circuits and D.C. Generators. For Group Charging use our Full Wave Automatic F-F Rotary Rectifier of 100 Volt, 36 cell capacity. Order Now or Write for Free BOOSTER Bulletin No. 31 or ROTARY 31A OFFICES & WORKS  
**The France Mfg. Co.** CLEVELAND, OHIO, U.S.A.  
Canadian Representative: Battery Service & Sales Co. Hamilton, Ontario, Can

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Our manufacturing facilities are completely employed in manufacturing the following—the well known Marshall-Gerken quality is built into every part. New Moulded Variometer—Super Standard Vario Coupler—Detectors and Amplifiers—New “Read ‘Em” Binding Post—Small Parts and Switch Arms.

## New “Read ‘Em” Binding Posts 16 Styles - Engraved - Not Stamped



Complete Post and Knob 15c each

Antenna  
Ground  
Condenser  
Tickler  
Variable Condenser

A—Battery +  
A—Battery —  
B—Battery +  
B—Battery —  
Plate  
Filament

Detector  
Phones  
Secondary  
Primary  
Grid

### THE MARSHALL-GERKEN CO.

Manufacturers—Jobbers

TOLEDO

OHIO

# DEALERS GET SPECIAL PROPOSITION

Send to KLAUS—"Radio Headquarters" for special discount lists and bulletins on apparatus and equipment. Our service department offers dealers assistance and advice on radio problems. We distribute "tested" apparatus. We know the equipment we send you is right. We want all Agents and Dealers to get our special proposition on the best lines of apparatus made.

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Write today to---

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**FIRST TESTED THEN SOLD**

## For REAL Service

Mail your orders to us. We can supply you with the BEST at the BEST PRICES. Shipments made within 24 hours after receipt of order.

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\$22  
AT YOUR  
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Designers—Manufacturers—Distributors

225 SUPERIOR ST.,

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## KECO-RADIO STORAGE BATTERIES



Are the highest grade batteries built especially for wireless instruments.

Solid oak box, natural finish, highly varnished. 6 volt, 7 heavy "Cristal" plates per cell, 50 amps.

We are one of the largest builders of exclusive high grade Wireless Batteries in the country. Thousands in use. Sold by all leading dealers or shipped direct from factory, \$20, with book of uses and abuses of the storage battery.

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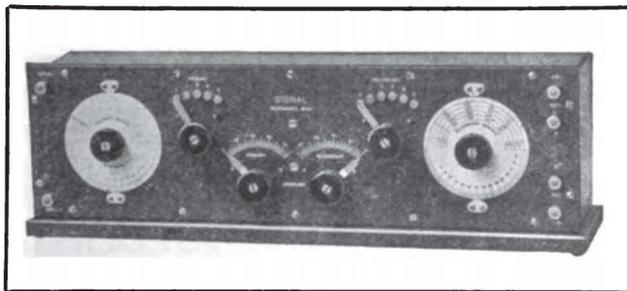


## Do You Take Only "Half Way" Pride in Your Radio Work?

It is impossible for the radio-electrician—professional or amateur—to take real pride in his work with inferior or "half way" instruments.

Whether in the first-grade—or taking a "P. G." in the great School of Radio, you owe it to yourself to be particular to the point of "fussiness" over your equipment.

Consult Radio experts, teachers and students who **know** about



A popular Signal Product—The new short wave Tuner, R-37-C. Described in the new Bulletin.

### "SIGNAL"

Then check up Signal **wireless apparatus** with other makes, price for price, feature for feature. If you do this your choice will invariably be—"SIGNAL". Write us today for literature, names of users and nearest distributor.

**Signal Electric Manufacturing Company**

**Menominee, Michigan**

**EVERYTHING FOR THE RADIO NOVICE AND PROFESSIONAL**

# TUSKA

\$1.10



Type 211

\$7.00



Type 233

\$1.10

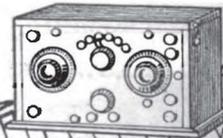


Type 212

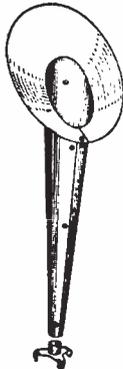
The Tuska Variocoupler is completely moulded. The rotor and primary are wound with green silk wire. Not only is the instrument striking in appearance but highly efficient in design.

Send 5c for Catalog #2

**THE C. D. TUSKA CO.**  
HOADLEY PLACE, HARTFORD, CONN.



## Use this Straight Horn



to eliminate distortion and obtain maximum output from weak signals.

THE STRAMCY HORN has been designed to eliminate as far as possible "horn sounds." It is 20" high and is made of special fibre composition. It is light in weight and stands upright on a telephone when the STRAMCY COUPLER is used. Two horns are better than one on account of variation of tone in different telephones. Buy one for each telephone.

THE STRAMCY COUPLERS enable you to fasten the HORNS to your telephones. They fit over the caps of the telephones and are held firmly in position by three springs. They also fit the tone arm of the Victor or Columbia

phonograph so that you may use the phonograph horn. Made of brass and nickel-plated.

MAILED POSTPAID ON RECEIPT OF PRICE

Price of HORN 75c each  
Price of COUPLER 50c each



## STRAMCY PRODUCTS

P. O. Box 435, NEWARK, N. J.

## Radio Frequency Transformers

TYPE RT-1 for amateur and broadcasting range

PATENT PENDING

175-500 meters . . . . . \$6.00

Hook up a radio transformer ahead of your detector and get acquainted with stations you have not heard before.

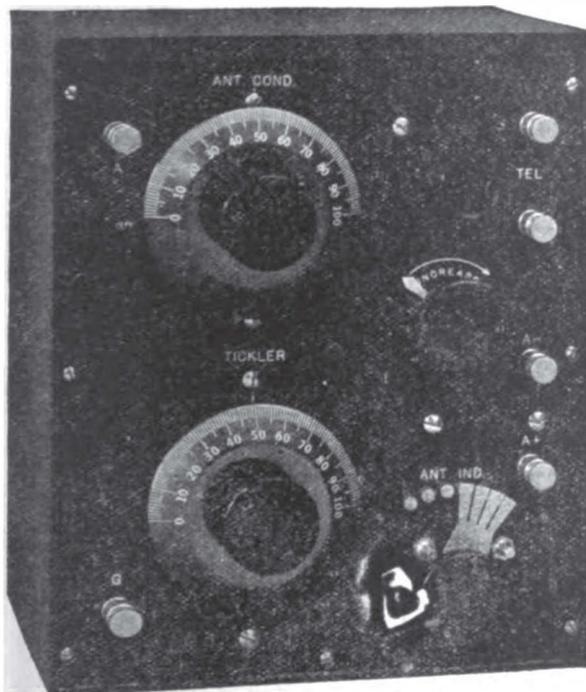


The RT-1 Transformer works on all standard makes of tubes.

**Radio Service Laboratories, Inc.**  
ASBURY PARK, N. J.

# Here's A Receiving Set That Is Guaranteed

—The Clapp-Eastham, Type HR Regenerative Receiver: And the price is only \$35. It's an easy thing to find a set that costs more money, but we'll guarantee that no matter what price you pay, you can't get a set that gives better, more satisfactory results.



Licensed Under Armstrong U. S. Patent No. 1,113,140

Tuning is as easy as setting the hands of a watch, and the distance at which signals are received and the sharpness and loudness of tunes is almost beyond belief. Regeneration is perfect on all wave lengths between 180 and 825 meters. Antenna Condenser built as a vernier. "B" Battery may be placed in compartment inside cabinet or external "B" Battery may be used.

The experienced radio man will appreciate the quality indicated by these specifications:

Panel—Formica, handsomely finished.  
 Cabinet—Dark Oak, varnish finish.  
 Condenser—Balanced type, 2 rotary, 8 stationary plates.  
 Dials—Indestructible metal. White figures on black ground.  
 Antenna Inductance—Wound on Formica tube.  
 Plate Inductance—Wound on moulded ball.  
 Binding Posts—Nickel-plated brass.  
 Switch—Fan Blade.  
 Rheostat—C.E. type H 400.  
 Circuit—Single Circuit regenerative.  
 Licensed under Armstrong U.S. Patent 1113140.

If you're looking for the most efficient receiver that can be obtained at any price, ask your dealer to show you the C-E Type—or write us direct.

Send 6c in stamps for a complete Radio Catalog. Each of its three parts describes equally interesting items and it covers every radio essential from the smallest to the largest item.

## CLAPP-EASTHAM COMPANY

RADIO ENGINEERS *and* MANUFACTURERS

114 MAIN STREET,

CAMBRIDGE, MASS.

California Representative: Leo J. Meyberg Co., San Francisco and Los Angeles

127-19

# T & H Radio Company

Largest Radio Stock In Mid-West

Immediate Deliveries

All items listed are in stock in large quantities.

## CW APPARATUS

UV202 5 watt Radiotron .....	\$8.00
UV 203 50 watt Radiotron .....	30.00
UV216 Kenotron Tubes .....	7.50
UV217 Kenotron Tubes .....	26.50
UR542 Porcelain Socket .....	1.00
UR541 Porcelain Socket .....	2.50
PR535 Filament Rheostat .....	3.00
PR537 Filament Rheostat .....	10.00
UP1719 Grid Leak .....	1.10
UP1718 Grid Leak .....	1.65
Acme CW Inductance .....	8.00
Acme 200 Watt CW transformer .....	20.00
Acme 500 Watt Power Trans. ....	25.00
Acme Choke Coils, single .....	6.00
Acme Choke Coils, double .....	8.00
Acme Modulation Transformer ...	5.00

## RECEIVING APPARATUS

UV200 Radiotron, detector .....	\$5.00
UV201 Radiotron, amplifier .....	6.50
Electron Relay, detector .....	5.00
A. P. Amplifier tube .....	6.50
Grebe CR9 with amplifier .....	130.00
Grebe CR8 150-1000 meters .....	80.00
Grebe CR5 150-3000 meters .....	80.00
Magnavox, 14" horn .....	45.00
Burgess #2156 "B" Battery ..	3.00
Burgess Tapped "B" Battery ...	2.75
Baldwin Receivers type C .....	12.00
Baldwin Receivers type E .....	13.00
Baldwin Receivers type F .....	14.00
Brandes "Superior" receivers ....	8.00
Acme Amplifying transformers ..	5.00
Honey Comb Coils, all sizes	

Inquire for monthly stock sheet, shows our complete stock each month. ...CW and radiophone catalog sent any address when four cents in stamps accompanies inquiry.

5th District Distributors for Ideal Apparatus Co.

# T & H Radio Company

ANTHONY,

9ZAC

KANSAS

## 3 NEW LITTLE EBY'S, BOYS

Triplets? GOSH NO!!! Because—

2 are BLACK (Insulated) & 1 is WHITE (nickel)

Posts shown are our two latest "BLACK BEAUTIES" ("Junior" & "Junior H") and they sure are Beauts, too. They look just like our "Ensign" post but cost less as knobs are removable.

