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The Inverse Duplex System of Amplification

By Boyd Phelps, Assistant Editor

THE Inverse Duplex system of amplification receives its name from the manner in which the tubes are used. It is an adaptation of the circuit developed and only partially successfully used by the eminent French engineer, Marius Latour. A recent commercial adaptation of this French circuit has been called the "reflex," but Mr. David Grimes, of New York City, the inventor of the circuit we are about to describe, prefers to call his system "duplex," which more clearly indicates the double function of the valves.

The best known so-called reflex circuit is a hook-up whereby three amplifying tubes are used for three stages of radio and two of audio at the same time, employing a crystal for detection. This arrangement is shown schematically in Fig. 1. Mr. Grimes, who during the war was assigned to special investigation work in the radio branch of the Air Service, tried to adapt the French circuit to the Air Service circuits in order to decrease the number of tubes and consequently reduce the size of the storage battery.

It was soon appreciated that the ordinary system of duplexing had several inherent disadvantages. A casual glance at Fig. 2, which attempts to duplex all of the tubes of a three-tube amplifier set and which also employs a tube detector, will show that the third amplifier tube is very easily overloaded due to the presence in that tube of both powerful radio and powerful audio energy. Thus the total amplification of the arrangement is limited to the output of the third tube. It is also seen that there exist three stages of secondary radio-frequency "leakage amplification" between the output and input of the detector. By this it is meant that a small amount of radio frequency energy leaks thru the detector and associated apparatus by capacity paths and is put back on the input of the three-stage radio amplifier. This causes the circuit to be very unstable, it being next to impossible to stop oscillation without greatly reducing the amplification efficiency of the series. A third and big drawback is the fact that the phones are in the plate circuit of the third amplifying, thus placing three stages of audio amplification between the loop and the phones. Under ordinary
conditions this means that the circuit cannot be satisfactorily operated because of the proximity of sixty-cycle circuits or other electrical apparatus which produce fields of audio frequency which would be amplified by the three audio stages in succession. (In the ordinary set this does not occur because the detector is placed between the loop and the audio stages.)

In Fig. 1, the last-mentioned objection is overcome by using the first tube for audio only. If a tube detector is used in Fig. 1 in place of the crystal, however, there is still a tendency to overload the third tube output of the third tube. The first tube
carries weak radio and strong audio energies, the second tube carries medium values of each, while the third tube carries strong radio and weak audio. Also, no matter how many tubes are used, there never is more than one stage of radio "leakage amplification" between the input and output of the detector tube and there never is more than one tube of audio amplification between the loop or aerial and the phones, as the phones are on the output circuit of the first tube.

Fig. 4 is a diagram showing the detail connections employed in an inverse duplex set using three tubes. This arrangement is recommended for all ordinary purposes, as sufficient amplification is usually obtained. It is the practical adaptation of the theoretical case discussed in connection with Fig. 3. It is well necessary to add the third amplifying tube, which of course would give three stages of radio and three stages of audio. However, if desired, a third amplifying tube may be easily inserted by following the same general scheme as presented in Fig. 4. Substituting a loose-coupler in place of the loop, the set may be readily operated on an aerial where shielding conditions prohibit the use of a loop.

The by-pass condensers in the Grimes circuit carry the radio currents, after passing thru the radio transformers, directly back to the filament instead of merely bypassing them around the audio transformers and then allowing them to pass thru the common B-battery where they would "cross-fire" with the radio energy from the other tubes. This of course places the full B-battery potential across the condensers continually and necessitates their being of small capacity, such as the small square "micadons." Paper condensers here will "blow" after only a few hours of use. All of them are of .001 microfarads capacity except the one connecting the loop circuit to the filament of the first tube and this is made .0025 mfd. to reduce the radio frequency impedance here so that if needed as much as possible of the available radio potential from the loop can be placed across the tube. Increasing the others to .0025 will not materially aid the radio amplification and at the same time starts to by-pass the higher frequencies of the audio currents causing distortion.

In order to regulate the amount of radio frequency energy passing thru the amplifiers, a 400-ohm non-inductive rheostat is connected as shown between the fixed condenser and loop. This produces a straight IR drop in the grid voltage impressed on the first tube. On nearby stations the radio energy, if not needed may easily crowd the tubes to capacity, allowing no available energy for audio amplification. In view of the fact that a tube detector will only handle a certain maximum of radio energy it is therefore foolish to sacrifice the audio capacity of the tube by excess radio amplification. The 400 ohms will be found sufficient to reduce even the strongest stations to reasonable intensity. On weak signals these 400 ohms will be decreased, sometimes even to zero. This system of regulating the radio energy has several distinct advantages over the common practice of placing positive biases on the grids of radio amplifiers by means of potentiometers. In the first place, altho biasing the grids positively accomplishes the reduction of the radio energy and stabilizes the circuit, it also causes distortion and reduces the audio volume, which is not a condition that is desired. And in the second place, if the grid of the first tube is made positive it becomes a relatively low-resistance path across the tuning element which considers...
ably broadens its tuning. This is the reason for the broad tuning of most radio frequency sets. In the Grimes scheme the grids of all the tubes run directly back to the negative side of their respective filaments. Thus the first tube acts only as a small capacity across the tuning element and the controlling resistance is in series with this small shunt path. Therefore the tuning remains very sharp and the audio amplification is entirely undisturbed by the system of controlling the radio.