"BUDDY," our WHITE post, (not shown) is our latest metal post and it's a PIPPIN. It looks like our "Corporal" post but is furnished with a stud and nut; now making it a cinch to mount. Price of "Buddy" complete, nickel finish 15c.

AT LAST! Boys, your long desire to equip your set with EBY posts can now be realized. DEALERS & MANUFACTURERS—Order a stock of these LIVE sellers immediately at our usual attractive discounts.

(Please note price of JUNIOR in Feb. QST should have been 15c each.)

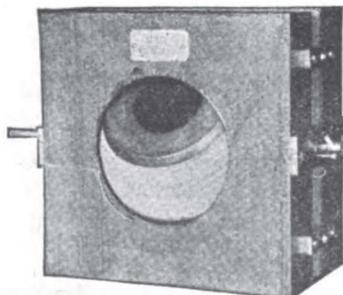


"Junior" 15c (including nut and washer)



Junior H" 15c (including nut and washer)

THE H. H. EBY MFG. CO., 605 ARCH ST., PHILADELPHIA, PA.



We have in stock panels, switches and other apparatus to complete your set.

## TUNESHARP VARIOMETERS

At the following prices are without doubt the best buy on the radio market today.

### VARIOMETERS VARIOCOUPERS

Complete.....	\$5.00	Complete.....	\$4.00
Unassembled... 4.00		Unassembled... 3.00	

(P.P. Wt. 3 Lbs.)

(P.P. Wt. 2 Lbs.)

Complete Knocked Down Set Wound \$10.00

(P.P. Wt. 6 Lb.)

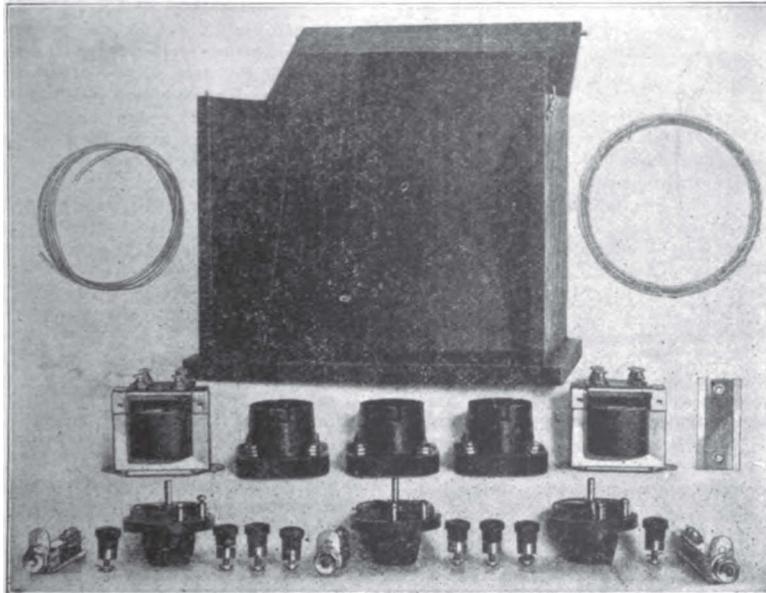
"The House of Service"

## LINZE ELECTRICAL SUPPLY CO.

1129 Olive St., Dept. Q3 St. Louis, Mo.

# "CHI-RAD" APPARATUS

## K-D DETECTOR-AMPLIFIER SET



**PRICE COMPLETE AS SHOWN - - \$25.00**

Add PP on 10 lbs.

Everything to build a high grade detector and two step amplifier at the usual "Chi-Rad" price. Immediate delivery—send in your order today!

### SPECIFICATIONS

- |  |                              |
|--|------------------------------|
| Solid oak cabinet, hinged cover to take panel 7"x9". | 1 Grid Condenser.            |
| 1 Black Formica panel 7"x9".                         | 3 DeForest Sockets.          |
| 2 Thordarson Amplifying Transformers.                | 1 roll spaghetti tubing.     |
| 1 roll tinned copper wire.                           | 8 Hard rubber binding posts. |
| 3 Fada Rheostats.                                    | 1 Single Federal Jack.       |
| 2 Double Federal jacks.                              |                              |

#### VACUUM TUBES

- Cunningham Detector . . . . \$5.00  
 Cunningham Amplifier . . . . 6.50

#### HEADSETS

- Murdock 56, 2000 Ohms . . \$5.00  
 Murdock 56, 3000 Ohms . . 6.00  
 Federal 2200 Ohms . . . . 8.00  
 Brandes, Superior type . . . 8.00  
 Brandes, Navy type . . . . 12.00  
 Baldwin, Type C . . . . . 12.00  
 Baldwin, type E . . . . . 13.00  
 Baldwin, type F . . . . . 14.00

#### TELEPHONE PLUGS

- Western Electric . . . . . \$0.75  
 Firco, round type . . . . . 2.50  
 Firco, flat type . . . . . 2.00

#### B BATTERIES

- Burgess, small 22 volts . . \$2.25  
 Burgess, tapped . . . . . 2.75  
 Burgess, large 22 volts . . 3.00  
 "Chi-Rad" new storage B  
 Battery, 2 volt cell, each . . .40

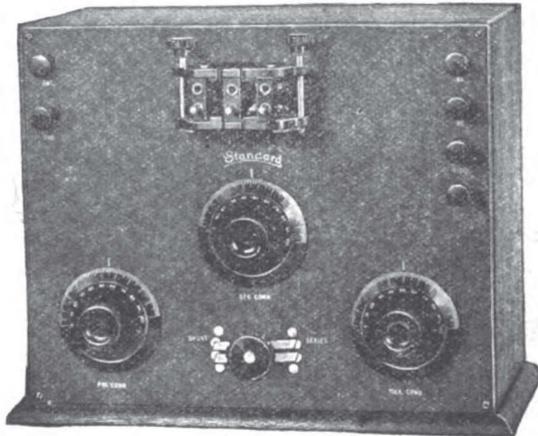
#### LOUD SPEAKERS

- Station type Vocaloud . . \$30.00  
 Radio Magnavox . . . . . 45.00

Watch next month for announcement of the new "Chi-Rad" Loud Speaker. A real instrument at the right price. Dealers wire or write for discounts on "Chi-Rad" Apparatus—it is priced reasonably low—yields you a good profit and is in demand by Radio-men everywhere.

**CHICAGO RADIO APPARATUS CO., Inc.**  
 508 So. Dearborn St., (Second floor) Chicago, Ill.

## THE STANDARD PLAN—"ASSEMBLED BUT NOT WIRED"



MULTIPLE WAVE TUNER

The Standard plan of distributing high-grade Radio instruments,—fully assembled but not wired,—is ideal for the experimenter who wishes to incorporate his own circuit and at the same time save the wiring cost. The Standard Assembling Co. does all the actual panel drilling and assembling, which is essentially machine work,—and leaves the wiring, which is hard work, for you to do. This offers you an average saving of 20% or more and is the only way in which you can secure correctly machine made instruments without paying for the expensive hand wiring, which you can do just as well. The multiple wave tuner shown here is an example of the Standard plan. It comes to you fully assembled but unwired for \$45.00, a clear saving of at least \$10.00 on what you would ordinarily pay for such a high-grade instrument.

*This tuner will be shipped anywhere in the United States upon receipt of one third the purchase price. Examine the instrument carefully and if acceptable, remit the balance. If you are not perfectly satisfied, simply return the instrument and we will refund your deposit. If you do not wish to order at once, send a stamped return envelope for our literature describing the complete line of Standard instruments.*

**STANDARD ASSEMBLING CO. 91 BRIDGE ST., N. Y. C.**

### IMMEDIATE DELIVERY

Cardboard Tubes, Seamless, Gray, 1/2 Wall 2 1/2 x 12 25c; 3 x 12 30c; 3 1/2 x 12 36c; 4 x 12 40c; 4 1/2 x 12 48c; 5 x 12 50c; 6 x 12 60c.

Contact Points—Nickel . . . . . 6 for 30c  
 Contact Points—Brass . . . . . 6 for 25c  
 Stops—Nickel . . . . . 2 for 10c  
 Phone Binding Posts—Nickel . . . . . Each 15c  
 Binding Posts, H.R. Top—Nickel . . . . . Each, 10c  
 Binding Posts, H.R. Top—Nickel . . . . . Each, 15c

BRASS BODS, POLISHED and DRILLED

1/4 x 7 . . . 15c	1/4 x 7 . . . 20c	SLIDERS
1/4 x 9 . . . 15c	1/4 x 9 . . . 20c	1/4 . . . 25c
1/4 x 13 . . . 20c	1/4 x 13 . . . 25c	1/4 . . . 30c

MAGNET WIRE

Price Per	1/2 lb	1/4 lb	1/2 lb 1/4 lb Double	1/2 lb 1/4 lb Double
B.&S. Ga.	Enameled		Cotton	Silk
No. 18	—	—	.75	—
No. 20	.60	.30	.80	1.00 .50
No. 22	.65	.35	.85	1.05 .55
No. 23	.70	.40	.90	1.10 .60
No. 24	.70	.40	.90	1.10 .60
No. 25	.75	.45	.95	1.15 .65
No. 26	.75	.45	.95	1.15 .65
No. 28	.80	.50	1.00	1.20 .70
No. 30	.85	.55	1.05	1.25 .75

Prices net parcel post prepaid anywhere in U.S. Send for our catalog FREE.

**THE KING RADIO CO.**  
 CENTURY BLDG., PITTSBURGH, PA.

### RADIO "A" BATTERIES

You Can Not Beat These Batteries at Any Price—

6 Volt 35 Amp. Hour . . . . \$6.00  
 6 Volt 60 Amp. Hour . . . 12.00

Heavy Duty Automobile Type

6 Volt 60 Amp. Hour . . \$17.50  
 6 Volt 80 Amp. Hour . . 20.00

TWO YEAR WARRANTEE AGAINST ELECTRICAL DEFECTS

OUR LINE OF RADIO SUPPLIES IS COMPLETE. SEND FOR CATALOG.

**Clarion Radio Shop**

347 Main St., Poughkeepsie, N. Y.

# DO YOU KNOW?

**THAT YOU CAN SAVE MONEY  
YOU CAN GET REAL SERVICE  
YOU CAN SAVE MUCH TIME**

BY

SEND FOR THE  
RADIO CORPORATION  
BOOK OF C.W.  
INSTRUCTION \$0.25

## SENDING YOUR ORDER TO "MISSOURI"

### VACUUM TUBES

No. UV200 Radiotrons detector ..... \$5.00  
No. UV201 Radiotron Amplifier ..... 6.50  
No. UV202 Radiotron 5 watt ..... 8.00  
No. UV203 Radiotron 50 watt ..... 30.00  
No. AP Amplifier oscillator ..... 6.50

### B BATTERIES

No. 766 Eveready 22½ volt variable .. 3.00  
No. 774 Eveready 43 volt variable ..... 4.50  
No. 765 Eveready 22½ volt ..... 2.25

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No. CR-3 Grebe Relay-special 175-680 meters ..... 65.00  
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No. ZRV Clapp-Eastham with dial ..... 6.50  
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### VARIO-COUPLERS

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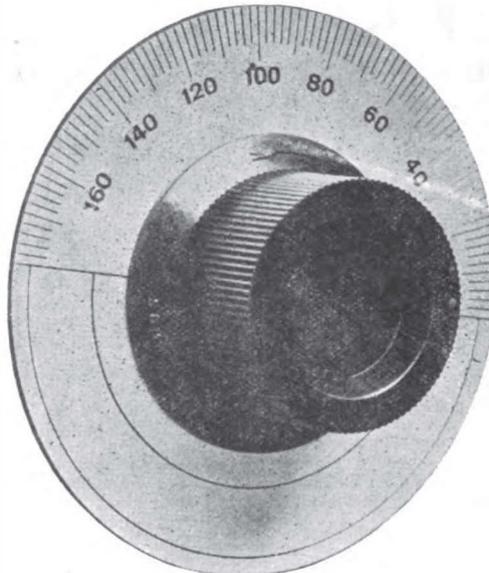
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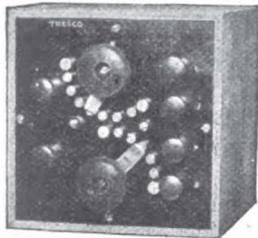
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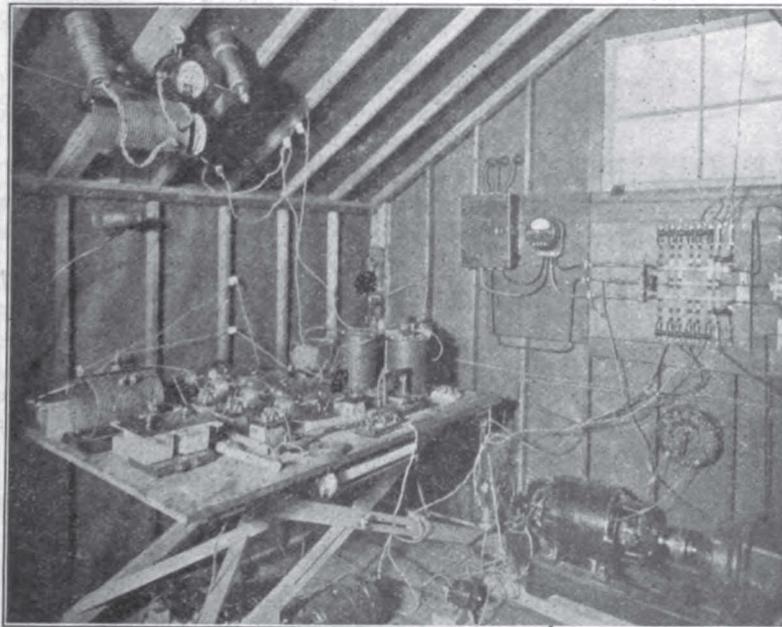
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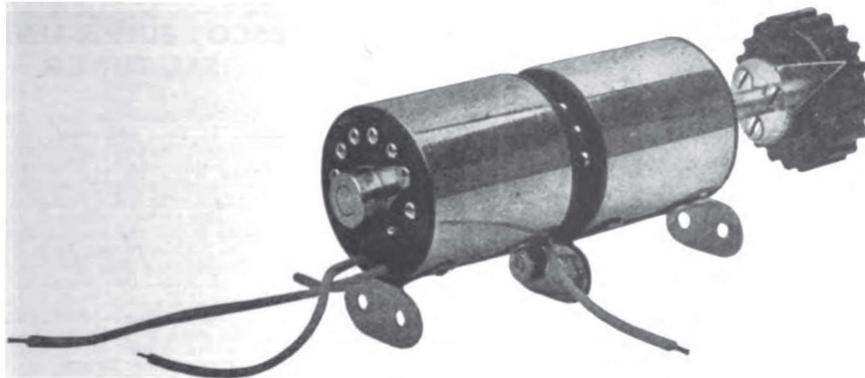
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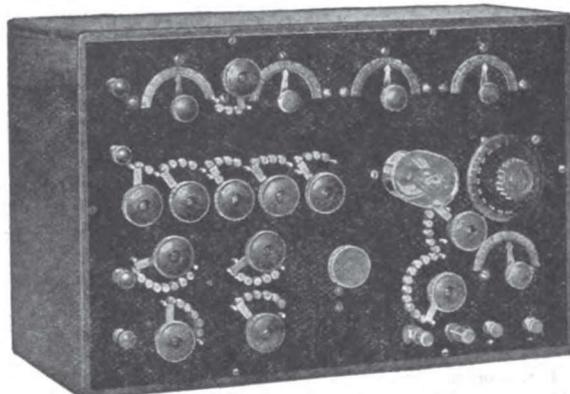
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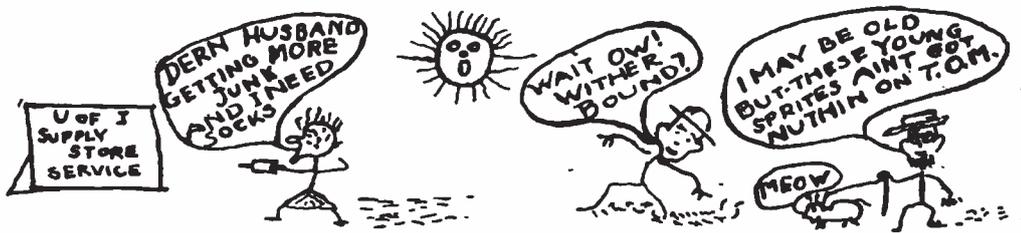
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Weight, 15 lbs.; shipping, 25 lbs.  
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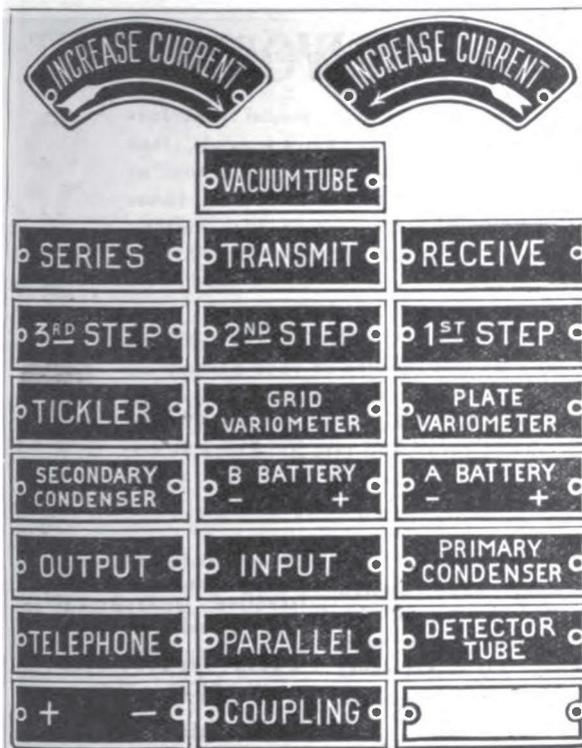
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No. 1100 "Rasco" Audio Frequency Transformer NOT ASSEMBLED, prepaid

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This is the one and only radio catalog containing such wonderful free information. Complete hook-ups of all important vacuum tube circuits are given in clear diagrams with complete explanation. Just to name a few.—The V.T. as a detector; detector and one-step amplifier; regenerative circuit; DeForest ultraudion; V.T. to receive undamped and spark signals; Armstrong circuits; one step radio frequency amplifier and detector; three stage audio-frequency amplifier; short wave regenerative circuits; V.T. radio telephone; 4-stage radio frequency amplifiers; radio and audio frequency amplifier, inductively coupled amplifier; Armstrong superautodyne; radio frequency amplifier and crystal detector; C.W. transmitters; self-rectifying 2 tube C.W. transmitter; V.T. transmitter with 6 volt battery; radiophone using plate and grid modulation; one tube radio transmitter and receiver; experimental radiophone; radiophone using Colpitts oscillator circuit.

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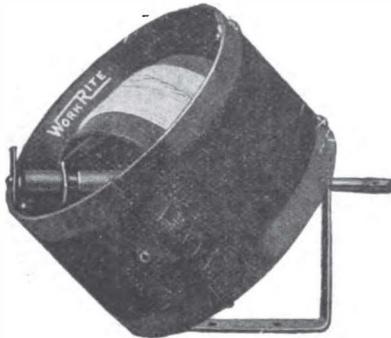
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Brooklyn, N. Y.—Elkridge, Md.

Remember that this business was originated with the sole purpose to cater to the amateur who has small orders. **ALL OF OUR ORDERS ARE SMALL** and that is why your small order will never be side-tracked by us. A trial order will make you a life customer. You can order from the above illustrations. "We can only stick you once." Try us with a 50c order.

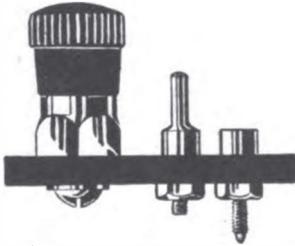
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**WORKRITE SUPER VARIOCOUPLER:** Rotor and Stator made from formica, wound with double silk covered wire, rotor specially bank wound. Has  $\frac{1}{8}$ " shaft, can be mounted on panel or base. Extremely sensitive and tunes unusually sharp. 200 to 600 meters. Immediate delivery. Price \$3.00.



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# QST Pittsburgh Amateurs!

You will find us in a position to supply your needs in radio supplies

Westinghouse, Amrad, DeForest, Acme, Murdock, Federal & Brandes  
Complete Antenna and ground equipment.

—PARTS—

Come in and  
See Us  
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Mail Orders  
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**VIRGINIA NOVELTY COMPANY**  
Martinsburg, West Va.

## AN ORIGINAL SURPRISE

Our next month's advertisement

**DX RADIO COMPANY**  
Summit, Ill., Factory, Argo

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**QUALITY**

**SATISFACTION**

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Westinghouse DA, amplifier ..... \$68.00  
 Remler, No. 300, detector ..... 8.00  
 Remler, No. 331, amplifier, less transformer and cam switch ..... 6.00  
 Remler, No. 333, amplifier, with cam switch less transformer ..... 9.00  
 Clapp-Eastham HZ, in cabinet ..... 35.00

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 Westinghouse RC, consisting of units DA and RA combined in one cabinet, wonderful value ..... 130.00  
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**ANTENNA WIRE**

Weco, 7 strands 22 pure copper per ft. ..... .01  
 per 500 ft. ..... 4.00  
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Electrose, Ball type ..... .40  
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 WECO "Special" 3 in Rod type ..... .25

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 WECO No. 1002, 22½ V. small, variable ..... 1.75  
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 WECO No. 1006, 45V. special, plain ..... 5.00  
 WECO No. 1008, 45V. special, variable ..... 6.00  
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No. UP-1636 Radio Corp. 325 watts ..... 25.00  
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No. UP-1719 for 5 watt tubes ..... 1.10  
 No. UP-1718 for 50 watt tubes ..... 1.85  
 No. UP-516 ½, 1, 1.5, 2 or 3 megohms each complete with mounting ..... 1.25  
 Grid leaks only, each ..... .75

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Clapp-Eastham H-400, twin ..... 1.35  
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 Paragon No. F-2, front and back mounting ..... 1.50  
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DeForest No. R-300, front and back connected ..... 1.50  
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 We Have Five Branch Stores—Postage Prepaid  
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YOU WILL LIKE TRADING WITH US

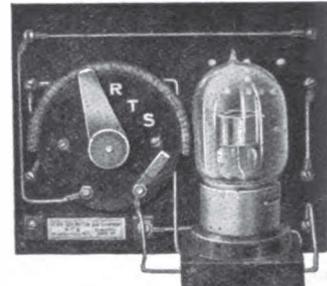
# THE WONDERFULLY PERFECTED RTS Standard Detector Panel



(Front)

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- 1—Silver Plated Wire
- 2—Machine Engraved Scale
- 3—Resistance, 8 Ohms
- 4—Small Wound Resistance
- 5—Grid Condenser and Leak accurate
- 6—Sure Contact Socket
- 7—Socket Used as a Standard
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(Back)

**\$5.95**

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Write today for our new catalog just published.