Another feature of the Grimes arrangement is that the phase angles of the audio currents are so arranged on the grids of the amplifying tubes as to aid the radio energy when it is increasing and diminish it when it is decreasing. It is a well known fact that small changes of grid biasing potential will greatly affect radio frequency amplification. Then at the instant when the voice-modulated radio-frequency energy is passing thru a given tube at a maximum the fed-back audio voltage resulting therefrom should be applied to the grid as a negative potential. When the voice-envelope is diminishing in amplitude, the audio voltage resulting therefrom should be applied to the grid as positive. In this way there results in the receiver an inherent or self modulation which tends to increase the amplitude of modulation of the distant transmitting station. The audio currents thus applied to the grids also tend to suppress in a super-regenerative manner any tendency toward oscillation resulting from the use of radio transformers of insufficient resistance. These phase relations are obtained by the use of audio transformers having a certain ratio between the resistance and inductance, the "Viking Audio," made by the Viking Transformer Co., of New York City, having been found nearest to requirements. To determine whether or not the phase is correct, the primary transformer leads may be interchanged and the result noted. The secondary leads should remain fixed, and with the lead from the outside layer of the winding connected to the grid circuit of the succeeding tube.

In New York City Mr. Grimes is able to tune out completely the local broadcasting stations and bring in many distant stations such as Atlanta, Pittsburgh, Schenectady, etc. This is done on a small loop one foot square having twenty turns. Chicago and Davenport pour in on this set with sufficient volume to fill a large room. Even on the most distant stations the set is remarkably free from high-power telegraph interference such as from WNY and ship traffic, even when operated on Staten Island, right in the heart of New York harbor interference.

One of the interesting features of the Grimes Inverse Duplex set, as it has been quite generally called, is its simplicity of adjustment—one knob does all the tuning, one knob operates the detector rheostat, and the third and last knob controls the 400-ohm radio frequency rheostat previously described. Mr. Grimes has found after experimenting with many types of transformers that in his particular circuit the Acme R2 and R3 are best suited for the radio input to the second and third tubes respectively. On 200 meters this set is just as good as the R.F.A. transformers used in it. Right here let us put in a loud wall because of the poor radio transformers that are supposed to get down to 200 meters. Until manufacturers answer our requests for a good 200-meter transformer, the above-discussed circuit will be best suited for broadcast reception. With the transformers mentioned above (obviously very inefficient on 200 meters) reception was tried on 200 meters with the small loop for about an hour in New York City and a large number of one's, two's and three's were logged with an occasional eight and five. The marvelous freedom from ORM and the ease of adjustment (what could be simpler than one knob?) made the writer yearn all the more for some decent 200-meter radio amplifying transformers.

Although in its present form, for the reason just stated, this circuit is perhaps not directly adaptable to 200 meter work, we are experimenting it because it brings out so many new and novel features. Mr. Grimes was informed that on turning loose our gang with this dope he could expect we would twist his circuit inside out with modifications as found best for our purpose, but at this he expressed no special worry. So here we are, fellows; go to it. Some of us will try tuned stages with two or three variometers on the same wooden shaft, others will try resistance coupled amplifiers with quite probable success, some in addition will use A.C. on the filaments, and others may drag in some features of proven merit in other fields.

At this writing we have not had time to try any extensive experiments. A variometer next to the plate of the detector or a separate oscillator may be used for the reception of C.W., the former being preferable. The use of a grid condenser and leak for the detector or grid biasing batteries for the amplifiers may be worth experimenting with. Fig. 5 shows some such suggestions. It is especially worthy of note that this receiver will not radiate energy and interfere with other receivers in the neighborhood. At any rate, it has possibilities in our field, especially where the average ham can not afford to buy and operate a large number of tubes.

We would appreciate hearing from any of our readers who get good results on 200 meters with this arrangement or modifications thereof.
Across the Pacific Again

AMERICAN amateurs are being heard regularly by amateurs in New Zealand over a distance which approximates 8200 miles from the center of the territory heard! This is good news, for here is another English-speaking country with which we may some day hope to “work.”

The omnipresent 6KA is the star U.S. station in New Zealand, as might be expected, and it is thru his kindness that we have been put in possession of a record of the reception of Mr. R. Slade, of Timaru, South Island. Mr. Slade’s report is verified by several other N.Z. amateurs.

The record-breaking one-tube set of Mr. R. Slade and M. J. Lough, at Timaru, N. Z. (We’re sending them QST now, by the way.)

Transmission is prohibited in New Zealand, the amateur is much restricted, and special permits have to be secured even for reception. Instruments are hard to get, prices high, and in general it is discouraging. Mr. Slade has felt for a long time, however, that American amateur signals could be heard in his country, and has experimented to that end. At last his efforts were fruitful, and from 1:50 to 3:20 A.M. P.S.T. on Sunday, Nov. 5th, 6KA was in his phones loud and clear. That same night he heard 5PX calling CQ, 6BCR calling 9BED, 9BED working, 9UU working, 9YAD calling CQ, and two unidentified stations. On Nov. 6th two unknown stations were heard, and the following night 6KA and two others. Altho the latter were too weak to read, part of a message was copied from 6KA. On Nov. 8th 6KU was heard calling 9AMQ, 9AJP calling CQ, and 9CNS working. Nov. 9th brought in 5XAD calling CQ, 6XAD calling 8UM and 5XAD, 6EN working, 9AWM calling CQ, while 6KA was in all evening and part of his messages copied.