**Radio Testing Station**

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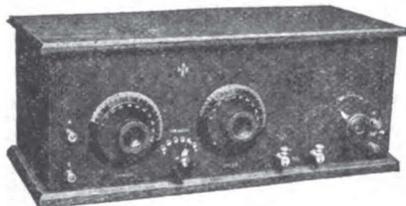
R.T.S.  
Switch  
Lever

**60c**



Knob—Marconi 1 1/4"  
Lever—Special alloy  
Bushing—Fits all panels from 1/4" to 1/2" in thickness.  
Guide Bushing—Nickel plated

**ACE "ACE RADIO CONCERT RECEPTOR" ACE**



**Type TRU Concert Receptor \$50.00**

This unit is especially designed for the efficient reception of Radio Telephone Concerts from even the most distant Broadcasting Stations. The ease with which this Receptor can be installed and the extreme simplicity of operation make it ideal for use by even the most in-experienced. No previous knowledge of radio necessary to secure results.

We stock a complete line of Radio Supplies and maintain a *prompt, reliable* Mail Order Service that reaches all over the world.

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Manufacturers & Distributors of Radio Apparatus

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Radio  
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**NOISELESS DEPENDABLE  
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**"B" Batteries for Vacuum Tubes**

22 1/2 to 100 Volts

19 Different Sizes—Plain and Variable

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Large, list, 3.00 .....\$2.50  
Small, list, 2.25 .....\$1.90

**VACUUM TUBES**

Detector, list, 5.00 .....\$4.50  
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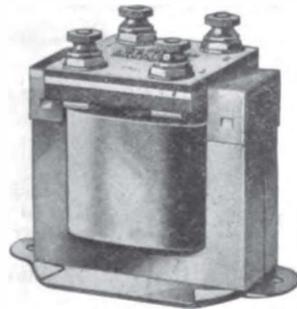
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**THE  
THORDARSON  
AUDIO FREQUENCY  
AMPLIFYING  
Transformer**

is now standard with many well known manufacturers

That should be sufficient guarantee that it is right.

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TYPE**



**PRICE  
\$4.50**

Each transformer supplied fully mounted in an ingenious, nickered frame with substantial terminals mounted on a bakelite terminal board.

The terminal board is on the top, the only logical place for a terminal board. The transformer is wound with silk covered wire.

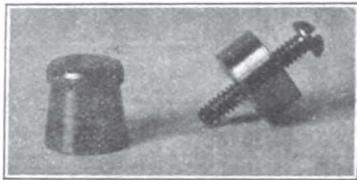
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**PRICE, AS ILLUSTRATED - - \$4.50**

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We are the Designers, Originators,  
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**The Bell Buoy Binding Post**  
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The Binding Post for Land and Sea.

The Peer of all Removable Head Binding Posts. Has the Vise-Grip. Wire will not turn. We leave the Question of its Superiority to You

15c each—6 for 75c—12 for \$1.45 p.p. prepaid.

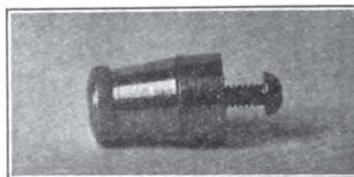
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*SPECIAL: Fada Non-Removable Head Binding-Posts, 15c each.*

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The famous Seibt Condensers, Capacity Meters, Frequency Meters, and other Precision Instruments, are now controlled absolutely by this company. We will continue to be the exclusive distributors.

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Attention!**

If you want service, order from us. We carry a large stock of High Grade Wireless Apparatus of our own and other manufacturers.

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Vacuum Tube Sockets.....	\$1.25
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Lateral Wound Coils. All Sizes.	

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THE HEART OF THE FIFTH DISTRICT  
We stock leading makes of—

**RADIO APPARATUS**

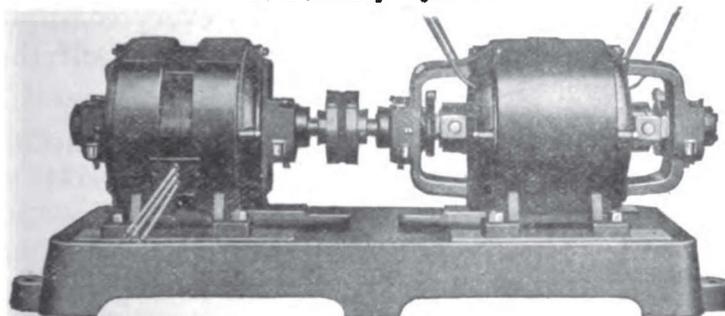
MAIL ORDERS A SPECIALTY

**Shreveport Radio Supply Co.**  
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# 1BCG-GREENWICH- FIRST KNOWN STATION TO GET ACROSS

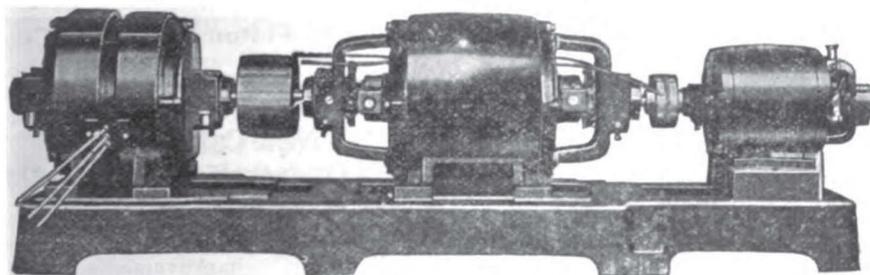
MR. CRONKHITE PUT IT OVER WITH THIS SET

Read remarkable power of this outfit on Page 25—January "Wireless Age" and Page 29 February "QST".



2 Unit—4 Bearing—1500 Watt

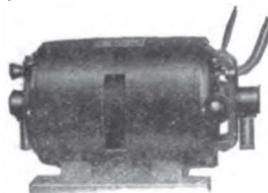
2FD—FLUSHING Got Across With Similar Set  
 1RU—HARTFORD Also—But With a 250 Watt Set  
 1BKA—GLENBROOK Put it Over With This



3 Unit—500 Watt Outfit

9HK—CLINTON, Iowa, Goes Coast to Coast With This Little Set

2 BEARING



100 WATT

THESE (AND OTHER) INSTITUTIONS USE OUR MOTOR-GENERATORS

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WRITE FOR BULLETIN 287

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MOTORS—DYNAMOTORS—GENERATORS—MOTOR GENERATORS

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STAMFORD, CONN., U. S. A.

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Every advantage is given the buyer to get in on the line of **RADIO APPARATUS.**

**FLOOR SPACE 3500 SQUARE FEET**

**Full Stock on Hand** of all the best and nearly all makes of wireless apparatus and parts.

**MEET US AT THE RADIO CONVENTION MARCH 7th**

*Send 15c. for new catalog Q-3*

**American Electro Technical Appliance Company**

**New Branch 227 Fulton St., Old Bldg., 235 Fulton St., N. Y. City**

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**A.H. CORWIN & CO.**  
4 West Park St. Dept. D  
Newark New Jersey



**New Catalog E6 FREE**  
Just off the press

Keep up-to-date. Learn about all the big recent improvements in radio apparatus.

84 pages chuck full of best and biggest values of America's 51 leading manufacturers. Most complete, includes everything.

**Two N-S LEADERS**

Red-Head Radio phones, 8000 ohms, military head band with cord complete Per pair **\$8.00**  
Arlington Tested Crystals; Galena or Silicon. Certified super-sensitive Per crystal **25c.**

*Write for Big Free Catalog Today*

**THE NEWMAN - STERN CO.**  
Newman--Stern Bldg., Cleveland, Ohio

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With a "RADINDEX" (Radio Index) Card Filing System you have, at your finger-tips, complete data on all stations—dates you heard or worked them, etc. etc. Write for circular and sample card.

**GEORGE H. BARNES**

Stanbridge East, Quebec, Canada.

The next time you need radio supplies, write us  
**THE HOUSE OF QUALITY, SERVICE, PRICE**

**KELLY & PHILLIPS**  
312 FLATBUSH AVE., BROOKLYN, N. Y.

## WANTED FOR MURDER!

Poorly designed phones "murder" weak signals. Oftentimes they cut receiving efficiency in half, and yet how many amateurs realize their importance? A costly receiving equipment may detect and amplify a weak signal, but whether or not that signal will be heard depends upon the 'phones used. They may make the most of the signal or they may "murder" it. If your 'phones are 50% efficient, how can your receiving set be 100% efficient?

Go to your dealer today and get a pair of Brandes on the ten-day-trial money-back-guarantee basis.

Our booklet F will be mailed for 5 cents

It will add to your 'phone education

### C. Brandes, Inc.

ROOM 721, 237 LAFAYETTE ST., NEW YORK CITY

*Member Radio Section Associated Manufacturers of Electrical Supplies.*

# BRANDES Matched-Tone HEADSETS

**NEW MOTORS** FOR ALL PURPOSES  
STANDARD MANUFACTURERS  
PROMPT DELIVERY

ALL SIZES UP TO 5 H.P.

**We Specialize In Small Motors & Generators**  
ALL PHASES AND FREQUENCIES IN STOCK AT ALL TIMES  
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WIRELESS, TELEPHONE GENERATORS  
500 VOLT - 100 WATT - 3400 R. P. M.  
FOR MOUNTING MOTOR GENERATOR SETS.

**\$28<sup>50</sup>** EACH



WRITE FOR CATALOG

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Ace "B" Battery . . . . . \$1.50  
Porcelain VT Socket . . . . . .50

Total List . . . . . \$2.00

**Both for \$1.35**

Postage Extra

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**A.H. CORWIN & CO.**  
4 West Park St. Dept. D  
Newark New Jersey



**New Catalog E6 FREE**  
Just off the press

Keep up-to-date. Learn about all the big recent improvements in radio apparatus.

84 pages chuck full of best and biggest values of America's 51 leading manufacturers. Most complete, includes everything.

### Two N-S LEADERS

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Arlington Tested Crystals; Galena or Silicon. Certified super-sensitive Per crystal **25c.**

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**THE NEWMAN - STERN CO.**  
Newman-Stern Bldg., Cleveland, Ohio

*24-Hour Service*  
*We pay all Shipping Charges*  
*Get the latest*  
*Don't buy till you see this catalog.*

The next time you need radio supplies, write us

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**KELLY & PHILLIPS**

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**GEORGE H. BARNES**

Stanbridge East, Quebec, Canada.

## WANTED FOR MURDER!

Poorly designed phones "murder" weak signals. Oftentimes they cut receiving efficiency in half, and yet how many amateurs realize their importance? A costly receiving equipment may detect and amplify a weak signal, but whether or not that signal will be heard depends upon the 'phones used. They may make the most of the signal or they may "murder" it. If your 'phones are 50% efficient, how can your receiving set be 100% efficient?

Go to your dealer today and get a pair of Brandes on the ten-day-trial money-back-guarantee basis.

Our booklet F will be mailed for 5 cents

It will add to your 'phone education

### C. Brandes, Inc.

ROOM 721, 237 LAFAYETTE ST., NEW YORK CITY

*Member Radio Section Associated Manufacturers of Electrical Supplies.*

# BRANDES Matched-Tone HEADSETS

**NEW MOTORS** FOR ALL PURPOSES  
STANDARD MANUFACTURERS  
PROMPT DELIVERY

ALL SIZES UP TO 5 H.P.

**We Specialize in Small Motors & Generators**  
ALL PHASES AND FREQUENCIES IN STOCK AT ALL TIMES  
Largest exclusive Mail Order Small Motor dealers in the world.  
CHAS. H. JOHNSTON, Box 19, West End, Pittsburgh, Pa.

WIRELESS, TELEPHONE GENERATORS  
500 VOLT - 100 WATT - 3400 R. P. M.  
FOR MOUNTING MOTOR GENERATOR SETS.

**\$28.50** EACH

WRITE FOR CATALOG



### MARCH SPECIAL

Ace "B" Battery . . . . . \$1.50  
Porcelain VT Socket . . . . . .50

Total List . . . . . \$2.00

**Both for \$1.35**

Postage Extra

**A.K. Laing Radio Co.**

HANOVER,

N. H.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

# HOMCHARGE YOUR BATTERY *for A Nickle*

A perfect rectifier at last, fully automatic and fool-proof in every respect. It can be operated by anyone.



## The HOMCHARGER

Connects to any alternating current lamp socket, gives a taper charge—will fully charge any "A" battery over night. It is selfpolarizing. Connect your battery either way and it will always charge. Automatically disconnects battery when power is interrupted. Restarts charging when connections are restored. Adjustable for wave form, frequency and voltage. Contains only one moving and two wearing parts, lasting thousands of hours, replacable as a unit for \$1.00. The highest charging rate, greatest efficiency, and simplest of any rectifier selling for less than \$100.00. Bulletin 628 proves it. Ask for your copy.

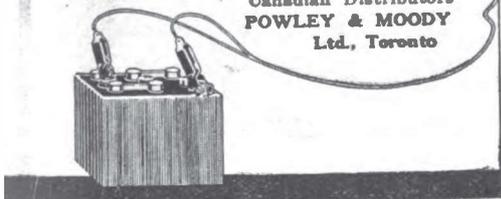
Manufactured in sizes for charging three or six cell batteries from both direct alternating and direct current circuits. Cannot injure battery—will last a lifetime—approved by underwriters—satisfaction guaranteed. For sale by all Radio, electrical and accessory dealers or shipped express prepaid for purchase price—\$18.50. (\$20 West of the Rockies.)

### ATTENTION MOTORISTS:

Send for special bulletin 58 showing how easy it is to "HOMCHARGE" your battery.

THE AUTOMATIC ELECTRICAL DEVICES CO.  
127 West Third St., Cincinnati, Ohio

Canadian Distributors  
**POWLEY & MOODY**  
Ltd., Toronto



# HERE

## RADIO CITIZENS

Complete stocks carried for immediate shipment of the following apparatus:

Grebe Murdock  
DeForest Adams-Morgan  
Acme Radio Corporation  
C. Brandes, Inc.  
Federal Telephone & Telegraph Co.

### FREE BULLETINS PRICE LISTS

Get the new lowest prices on apparatus and supplies. Bulletins and price lists mailed FREE on your request. Send for them today.

**Nash Electrical Service Co.**  
Marshall, Ill.

## CARDBOARD TUBING

IN ANY LENGTH UP TO 28 INCHES

	Per in. or Fraction	Per Ft.
2 1/2, 3 and 3 1/2 in. diameter . . . . .	3 1/2c	30c
4 and 4 1/2 in. diameter . . . . .	4c	35c
5 in. diameter . . . . .	4 1/2c	42c
5 1/2 and 6 in. diameter . . . . .	5c	50c
2 1/2, 3, 3 1/2, 4 in. diameter have 1/4 in. wall:		
4 1/2, 5 and 6 in. diameter have 1/2 in. wall		

Postage extra; shipping weight 1 lb. per ft.  
NO stamps accepted on orders.

## MICHIGAN RADIO CO.

(Formerly Jeffery Crawford Co.)

2173 HILLGER AVE., DETROIT, MICH.

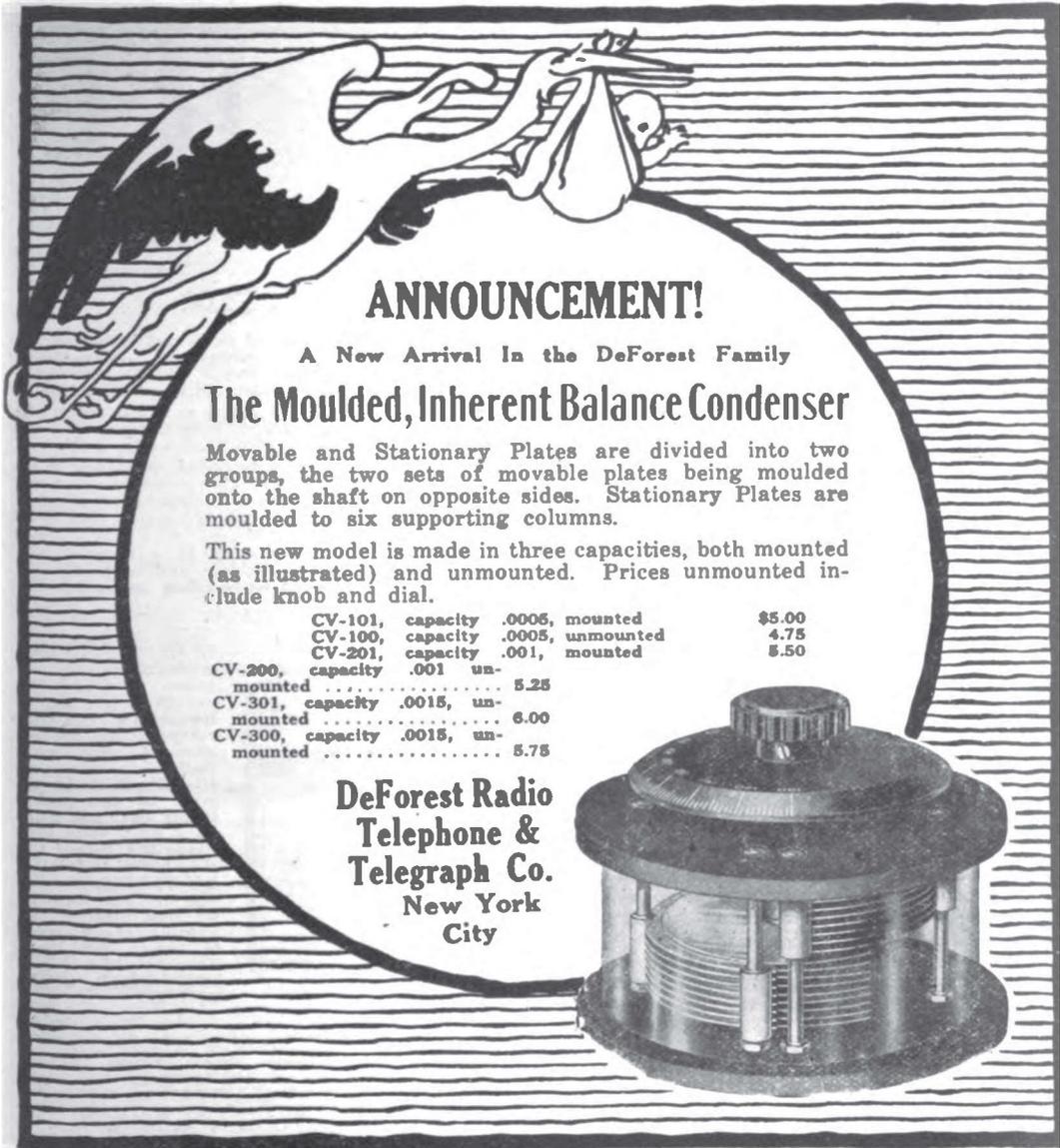
## "SHRAMCO PRODUCTS"

Amateurs: Send 5c in stamps today for our new Catalogue L showing complete line of parts, raw materials and high grade apparatus.

Dealers: Write for our attractive proposition.

The Shotton Radio Mfg. Co.,  
INCORPORATED  
8 Market St., Albany, N. Y.

Latest and Best  
Books on  
Wireless Chemistry  
Invention  
Automobiles Aviation  
SEND FOR FREE CATALOGUE W.  
D. ALTMAN COMPANY  
225 East 110th St., New York



**ANNOUNCEMENT!**

A New Arrival In the DeForest Family

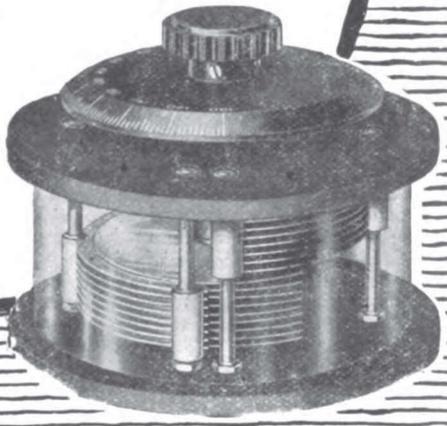
**The Moulded, Inherent Balance Condenser**

Movable and Stationary Plates are divided into two groups, the two sets of movable plates being moulded onto the shaft on opposite sides. Stationary Plates are moulded to six supporting columns.

This new model is made in three capacities, both mounted (as illustrated) and unmounted. Prices unmounted include knob and dial.