Altho we are rapidly getting inured to super-DX records, we get a real kick out of this reception. Now how many stages of radio amplification do you suppose Mr. Slade uses, or what new discovery has he got that makes this work possible? Get this: He uses a home-made single-circuit tickler regenerator and a single detector tube! (Owners of super-heterodynes will kindly tear their hair in proper manner at this point, and plug in additional stage in the tooth-grasping act.) It’s almost unbelievable, but “there she be, derned if she ain’t.” The tube, of course, was a good one, an “Expanse,” which is a model not now made, and akin in appearance and characteristics to that detector which pre-war amateurs regard as the best we fellows ever had, the old-time tubular Andiotron. If it’s a detector like that, perhaps the reception becomes understandable.

We offer our congratulations both to Mr. Slade and to the transmitters who were heard. We call this real work. As far as we know, this is the first recorded amateur reception in New Zealand.

Another New Zealand amateur, in the North Island, copied an unknown 9th-district station on the early morning of Nov. 10th (9th district time) calling 9AFD. This amateur used a detector and two-step. We are hoping to identify the station heard by an examination of station logs.

Signals in China Again

The same ship operator whom our last issue reported as copying stations in Asiatic waters has now capped the climax by further reception while at anchor in Asiatic ports. On Nov. 25th, while running 100 miles west of Port Author, China, in the Gulf of Chihli, 6KA was copied solid for several minutes and his message logged. This distance is 6300 miles. Again on Dec. 5th at 12:25 A.M. P.S.T., 6KA was copied calling 1DX while at anchor at Tsingtau, China, distance 6100 miles.

One of the best records, mentioned in January QST, has been confirmed. This unusual distance was made by 9CXP of Waterloo, Iowa, with two fifty watt tubes and with an aerial far from ideal in many ways. The first part of this distance was across over half the continent and a mountain range in addition, making the total distance to the point near Australia where 9CXP was heard 5100 miles.

Ploughing eastward across the Pacific on Dec. 17th, 4470 miles west from San Francisco, 6ANH was copied, and the next night at 4225 miles 6TI and 6AWT were added to the list. At 4000 miles 6’s and 7’s were numerous, and 5’s and 9’s were coming in. For further particular see Calls Heard.

It looks like we’ll have to have some Trans-Pacific Tests soon.

K.B.W.
Exploring 100 Meters
By S. Kruse, Technical Editor

We have been a very long time in beginning to appreciate the short radio waves. In 1912, the amateur was given the waves below 200 meters because no one else wanted them and when we began working a thousand miles with our sparks, no one else would believe it.

The coming of the tube set started the same circus all over again. Nobody wanted to work on a short wave; yet we have 200 meter tube sets that work across the continent with less than half a kilowatt.

Now we are ready for the third step, moving on down into the thinly settled territory below 180 meters.

A Resume of Some Short-Wave Work

In the winter of 1920-21, mainly to get away from NSF's chopper and NAA's arc mush, we at Washington, D. C., began to feel our way downward. To our pleased surprise we found that our regular sets only a Western Electric "E" tube driven by a Ford spark coil. His signals at Washington (8 miles) were so intense that the phones were normally left on the table. The other station, 3ABI, was able to work 1TS and 1QP whenever they could be induced to tune down—again there was no interference.

During January of 1922 Mr. Boyd Phelps made tests at Minneapolis to find out how far down the 100-watt tube set at 3ZT would go. Good antenna currents were gotten as far down as 35 meters but no one seemed to have a tuner that was fitted to the job of listening. However, in the spring of 1922, after Mr. Phelps had joined the QST staff, he ran some further tests with Mr. J. L. Rickett and Mr. Frank Conrad of 8XK, with 1RD as listening station. Further tests between 1XK and 1HX (Mr. Phelps' Hartford station) resulted in immediate communication at 135 meters with good signals all the way down to 100 meters. The set at 1HX consisted of two 50-watt tubes working in a Hartley circuit on 1500 volts a.c. This set at 100 meters put 3.6 amperes into a single wire antenna 30 feet off the ground and 60 feet long; at 135 meters the current was 6.5 amperes.

In January of this year "DN" (L. E. Dutton) of 9ZN got the big tube set of that station down to 100 meters and a bit later to 70 meters. Weekly listening tests were at once arranged. In these tests 9ZN called 1HX at 200 meters, announced his wave and then said "QSY 190," and so on down in 10 meter jumps to 100 meters.

In the second test excellent signals at waves down to 145 meters were put into 3XM, 1QP, 3ALN, and Mr. C. A. Service's listening station at So. Manchester, Conn. On a third test good signals all the way down to 100 meters were put into 1HX, 3ALN, 3JJ, 3APV, 3XM, and the listening station of Mr. A. L. Budlong at Washington, D. C.

On February 11th there was run a three-cornered test with 3ALN, 1QP, and 9ZN sending one after the other. 3ALN went down to 110 meters and everything was copied sent by both 1QP and 1HX. 1QP also went down to 110 meters and was copied solid by 3APV and 3ALN. 9ZN did not send but was heard faintly (by Mr. Budlong) saying "In trouble--shot--" 3ALN accordingly sent a second test with about the same results at 1HX.

What the tests mean to us

Why all these logs? For this reason—in every single test, with one solitary exception, the best signals were heard at some wave length below 170 meters. Even if we forget all about the decreased interference it is possible for us to move downward, work our antennas near their fundamentals (or below), and get better signals thru.

The early settlers have found the region of 100 meters good; they invite the amateur world as a whole to come along, and by way of a starter the Operating Department announces —

A 100-Meter CQ. Party
By F. H. Schnell, Traffic Manager

For the benefit of those stations which think they can get down to 100 meters or thereabouts with both transmitter and receiver; a 100 meter CQ Party is arranged for the nights of March 24th and 25th. Beginning promptly at 10:30 p.m., Eastern Standard Time, the short-wave stations of each district will call CQ in accordance with the following schedule.

<table>
<thead>
<tr>
<th>District</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>First</td>
<td>10:30 to 10:40</td>
</tr>
<tr>
<td>Second</td>
<td>10:40 to 10:50</td>
</tr>
<tr>
<td>Third</td>
<td>10:50 to 11:00</td>
</tr>
<tr>
<td>Fourth</td>
<td>11:00 to 11:10</td>
</tr>
<tr>
<td>Fifth</td>
<td>11:10 to 11:20</td>
</tr>
<tr>
<td>Sixth</td>
<td>11:20 to 11:30</td>
</tr>
</tbody>
</table>
March, 1923

Weekly Short-wave Tests

We are planning a system of short-wave tests stations which will, at the same day and hour each week, start at 200 meters and send tests down to 100 meters or lower. The schedule is not ready but will be broadcasted on 200 meters on March 3rd and 10th by picked A.R.R.L. stations in each district, including Canada. These stations will send at 11:30 p.m. their own local time.

Receiving Tuners to Work Below 200 Meters

By Boyd Phelps, Assistant Editor

It is more difficult to make a receiving tuner that will work in the neighborhood of 100 meters than it is to get a tube sending set down to that wave. We have lots to learn in this connection but can use as a basis that which has already been done.

Mr. J. O. Ramsey of 1XA, for waves somewhat below 100 meters, recommends the familiar three-coil regenerative circuit using coils with a diameter of about 3½ inches with 10 turns on the secondary, ½ on the tickler, and about 8 on the primary, which latter is put in series with a small variable condenser. No condenser is needed across the tickler but a good fixed mica condenser (probably between .0005 and .001 microfarads) should be connected around the phones and the B battery. Any inductive-wound rheostats should also be shunted by condensers. Several different tickler coils should be kept handy.

Mr. B. J. Kroger, 3APV, uses a receiving circuit that looks like the familiar “1DH” reversed-feedback transmitting circuit.

Because the tuners at 1HX are handy they can be described in detail. Tuner No. 1 will oscillate between 250 and 100 meters and tunes down (non-oscillating) to 50 meters. It uses the Reinartz circuit and all coils are wound on an untreated cardboard tube with an outside diameter of 2½ inches. The plate coil is tapped at 0, 15, 30, 45 and 60 turns; the antenna coil is tapped at 1, 2, 3, 4, 5 and 8 turns, and the secondary coil is tapped at 20, 26, 32, 30 and 55 turns. The secondary condenser has 5 plates double spaced and the plate condenser should be about .0005 microfarads. Tuner No. 2 oscillates from 160 meters to 75 meters and tunes non-oscillating to 10 meters. It is wound on a 1½ inch tube with No. 22 D.C.C. wire. The tickler plate coil is tapped at 5, 10, 15 and 20 turns, the secondary coil also at 5, 10, 15 and 20, and the antenna coil has six turns, each of which is tapped. “Signal” 11- and 21-plate condensers are used in the secondary and plate circuits, respectively. It is very important that the rotary plates of the feedback condenser be connected to aerial and the rotary plates of the tuning condenser to earth.

It is not necessary with this sort of tuner to tune the antenna to the short wave, neither the setting of the primary switch does have much effect on the secondary wave length. In the tests with 9ZN, 1QP and 3ALN, a single WD-11 tube was used with the filament operated by alternating current from a small bell-ringing transformer. The 60-cycle hum was balanced out by a “Bradleyometer” 200-ohm potentiometer, to the center-tap of which both the grid and plate circuits were returned. A buzzer-driven wave meter was used to check each wave as it was tuned in.

Two-way Tests with Europe

N°1 content with the success of the Transatlantic Tests the Traffic Manager immediately upon their conclusion started arrangements for a definite attempt to establish two-way communication between European and American amateurs. Plans for the tests with England have not yet been completed, but the first series of French tests has been run off, unfortunately without success.

Station 1CKP in South Manchester, Conn., which was heard in England, France and Holland during the December tests, was chosen as the American station for the first trials, and 8AB of Nice as the French terminal. A schedule was arranged by cable providing for transmission and listening periods from Jan. 20th to Feb. 3rd, between 5:00 and 7:00 p.m., and between 10:00 and 12:00 p.m. E.S.T. Communication was not established, altho 8AB was heard on two nights. The first reception is credited to Mr. E. Lauffer, of 2AQP, New York City, who, reading in the newspaper of the tests, straightway re-
paired to his set and slipped on the cans. This was at 5:30 P.M. on Jan. 27th. Local QRM was so bad that he was about to despair, when at 6:20 he picked up Deloy, sending slowly and signing "8AB French." Wave 195 meters, 25-cycle C.W., slight QSS, good audibility but QRM'd; which checks to make a hard job of it. He was heard many times calling and signing, but the only text copied was "Arc QRM terrible—nothing heard." From this it is known that 8AB was having his troubles too and did not hear 1CKP.

Mr. Deloy has cabled us that on Sunday

up OK. On the night of Feb. 2d 1CKP was successful in picking up 8AB on both transmission periods. Under better conditions the signals would have been readable practically thruout, but heavy QRM, considerable QRN, and slight QSS combined

Feb. 4th at 0632 G.M.T. he heard 1XM calling him. Communication was not established, but in the hope that this may be accomplished soon 8AB has arranged to be on the job regularly until March 15th. Here's your chance, fellows. The two-way
trans-Atlantic test is wide open to everybody, a free-for-all. Every man with a good station is invited to participate. 8AB advises that he will transmit every Sunday, Tuesday, and Thursday from this writing until March 15th, from 0500 to 0530 G.M.T., which means from midnight to 12:30 A.M. of those days in E.S.T. Anyone who hears him is privileged to answer from 0530 to 0600 G.M.T. (12:30 to 1:00 A.M. E.S.T.), during which time 8AB will listen for replies.