CV-101, capacity .0005, mounted	\$5.00
CV-100, capacity .0005, unmounted	4.75
CV-201, capacity .001, mounted	5.50
CV-200, capacity .001 unmounted	5.25
CV-301, capacity .0015, unmounted	6.00
CV-300, capacity .0015, unmounted	5.75

**DeForest Radio Telephone & Telegraph Co.**  
New York City



Are You **HEARING** by Radio  
Music and News Each Night?  
Begin today Buy the Best

**GREBE**                      **GREBE**  
CRs                                      CRs

*Now in stock, immediate shipment*

**The Best in Radio Apparatus**  
Wholesale      3XAB                      Retail

**VIRGINIA RADIO CO.,** Charlottesville, Va.

PROMPT SHIPMENTS FROM

**“DEL FELCO”**

**DELANCEY FELCH & CO.**  
12 Meeting St., Pawtucket, R. I.

Branches:

Fall River, Mass.                      Providence, R. I.  
84 No. Main St.                      6 Market Square

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

# RADIO MAGNAVOX

The  
reproducer  
with the  
movable coil



No set complete without one

## There is NO Substitute for the Radio MAGNAVOX

Properly energized, the Radio MAGNAVOX will accomplish what no other Radio reproducing apparatus ever has accomplished—*great sound intensity without distortion.* It's the famous *movable coil* that does it, and no other apparatus has this coil because it is *patented* by The Magnavox Co. That is why *there is no substitute for the Radio MAGNAVOX*, and no set is complete without one. It provides a source of satisfaction and scope of enjoyment obtainable from absolutely no other equipment or in no other way. Sold by dealers. Write Dept. "S" for free folder.

Dealers  
write for  
proposition



REG. U.S.  
PAT. OFF.

### THE MAGNAVOX Co.

GENERAL OFFICES & FACTORY  
OAKLAND, CALIFORNIA  
NEW YORK OFFICES  
370 SEVENTH AVE. PENN. TERMINAL BLDG.

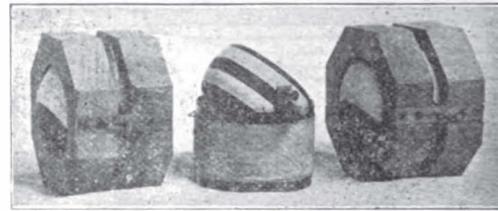


Plate Variometer **\$3.60**      Grid Variometer **\$3.60**  
Vario-Coupler **\$3.00**

**SPECIFICATIONS:** Designed for Panel mounting.  $\frac{1}{4}$ " Brass shafting used throughout. Wave length range 175-450 meters. Range may be increased to 650 by shunting secondary with special condenser. **KNOCKED DOWN SET** of parts, as shown above with windings in place, for 8.75, two variometers and one vario-coupler.

Single variometer parts as described, consisting of two stators and a rotor, made of gum or poplar wood, well shellaced; complete with set of bearings and parts, but **UNWOUND**. Price .....\$1.45  
Winding Form. Price each .....\$0.50  
Vario-Coupler parts, consisting of a formica tube, rotor and the necessary bearings and parts for complete assembling. Ready for winding and assembling. Price .....\$1.45  
Price of Stator, only .....\$0.40



**HI-GEE "B" Batteries ARE SUPREME** because they are lowest in price, have a longer life, marvelous recuperation, and unequalled shelf depreciation. HI-GEE batteries are made in two grades: Grade 101, size  $2\frac{1}{2} \times 3 \times 3\frac{1}{2}$ , 22½ volts, \$0.90; Grade 101, tapped 1.10. **HI-GEE STORAGE BATTERIES:** These are the best batteries on the market for lighting the filaments of your tube sets. They are backed by a **TWO YEAR GUARANTEE.**

6 volt, 60 ampere .....\$12.95  
6 volt, 80 to 100 ampere,..... 20.95

All storage batteries are shipped **FULLY CHARGED**, ready for use. Add \$0.50 for special crating. **THIS STORAGE BATTERY IS THE BEST THAT MONEY CAN BUY—IT IS MADE UP FOR US BY ONE OF THE OLDEST BATTERY MANUFACTURERS IN THE COUNTRY. THAT'S WHY THIS BATTERY CARRIES A BETTER GUARANTEE THAN ANY OTHER BATTERY YOU WILL BUY AT A HIGHER PRICE. NO SECONDS—EVERY PART USED IS ABSOLUTELY NEW.**

**HI-GEE UNASSEMBLED RECEIVER**, Catalogue Nr. 608. This receiver consists of stained oak cabinet, 18"x7"x7", binged top. 1 Formica panel 18"x7"x $\frac{1}{2}$ " to fit cabinet. 2 HI-GEE Variometers. 1 Winding form for stator coils. 1 Formica Coupler primary tube  $3\frac{1}{2} \times 2\frac{1}{2}$  high. 1 Coupler secondary ball, 7 contact points, 6 binding posts, 1 switch lever, 2 stops.....Price, \$13.90

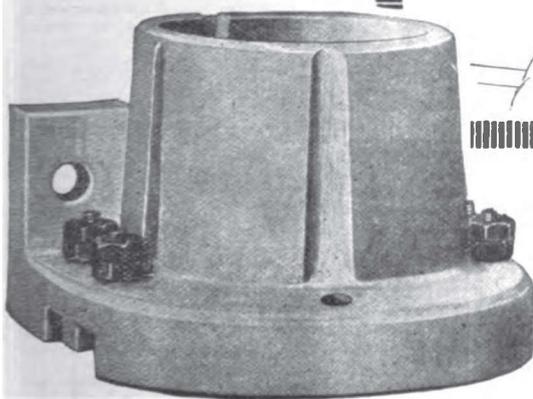
HI-GEE Unassembled Receiver, with all windings in place .....\$17.90  
Cabinet only. Complete with panel ..... 4.85  
Unassembled Receiver same as above, with detector and 1-step amplifier in larger cabinet. Includes all windings .....\$25.00

Get our Bulletins. **"UNEXCELLED SERVICE"**  
Every Order shipped Prepaid—Except storage batteries

**HI-GEE RADIO MFG. CO.**

**MARION, ILLINOIS**

# CROSLEY V-T SOCKET



PRICE

60¢

*Better—  
Costs Less*

Now the CROSLEY V-T Socket has been adopted by several of the leading manufacturers of radio apparatus, as standard in their products. There are many good reasons for this universal acceptance. Here are some of them.

The CROSLEY V-T Socket is made in one piece, of porcelain—the very same material that is used in the base of vacuum tubes—consequently it is of high dielectric value. The bayonet catch is imbedded in a heavy wall of porcelain, that is for all purposes, unbreakable. Soldering irons will not melt this socket and it is ideal for power tube work.

The design positively eliminates all possibility of short circuiting filament across high voltage B Battery.

Almost every leading jobber and dealer in radio equipment, the whole country over, is handling the CROSLEY V-T Socket—NOW. The demand is heavy and its popularity is sweeping the country.

The low price needs no apologies—large production alone makes it possible.

Everyone now says the CROSLEY V-T Socket is "Better—Costs Less."

Buy from your Dealer. He has it or can get it for you.

*To the few Jobbers and Dealers who are not handling the CROSLEY V-T SOCKET, we make the suggestion to get in line.*

**CROSLEY MANUFACTURING COMPANY**  
Radio Dept. Q-8, Cincinnati, Ohio

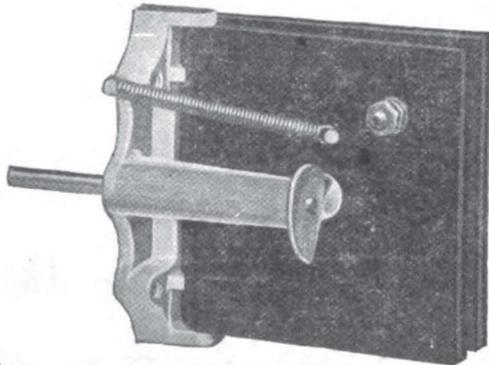
ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

127

# Crosley Variable Condensers

"Better—Cost Less"

Variable Condensers that do the work—that's the only kind we make. The Auto Electric Service, of Rockport, Maine writes:—"Our station has your Condensers in use and we get KDKA with a Two Step Amplifier loud enough to hear in the next room with the phones on the table. This we could not do with any other make of Condenser." It's the same story everywhere they are used.



## MODEL "B"

Like all CROSLY VARIABLE CONDENSERS the Model "B" has no appreciable body or hand capacity and is easier to tune in C.W. and I.C.W. than any other condenser made. Conservatively rated capacity, .0005 Mf., but tests in the Laboratories of one of the leading universities of the country have shown the maximum capacity of this model to never be less than .0008 Mf. and frequently running better than .001 Mf. The Model "B" CROSLY Variable Condenser has best quality laminated wood plates and a die cast metal frame. Extremely neat in appearance. Furnished, ready to mount on panel or in a cabinet, with  $\frac{1}{4}$  in. shaft as standard and  $\frac{1}{8}$  in. shaft optional. This model occupies a space on the panel of  $1\frac{1}{2}$ " x  $3\frac{1}{2}$ " and  $3\frac{1}{2}$ " deep.

Price, each without knob and dial .....\$1.75  
 Same, with knob and dial ..... 2.25  
 Same, with knob and dial and mounted in mahogany finished cabinet complete with binding posts 3.00

## CROSLY MODEL "A" Variable Condenser

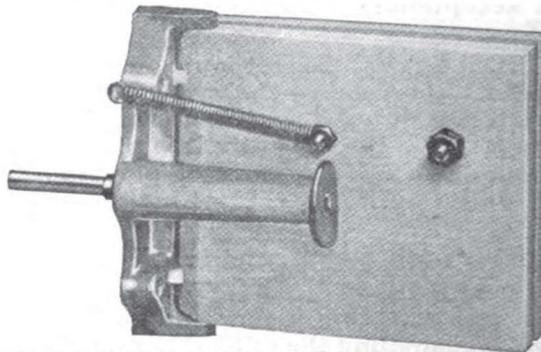
This instrument needs no further introduction to radio men. Thousands have been sold and are now in use. The conservatively rated capacity is .0005 Mf. and like the other CROSLY models, it is a universal condenser for C.W. and other transmission work as well as receiving. Every CROSLY Variable Condenser is tested to withstand 1000 volts before shipment. Just try this test on most air condensers providing you have no further use for the instrument.

The frame of this model is made of wood; the plates are high grade laminated wood which function perfectly under all conditions.

Price each, without knob and dial .....\$1.25  
 Same, with knob and dial ..... 1.75  
 Same, with knob and dial and mounted in mahogany finished cabinet, complete with binding posts ..... 2.50

## CROSLY MODEL "C" Variable Condenser

The principle of this instrument needs no introduction or explanation—it is made right and it works. This model differs from the other CROSLY models in the size of the plates, the material of which they are made and the capacity. The plates are made of porcelain, ground true on the contact surfaces before the copper and mica are applied. The capacity is conservatively rated at .001 Mf. and the extremely low capacity makes it ideal for use where a condenser is specified up to .001 Mf. capacity. It is especially recommended for radio phone work as it will not shower or break down, tested under a thousand volts.