And QST hereby offers one genuine Brown Derby to the first American amateur to establish two-way communication with Europe. Up and at 'em, lads!

1CKP is a 500-watt 500-cycle I.C.W. set putting 8 amperes into an inverted-L cage aerial 65 ft. high. Altho a new station, it has been heard in every district. Chas. A. Service, jr., assistant A.R.R.L. secretary, is its chief operator.

We take pleasure in presenting several photographs of 8AB, the only French amateur station so far heard in this country. M. Leon Deloy, its operator, was introduced to our readers in "Who's Who" in our December number.

8AB's aerial consists of three 8-wire cages radiating from a main mast on his home at Nice. The top of the 30-ft. mast on the house is about 105 ft. above ground; the other three masts, not shown, are 75 ft. high. At their far end the cages are 12 ft. in diameter, tapering to 6 ft. at the house end; the lead-in cages are 8 inches in diameter.

The first thing to impress the reader in the photograph of 8AB's receiver is the American-built Tucka 3-circuit tuner. This was used during the Tests, with the detector and its battery to the right of the tuner, and the one-step audio amplifier on top of the cabinet. The 6-valve R.F. amplifier, heterodyne, and Magnavox, at the right of the picture, were not used during the tests. 8AB logged 1ARY, 1BCG, 1BDI, 1BGE, 1NY, 2KL, 8AQO, and 8MS on this equipment.

Particular interest attaches to Deloy's transmitter, of course, but unfortunately the picture is not a good one and requires considerable explaining. Left to right are the aerial lead, antenna meter, short-wave condenser, grid coil, aerial and plate coil, two 50-watt tubes used as grid-leak a la 3ZO, grid condenser, rheostat for the 50-watt tubes, two rheos in parallel for the main tubes, insulation condensers (two in series), four 250-watt valves, filament voltmeter, choke coil, H.T. milliammeter, keys, high-tension transformers (four with secondaries in series, delivering 5,000 volts), switch in transformer primary circuit. Below the table is a storage battery for the 50-watt tubes, while on the wall above is the main switch on the 25-cycle 110-volt 3-phase town supply. Filaments of the 250-watters are heated by a step-down transformer located between the O.T. and insulation condensers.

Who will be the first U.S. ham actually to work 8AB?

K.B.W.
The Trans-Canadian Relay

By The Traffic Manager

If we had a bugle we would mount the highest peak in Canada and blow it loud enough for all Canadian Amateurs to hear this Call to the Key in the first attempt at a Trans-Canadian Relay.

The time is ripe for this affair and we are firmly convinced that it will be successful if the stations can be on the air and will do their best to put the relay through. Not one “Yank” is going to help unless it is absolutely necessary, yet if help is needed every “Yank” in the country stands ready to assist in bridging a gap of too great a distance.

Even the arrangements for the relay will be in the hands of a Canadian, as W. C. C. Duncan, member of the A.R.R.L. Board of Direction, (9AW), 196 Ellsworth St., Toronto, Ontario, will have charge of the affair.

The dates selected are March 24, 25, and 26, 1923.

The idea is to relay a message across Canada and get a reply back during one of the nights, and this message is to be handled by Canadian Amateurs only. These good chaps have long wanted a chance to exhibit their skill, and here it is. With so many good Canadian stations on the air, it is but a small matter to get routes lined up.

All Canadian stations (and American stations on the Canadian border) are urged to get ready for the tests and are requested to forward information as to what they can do to Mr. Duncan, who will lay out the route. He will call on American Amateurs if in his judgment they are needed. For the benefit of all stations the following men will be glad to furnish further information:


A. J. Lorimer, Manager of the Quebec Division, c/o Buzzell-Lorimer Co., Cowansville, Que.

P. Socolofsky, Manager of Winnipeg Division, Loreburn, Sask.

J. T. North, Manager of the Vancouver Division, 2017 15 Ave., Vancouver, B.C.

We want to see the following Canadian stations doing their bit along with the others: 2EI, 2AF, 2AN, 2BG, 2DA, 2HG, 3CO, 3XN, 3BV, 3DH, 3DS, 3JH, 3OT, 3DE, 3GK, 3SX, 3JK, 3JL, 3AD, 3FA, 3GE, 3GK, 3NB, 3MN, 4AB, 4AQ, 4CG, 4HH, 4BV, 4FN, 4BR, 4DQ, 4GB, 4AQ, 4EA, 5CN, 5AC, 5BQ, 5EJ, 5GO, 5CW, 5CT, 5AK, 9AX, 9CD, 9BX, 9BD, 9AL, 9AW, 9AC, 9BA, 9BH, and 9BV.

Canada, what do you say?
transatlantic Test Notes

The A.R.R.L. Transatlantic Tests were so hugely successful in the eastward transmission that the analysis of the reports of the European operators who copied signals has assumed enormous proportions. As a result, up to this writing we have not received official reception reports from either England or France. We are advised that Mr. Coursey's report is a week from completion, altho he has been working on it night and day. Because of the huge size of the task, then, we are not yet able to present anything more official than our preliminary report last month.