Furnished ready to mount on panel or in a cabinet, with  $\frac{1}{4}$  in. shaft standard or  $\frac{1}{8}$  in. shaft optional  
 Price each, without knob and dial .....\$2.25  
 Same, with knob and dial ..... 2.75  
 Same, with knob and dial and mounted in mahogany finished cabinet, complete with binding posts 3.50

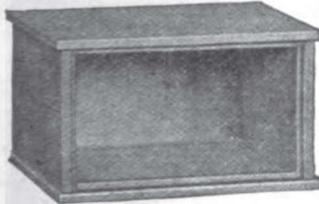
Most Jobbers and Dealers are now handling CROSLY VARIABLE CONDENSERS. If yours does not, send order direct to us with his name and address. We will ship prepaid.

**CROSLY MANUFACTURING COMPANY**  
 Radio Dept. Q-8, Cincinnati, Ohio

# --More CROSLY RADIO APPARATUS

"Better--Costs Less"

## Crosley Cabinets



The tendency in the radio field today is to put apparatus in cabinets not only for appearance's sake, but as a protection from dust, dirt, atmospheric conditions etc. Realizing the demand for attractive stock cabinets of various sizes, we are building them in quantities in our large wood working plant. These cabinets are all uniform in style. The panels are rabbeted in to the front. As the outside dimensions and inside dimensions are either larger or smaller than the panel itself, we show panel size and also inside dimensions. Prices quoted do not include the panels.

Wood used is either gum or mahogany in dark antique or red mahogany finish or in quartered oak in natural or antique finished. Specify type of wood and finish in ordering. Lids or tops are hinged. Sizes and prices are:

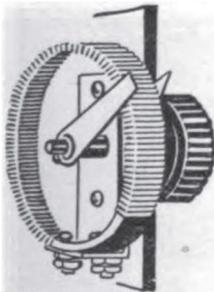
For Panel Size	CABINETS Inside Dimensions			Mahogany or Quartered	
	High	Wide	Deep	Gum	Oak
6x7	5 1/2"	6 1/2"	7"	\$2.50	\$3.85
6x10 1/2	5 1/2"	10"	7"	2.75	4.40
6x14	5 1/2"	13 1/2"	7"	3.30	5.55
6x21	5 1/2"	20 1/2"	7"	3.90	7.30
9x14	8 1/2"	13 1/2"	10"	3.70	6.80
12x14	11 1/2"	13 1/2"	10"	4.40	6.80
12x21	11 1/2"	20 1/2"	10"	5.25	10.60

Cash must accompany order. No C.O.D.'s. We pay transportation charges.

## FORMICA PANELS

We can furnish genuine formica panels 1/8" thick. cut to the following dimensions: 6x7; 6x10 1/2; 7x9; 6x14; 7x12; 6x21; 7x18; 9x14; 12x14; 14x18; 18x21. Price of panels—2 1/2c per square inch. For odd sizes order the next largest size; we will trim. We pay postage.

## CROSLY RHEOSTATS

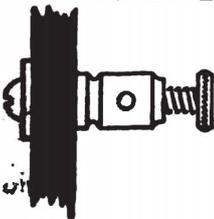


Complete with knob, pointers, etc. as shown in illustration. Our unique construction permits mounting on panel of any thickness up to and including 1/4"; non-corrosive resistance wire.

Model "A"—overall diameter 1 1/2". Resistance 7 ohms, one ampere without heating. Suitable for detector or amplifier tubes. Price 60c each.

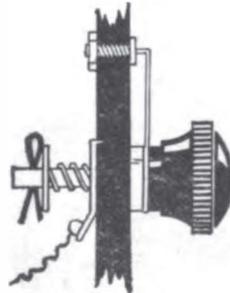
Model "B"—Resistance 4 ohms; will carry 3 amperes without heating. Suitable for detector, where very accurate adjustment is required and for 5 watt power tubes. Price \$1.25.

## CROSLY BINDING POSTS



Barrel 3/4"x1/2". Not too small nor too large, just the right size.

Nickel plated. Complete with base screw and washer as illustrated. Price, 8c each or 90c per dozen.

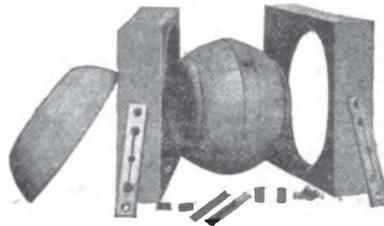


## CROSLY TAP SWITCHES

Note unique construction assuring constant tension. Composition knob, nickel-plated switch arm and bushing. Note stationary washer with soldering lug, making possible buss wire connection. Price 40c each. Better—Costs Less.

SWITCH TAPS for above, brass nickel-plated, complete with brass nut, 8c each, 80c per dozen or \$2.50 per hundred.

## CROSLY VARIOMETER PARTS



This set consist of two stators, one rotor, the necessary hardware shown in the illustration. Shaft for knob and dial is 1/8" diameter. The wood parts are furnished either in poplar or mahogany.

The average radio man has his own ideas about the kind of wire and the number of turns that he wishes to use, depending upon its purpose, so we leave that to the purchaser. The operation of winding and setting up is very simple, but the parts that we list are difficult for the amateur to make. They are made in our own large wood working plant on special automatic machinery that make possible very accurate quantity production.

Price of Variometer parts, described above, made of poplar wood, is \$1.50 (including wood parts and hardware).

If wood parts are made of mahogany \$1.75.

If winding form is desired, it can be used for winding one or more variometers. Price is 30c additional.

## CROSLY VARIOCOUPERS



CROSLY VARIOCOUPLERS consist of formica tube, rotor and brass hardware. It is made with the same care and accuracy as the CROSLY VARIOMETER.

Price, complete as shown in the illustration, not wound or assembled, \$1.50. Stator, only 40c.

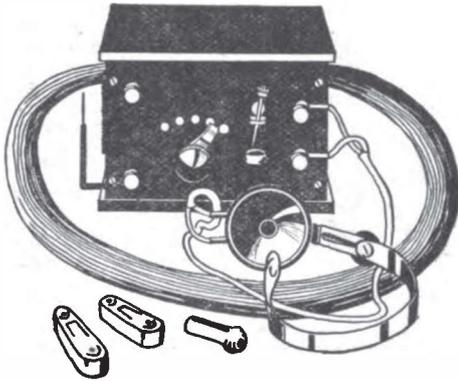
If your dealer does not handle any of the above parts, you may order direct. We will ship prepaid.

Dealers and Distributors: Every item shown above should be in your stock. Write for proposition.

**Crosley Manufacturing Company**  
Radio Dept. Q-8,  
Cincinnati, Ohio

# CROSLEY RADIO APPARATUS

"Better—Costs Less"



## HARKO RADIO RECEIVER

The most compact and complete efficient crystal receiving outfit on the market. Designed for the amateur who wishes to get started in this wonderful game. The illustration shows complete outfit ready to hook to aerial, fones and ground wire. Will tune from 200 to 600 meters, bringing in spark, voice and music with average amateur antenna. NAM, Norfolk, Va. and ships at sea copied in Cincinnati.

A wonderful little instrument. Price complete with battery, interrupter for testing crystal, instructions, etc. \$9.00. One thousand ohm single head set, 125 ft. antenna wire, insulators, etc. \$8.00 extra. Complete outfit \$15.00. If your dealer cannot furnish, we will ship direct prepaid.

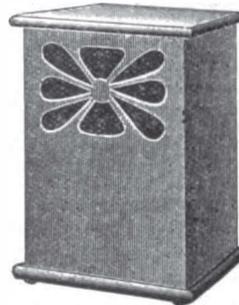
## THE CROSLEY MAGFON

No radio station is complete without the CROSLEY MAGFON—made to take any watch case receiver. Will radiate signals, phone music, voice, etc., all over the room or building. Enables a party of friends to enjoy wireless phone without the necessity of taking turns with head phones. Uses any single watch case receiver.

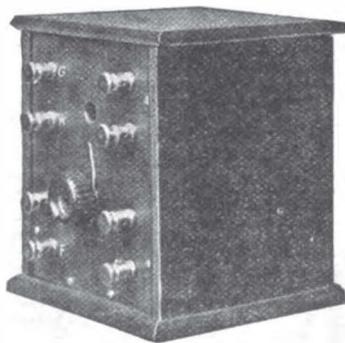
The MAGFON stands 12 inches high, is 8 inches wide and 8 inches deep, and comes in a dark antique mahogany finish.

Complete, ready for one of your head phones to be attached.

Price .....\$10.00



## CROSLEY DETECTOR UNITS

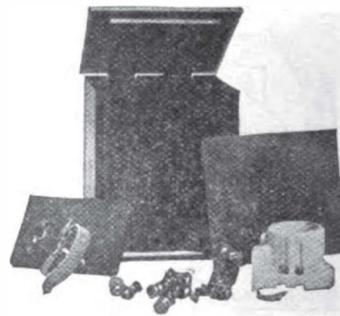


There are furnished in two ways:

Completely wired and mounted as shown on the left, or knocked down as shown on the right. Mounted—everything ready to hook to your set. Suitable for many different hook-ups. Formica panel: mahogany finished cabinet. Matches up with the CROSLEY TWO STEP AMPLIFIER.

Price, completely assembled, as shown on the left.....\$7.50

Price of all parts, including formica or other panel of high grade dielectric composition, not drilled as shown on the right ..... 6.00



Size of the cabinet is 5 1/2 in. long, 4 1/2 in. deep and 8 in. high.

If your dealer cannot furnish any of the above units, we will ship direct prepaid, at the price. Dealers: Do not overlook the sales possibilities of the above units. Write for proposition.

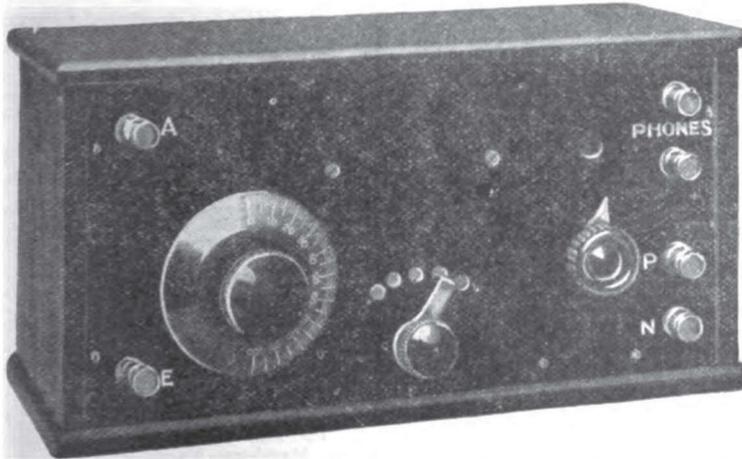
# CROSLEY MANUFACTURING COMPANY

Radio Dept. Q-8,

Cincinnati, Ohio

# CROSLY HARKO SENIOR

## RADIO RECEIVER



The HARKO SENIOR was developed to supply the demand for a low-priced, efficient receiving outfit, having a range of from 150 to over 600 meters, thus bringing in on the average amateur antenna—amateur stations, radio telephones and commercial stations, operating up to and including 600 meters. Ships and stations on the Atlantic Coast are easily copied in Cincinnati. Radio telephone concerts and voice, from Newark, New Jersey and other New Jersey phones in addition to Pittsburgh and other phones, are regularly copied in Cincinnati. It is just the thing for receiving radio telephone concerts.