Reception in Holland

The January 6th issue of the Netherlands amateur magazine Radio Nieuws reports the very successful efforts of Mr. G. J. Eschauzier, of The Hague, who a year ago by receiving 1BCG became the first Holland amateur to hear an American amateur station. In the last tests he succeeded in copying the code words of 34 stations, and in addition heard a total of 53 stations without codes, embracing every U. S. district but the 7th. Among the code groups copied were three not previously reported from Europe: 1FB, 3NH, and 4ID. This has provided a positive identification of the transmission of these stations, and illustrates the great value of qualification in the preliminary tests; in fact Mr. Eschauzier listed codes in several places where the calls were not caught at all, and even tho some of the codes were somewhat garbled the identification was certain. In his list, which follows, asterisks have been used to indicate reception on more than one night, the number indicating the total number of nights logged:

Code letters verified: 1BCG, 1BET, 1AJP, 1BDI, 1ASF, 1XM***, 1YK, 1CNF, 1FB, 2ZK**, 2EL**, 2BML, 2AWF***, 2GK**, 2AWL, 2CQZ, 2CKN, 2HJ, 2L0, 3BGT, 3ZZ**, 3XM, 3BG**, 3NH, 3AAU, 3FS, 3CG, 4BY**, 4ID, 4KM, 5XK, 6ZZ, 8AQO, 9ZN**.

Heard without codes: 1BET***, 1BDI, 1CMK, 1BCF, 1ASF, 1XM, 1BDT**, 1ZE, 1BRO**, 1CKP, 1IH, 1CDO**, 1CDR, 1XK, 1BNT, 1FB, 2BML**, 2ZK, 2CKR***, 2AWF, 2FP****, 2CPD**, 2CBX**, 2BET, 2AWL, 2AYV, 2BQN, 2CJN, 22N, 2BQH, 2YK, 2HJ, 2GK, 3HG**, 3ZQ, 3BG, 3ZW, 3AFB, 3XM**, 3BF, 3BNU, 4ZW, 4ZS, 4Ol**, 4EA, 6AGJ, 8BUM, 8XAE, 8AQO*** including two messages in French, 8AGD, 8DET, 9CXA, 9CM.

This work was done on a honeycomb-tube tuner, detector, and two stages of audio amplification. (On the last night signals were good on but 1 audio stage.) The tubes used were double-grids, but we do not know the hook-up.

Another Dutch amateur, Mr. Y. L. Leistra, of Rotterdam, was also successful in copying 1ZE and his code letters, 1OR working 2CT, 2FP calling Test, and 4BY and 4PT working. 1ZE was the best station, being very QSA, and 2FP next. In the 1921 tests Mr. Leistra heard several stations but too weak to read. This year he used three stages of R.F.A. with V-24 tubes, a W.D.11 detector, two audio stages, and a separate heterodyne. The aerial was a single wire 190 ft. long and 105 ft. high at the far end, with a counterpoise 40 ft. high. This was an excellent aerial but its proportions were such as to give it a marked directional property and this unfortunately was at right angles to the Great Circle of reception. After four nights of listening the aerial came down in a storm, so his effort covers only Dec. 12th to 16th. The last night was poor, with heavy fog and terrific QRN. He reports signals of good audibility but an unfavorable signal-stray ratio, QSS annoying, and many calls lost thru "bum fists" or failure to sign.

Mr. Eschauzier's night-to-night variation in reception was very much in accord with the experience of other European amateurs. For example, on the 16th (G.M.T.) 2BML was the only station heard, while none were logged on the 17th. Yet the 18th was good, and the 20th and 21st excellent. There is every indication that whatever phenomenon it is that governs transmission at such distances was rapidly approaching a peak as the tests concluded; it would have been very interesting indeed, considering the huge lists logged on the last two nights, if transmission could have continued a few nights longer and the shape of the reception curve noted.

This is the way the "Wireless World" shows what Mr. Coursey is up against. Any night since the Transatlantic Tests—sorting out results.
A Seven in England

Mr. W. Witt Burnham has sent us the log of the chief operator of his firm, Mr. J. H. D. Ridley, who was shown seated at his set in the photo on page 9 of our January issue. Mr. Ridley lists 13 stations with the proper codes and 34 without, all of which were reported thru Mr. Coursey's daily messages except 7ZV of Douglas, Wyo., which was not previously mentioned. This station was logged at 0447 G.M.T. Dec. 20th, Eccles committee, but it was believed that it was participating in the free periods. The British representatives have cabled for particulars and a prominent British amateur writes us that no such station was transmitting on their side during the tests. American 2PZ is known to have been QRX. The mystery is still unsolved at this writing, pending word from England. If 2PZ doesn't turn out to be European amateur, the editor of this sheet may yet lose that coat to O.M. Burnham.

5MS Reported Here

The Manchester station 5MS seems to have been heard in this country prior to the tests. Mr. John Leighner, operator JL at 8ZD Pittsburgh (and 8AF at home) copied signals from a station signing 5MS from 0511 to 0514 G.M.T. December 10th. Wave about 270; QSS medium; note like D.C. supply but not smooth. The Manchester Society verifies transmission at that time; no further check seems possible.

28GI, Lakehurst, N. J., reports hearing 5MS on the nights of Dec. 28th, 29th and 30th. On the first two nights no attention was paid to it, Mr. Cranmer supposing it to be a U.S. station. On the 30th he learned that 5MS was British and listened for it in particular that night; at 9:30 E.S.T. he found him, sending his QRA. Detector and one-step audio were used. This report has not yet been verified.