This instrument is a combination tuner and audion detector. It consists of a tapped inductance, a CROSLY VARIABLE CONDENSER, CROSLY Model "A" Rheostat, CROSLY V-T SOCKET, CROSLY GRID CONDENSER and Leak. The hook-up is special—of our own design and is now regenerative.

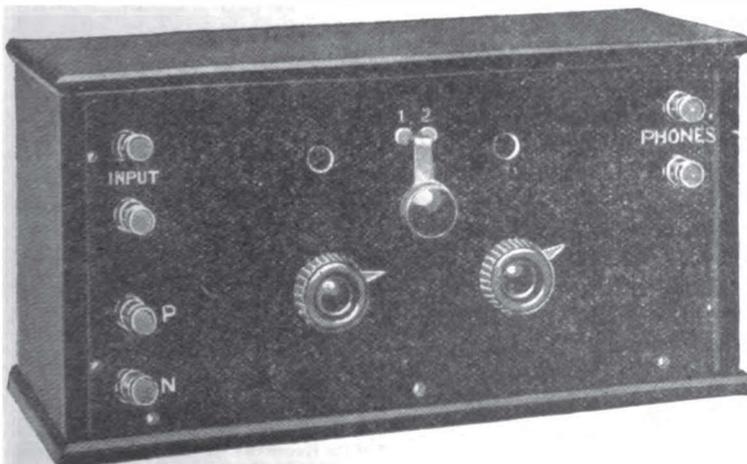
Parts are mounted on panel of formica or other similar dielectric composition. The whole thing is mounted in a mahogany finished cabinet 11½ inches wide, 6 inches high and 4½ inches deep.

This set is very efficient. The price is remarkably low.

The HARKO SENIOR is sold complete as described without tube, "B" Battery, "A" Battery or phone, as is usual with such apparatus.

PRICE .....\$16.00

## CROSLY TWO STEP AMPLIFIER



This instrument was designed to give the very maximum in value—to match up with the HARKO SENIOR, using the same sized cabinet. Complete with amplifying transformers, sockets, rheostats, switch, binding posts, etc. mounted on formica panel in mahogany finished cabinet. This instrument can be used not only with the HARKO SENIOR but with any other apparatus requiring two step amplifier.

Price, complete as shown in the illustration .....\$25.00

# CROSLY MANUFACTURING COMPANY

Radio Dept. Q-8,

Cincinnati, Ohio

## CLASSIFIED ADVERTISEMENTS

Five cents per word per insertion, in advance. Name and address must be counted. Copy must be received by the 10th of month for succeeding month's issue.

It comes in like a ton of bricks thru the King "Amp-li-tone." See page 109.

**RADEX**—"Service That Satisfies." Prompt shipments, reduced prices, on all leading makes, from our large stock. Chi-Rad sets, \$6; bakelite panel 7x18 or 6x21, \$1.75; France battery charger, \$14; Detector tubes, \$4.50; Amplifiers, \$6; hand type microphone, \$5.40, panel type, \$3.60; receiving tube rheos \$0.65, power rheos \$0.65; storage B battery with charging rectifier, 32 volt \$7.50, 48 volt \$9.25, 68 volt \$11; mounted amplifying transformers, Thordarson \$3.75, A-A 10 to 1 ratio \$4.25, Acme \$4.75; 7-22 stranded aerial wire 100 feet \$0.70; bare tinned #14 copper one cent per foot, just the thing for bus-bar wiring; Square tinned bus-bar wire six cents per foot. Request bulletins. The Radio Exchange, Stroh, Ind.

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1 ACME double choke, 500 m.a., \$5.00; 1 Clapp-Eastham B-Q wavemeter, \$20.00; 1 Crocker-Wheeler generator 500 volt D.C. 500 watts, with field rheostat, \$40.00; Lot of assorted mineral rocks from all parts of world, with chemical analysis, \$5.00; 1 open core transformer with rheostat, gives 8 inch spark, 3 variations of power, made by E. B. Meyrowitz, \$30.00; 1 DeForest 15 panel honeycomb coil receiving set in cabinet, A. battery potentiometer and 2 step \$100.00. Write 3HB.

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**FOR SALE:** Slightly used 500 Volt-100 watt Peerless generator also Arlington loose coupler, cheap. J. P. Hyde, Markham, Va.

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In response to the tremendous new interest in wireless, created by the sweep of broadcasting stations all over the country, many styles of complete ready-to-operate outfits have been developed. Continental has carefully selected certain of these sets, of a wide price range, which combine efficient service with simplicity of operation.

The "Marvel" set at \$15.00 complete is truly "The Marvel of Radio". Within 25 or 50 miles of a powerful broadcasting station, you can hear concerts clearly on a Marvel set. It requires no knowledge of radio whatever, and is so simple to install that you cannot go wrong.

Another low priced but entirely satisfactory set is the Westinghouse Aeriola Jr., at \$25.00. This is an easily adjusted crystal detector set purposely designed to receive the broadcasting. It is so simple to operate and the instructions are so clear that it is practically fool proof. The Westinghouse reputation is back of this efficient instrument which will be found unexcelled for distances of 40 to 50 miles from a broadcasting station. The price of \$25.00 includes head phones. The only extras you will need are included in our Antenna equipment Number 1 at \$2.00 complete. Thus for \$27.00 you can get an outfit complete in every detail. You can put it up in one afternoon and listen to concerts that same evening.

To receive longer distances, it is, of course, necessary to have vacuum tube equipment. Most vacuum tube sets are complicated and require considerable technical knowledge. This objection is overcome in the Westinghouse Aeriola, Sr. This set employs the Armstrong regenerative circuit, and includes a vacuum tube detector in one handsome, portable cabinet. This outfit, which is far more sensitive and has considerably longer range than the Aeriola, Jr., comes to you complete for \$75.00.

For those who want a longer range, powerful and highly efficient set including a loud speaker, we recommend the following outfit: a Grebe CR-9 receiver, which includes vacuum tube detector and two-step amplifier equipment, one Radiotron detector tube, two Radiotron amplifier tubes, one pair of Baldwin type "C" phones, one Radio Magnavox, 3 "B" Batteries, and one storage Battery. This set has a range of 750 to 1000 miles. Under normal conditions

you can hear voices and music by wireless telephone clearly 25 to 50 feet from the loud speaker. It is unusually simple to install and operate. Simply connect your Antenna and ground connections, insert tubes, hook on batteries, and you are ready to listen. The price of this outfit as listed above is \$246.00.

For those who want the limit of perfection, there is the Paragon R.A. Ten, for which we are sole wholesale distributors. Many prominent amateurs who have tested Paragon R.A. Ten unanimously report that it is "unexcelled for C.W. (telephone) reception". This receiver employs the Armstrong Regenerative Circuit and is 24 per cent more sensitive and selective than its famous predecessor—Paragon R.A.-6. And the now low price of \$69.50 makes Paragon R.A. Ten a remarkable value.

For a complete set built around the Paragon R.A. Ten receiver we recommend the following additional equipment: one \$65.00 Paragon DA-2 amplifier cabinet, 3 vacuum tubes, 3 "B" batteries, one storage battery, one pair of Baldwin Type "C" phones, a radio Magnavox and our number 3 Antenna Equipment. This entire equipment, which gives you a set fully equal in results and appearance to a high class commercial receiving station, is priced at \$258.50 complete.

In addition to the sets described above, we also recommend complete sets built around the deForest "Everyman" set at \$25.00, the Clapp-Eastham type H-R receiver at \$35.00, and the AcmePhone at \$80.00. Descriptive literature on request.

If you can visit the Continental Store in New York, by all means do so. Come in and listen to the different sets in actual operation. Let our salesmen, who are experienced Radio operators, help you select a set which meets with your particular requirements.

If you live farther away, our mail order department is prepared to serve you efficiently. Any of the complete sets described above will be shipped to any part of the United States by express, immediately.

If you do not wish to order at once, let us send you our new folder "Music from the Clouds" which illustrates and describes in detail five complete ready-to-operate outfits. It is absolutely free. Drop a post card for your copy today.

**CONTINENTAL RADIO AND ELECTRIC CORPORATION**

Dept. B3,

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*"New York's Leading Wireless House"*



## New Radio Receiving Set *TYPE JR-3*

This new set employs a CONNECTICUT Vacuum Tube for detection, and offers a moderately priced receiving set with exceptional qualities of selectivity and sensitiveness. It is designed primarily for the novice, and may be successfully operated by those with limited radio experience.

## A New CONNECTICUT Detector Unit

This unit is designed to use a CONNECTICUT Vacuum Tube; and as a *detector* will give a strong signal. It receives signals without squeals.

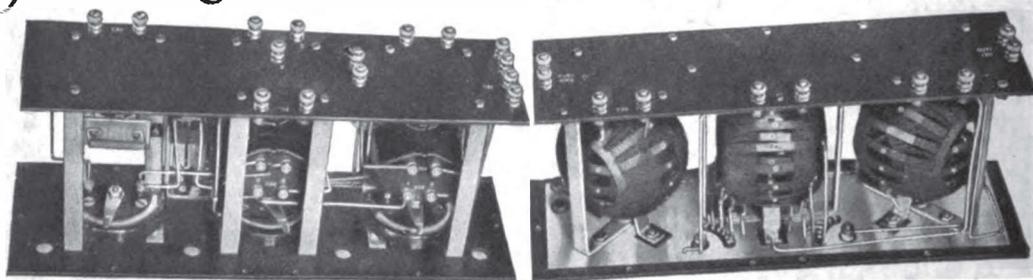
Information on these new products will be found in our new bulletins, A8 and A9.

Ask your dealer to supply your wants on CONNECTICUT apparatus.

**CONNECTICUT TELEPHONE & ELECTRIC COMPANY**  
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# AMRAD

*The Recognized Symbol of Superior Performance*



Detector 2-stage Amplifier 2634

Short Wave Tuner 2596

## Look Behind the Panel

Experienced motorists, before purchasing a new car, critically examine the power mechanism. **THEY LOOK UNDER THE HOOD.** Skilled radio men—QST readers—before passing judgment on the merits of a new set, **LOOK BEHIND THE PANEL.** In the Amrad designs they find the celebrated Basketball Variometer, variable vernier inductances, terminals for load coils, aluminum frame construction, rear connections and shielded Ampliformers.

In the Amrad Short Wave Tuner they find an instrument which will **TUNE DOWN** to 165 meters. In the Amrad Detector 2-Stage Amplifier they find precise plate voltage regulation.

No wonder these highly developed instruments in combination have become a national favorite for the reception of telephone broadcasting and "DX" relays." The solid mahogany cabinets and the lustrous finish delight the eye, but the actual performance thrills the soul.

*Complete description in Bulletin L-1  
sent free on request.*

We encourage relay men to adapt our designs to instruments of their own building. Essential parts of the above combinations are now available. Ask for Forms 299 and 300 if interested.

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