European Signals at Sea

In our last issue we published the logs of some ship operators who copied American stations while in European waters during the first half of the tests. Now we have a log from an operator who sailed from New York for a European port shortly after the beginning of the second half of the tests—fortunate boy! He reports 5WS on Dec. 23d, 900 miles east of New York. The next night, 1100 miles east, he copied French 8AB and a British station believed to be 2SH sending "Great Britain sends Xmas greeting," etc. On Christmas night, 1400 miles east, an unknown British station was received sending the code group MUPZN, which reference to our records shows to have been British 2OM. Dec. 26th, 1600 miles east, British 25H and 5WS were heard, and on the 27th 5WS again at 1800 miles. On Dec. 29th, 2200 miles east and only some 800 miles west of London, British stations 2A0, 2OM, 25H, 5MS, and 5WS were copied, and French stations 8AB and 8RRX, the latter sending his code group ULMON. Altho 8RRX is a queer call, it checks with Dr. Corset's list.

This reception was made on a ship's set with but one tube, and is probably representative of the respective abilities of the various European transmitters.

Some Features of 5WS

We expect to have a detailed description of British 5WS, the European star of the

[Image of Mr. Y. L. Leistra's station in Rotterdam.]

audibility 5, QSS, calling unknown station. Unfortunately nothing further was copied for verification, but if Mr. Felix Thompson was on the job at that moment he may pat himself on the back and say that he got over.

Some Duds

As we mentioned in our February report, some of the calls reported are obviously mistaken. 1GH was not operating when reported from Switzerland; apparently it was 1GV who was heard, as the latter was reported frequently. 3WR is believed to have been 2WR. 8BPF has no C.W. set and was not in commission. 7PO was at sea, but writes to say that he does not believe the mistake is on the part of the listener for he has received cards from Wisconsin and Illinois points reporting his sigs while the set was idle. 1XP comes to light as the station which was reported as "one xray." 3BL was not transmitting although reported; he has cards from every district but somebody else is being misread. 8AJ has not been in operation for a year.

British 2FZ Queried

As reported last month, no less than nine different amateurs, from the Atlantic seaboard as far west as Michigan, copied signals from station 2FZ, unmistakably of foreign origin, during the American listening periods of several nights. This station is listed as belonging to the Wireless Society of Manchester, England, who also built a station with the call letters 5MS for the tests. 2FZ was not among the stations issued code letters by Mr. Coursey's
tests, in an early issue. This station was assembled and operated by a committee of the Radio Society of Great Britain and was located at the Wandsworth generating station of the County of London Electric Supply Co., where a brick chimney 170 ft. high provided an excellent antenna support. A 6-wire cage, 5 ft. diameter, and having an over-all length including lead-in of about 160 ft., was suspended nearly vertically from the stack. Local power of 50-cycle

220-volt A.C. operated an induction motor which was belted to a 350-cycle generator. The generator output was fed to two 1½-kw. step-up transformers for full-wave rectification by rectifiers of the kethron type. We have no particulars as yet on the circuit or tubes used. The input was 1.5 kw. and the antenna current on 200 meters was 4.3 amperes, representing nearly 750 watts. K.B.W.

What the Department of Commerce Thinks of our A.R.R.L. Voluntary Lid

WHEN we amateurs recently evolved a definite plan for cooperation with broadcast listeners in congested communities, the “Rochester Plan” whereby local agreements have been worked out based on mutual concessions and providing that in such localities amateurs will not operate transmitters that can cause interference to concert reception between the hours of 7:00 and 10:30 P.M., our headquarters office wrote letters to the various offices of the Radio Inspection Service inquiring their opinion of our action. We are very happy to say that all the replies were very favorable in their tenor, some of them even gently rebuking us for too full a measure of generosity. This is exactly what we desired to do, however—to have us amateurs assume a position where all fair-minded judges would say that we have been more than square and more than liberal.

For the information of our members we quote, with permission, extracts from the letters received from our bosses, the Department of Commerce:

Hon. D. B. Carson, Commissioner of Navigation

“This plan, if it can be carried out successfully, should eliminate much of the interferenced experienced from spark transmitters nearby, and will certainly convince broadcasting audiences that the amateur organization desires to co-operate with the Department and are willing to voluntarily do their part in solving the interference problem.

“This office does not want to see anything done which will discourage the amateur and believes that the plan you have worked out while it does restrict them to some extent and may deprive a few of them of the enjoyment they have formerly had, it still leaves open sufficient time for the beginners to practice and the older ones to do good work in long distance relaying and experimenting.

“The Bureau fully appreciates cooperation in its endeavor to improve radio operating conditions.”

Inspector C. C. Kolster First District

“I consider the concession made to the broadcast listeners...very liberal on the part of the American Radio Relay League and sincerely hope that this will solve the present day problem. A thorough study of the present day situation should readily convince every 100% radio amateur that the establishment of this silent amateur period is essential for the good interest of future amateur radio.

“I am of the opinion that the establishment of this silent amateur period is but temporary, and that this perplexing problem will bring about certain developments in amateur transmitting equipment which will permit amateur and broadcasting activities to be carried on simultaneously without any serious interference to each other...

“As an amateur, radio operator, radio inspector having served in four districts, and also having served in the Naval Service during the late war, at which time the actual value of amateur radio was put to a real test, I have been in close touch with several hundreds of radio amateurs and no one can better realize than I do the great value of amateur radio and I sincerely hope that the amateurs who have the advantage of many years experience will do all in their power to co-operate with the broadcast listeners and bring about a condition whereby each can enjoy the radio privileges offered them to the best advantage.

“The success of amateur radio to date can be solely attributed to the fact that the amateurs have been so well organized under the American Radio Relay League. The future success of amateur radio depends entirely upon the earnest support of each individual amateur to the organization and it is urged that these amateurs adhere strictly to the future policies outlined by the League.”
Inspector Arthur Batcheller,  
Second District  

"I do not hesitate to say that the American Radio Relay League has displayed a splendid spirit of co-operation, and is making sacrifices in order that the radio public can “listen in” and not suffer interference from amateur transmitting stations.  

This office recognizes the rights that the amateur has under the law, and the technical difficulties encountered by the radio novice. You can rest assured that this office will co-operate with you fully as regards the matter which you have brought to our attention."

Inspector Theo. G. Deier, Fifth District  

"...we of course very highly approve of the arrangements as set forth. We realize also the sacrifice made by the amateurs and will do all in our power to see that it is appreciated by the listeners. To this end we would like very much to have, if possible, a number of copies of the reprint of the editorial referred to, and we will see that they are placed in the hands of representative listeners thruout our district...  

This office has, of course, had its share of trouble in trying to smooth out differences between the amateur and listener, but we do not consider that the amount of difficulty has been either hopeless or very deplorable.... It is believed that the stand of the A.R.R.L. will be of material assistance.  

“You can rest assured that the writer and the other members of this office staff not only approve and sympathize in the undertaking but also that we can be depended upon for whatever assistance you consider worthy of asking for."

Inspector J. F. Dillon, Sixth District  

"Insofar as this district is concerned we have, by mutual agreement between the broadcasters and the amateur stations, arranged for a period of silence between 7:30 and 8 P.M. and for the exclusive right to the space for broadcasters and pure C.W. Spark transmitters and I.C.W. are to keep off the air during the period from 8:00 to 10:30 P.M.; and at all other hours all stations have equal rights. In view of this I do not think it will be necessary for the League to impose any restrictions upon its membership within this district, as the agreement was really between the membership of the American Radio Relay League and the broadcasters associations of the various communities. Hence, there can be no friction between the two bodies.  

"Of course I am very much interested in the amicable co-operation of these parties and am constantly exerting every effort to maintain harmony among them. We all recognize that in the present stage of radio communication, it requires the earnest cooperation of all factions interested in the art in order to permit all of our people to obtain the maximum amount of pleasure and benefit from its operation."

Inspector S. W. Edwards, Eighth District  

"I read Mr. Maxim’s letter and your editorial with more than ordinary interest. Examining the proposal from all angles, it is my opinion that the American Radio Relay League have conceded too much. I believe that it would have been better had you endeavored to put thru a plan whereby a more equal division of time between listening and transmitting stations existed. The present plan... works a severe hard-  

(Concluded on page 23)

The Best American Amateur Transatlantic Sending Stations

The Tables on the next two pages are intended to describe the best of those American amateur sending sets which were heard in Europe during the east-bound Transatlantic transmission tests conducted from December 12 to 21 of 1922 by the American Radio Relay League in co-operation with the Comite Francois des Essais Transatlantiques and a committee of the Radio Society of Great Britain. Reception was however not confined to these countries but was aided by amateurs in Switzerland, Holland and Italy.  

The stations here described were heard more than twice in one country or else were heard in two or more countries.  

The list is not entirely complete; some station owners did not respond to the request for data in time for publication. In one case, that of 401 at Porto Rico, it was impossible to obtain data in time because of slow mail service.  

The list is not absolutely accurate. There will be noticed curious groupings of similar calls that which lead to the suspicion that there was inaccurate copying or sending. It is also probable that the list does injustice to the stations of Canada. The only distinction between a United States station and a Canadian is that the former uses “de” between the call and the “sine” while the Canadian uses “fm.” This slight difference does not seem to have been adequately appreciated in Europe hence some calls listed here as American may have been Canadian.
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<thead>
<tr>
<th>CALL</th>
<th>LOCATION</th>
<th>TUBES</th>
<th>NR.</th>
<th>TYPE</th>
<th>PLATE VOLS</th>
<th>PLATE WATTS</th>
<th>ANT. WATTS</th>
<th>AMB.</th>
<th>λ</th>
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<th>GROUND</th>
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ship on the vast number of amateurs of the younger set who necessarily, because of their age, must retire early. ... My argument against the present plan is that you have given up certain rights which you may not be able to ever again have returned to amateur transmitting stations. As I see it, listening stations will be demanding more and more time and as you have at one time given up the major portion of the evening hours, you will not have any time left to barter in case the listening stations make demands for an additional quiet period during the evening. Listening stations will probably now desire hours after 10:30 P.M. so that they can receive long distance concerts.

"The scheme that I have in mind to satisfy the demands of listening stations was to arrange quiet periods in various cities throughout the District two or three evenings during the week. This quiet period not only covered amateur stations but broadcasting stations as well.

"The whole thing simmers down, after all, to a question of efficient transmitters. Your statement "Our transmitters must improve" is the answer to the whole thing."

"However, because we seem to hold different opinions on the division of time, I do not want to give you the impression that your plan will not have my support. My only objection is that I feel that too much has been given at this time."
about 4½" x ½" and contain perforated spiral metal tubes packed with alternate layers of flake nickel and nickel hydroxide. The tubes are crimped shut at the ends and are banded by small steel rings. They are to be removed for use as the positive elements of our small cells.

The pockets and tubes that we now have are without connecting lugs and these must be provided. Drill thru each pocket and tube a ¼" hole about ½" from one end. Use a sharp drill running at high speed and feed lightly. If the drill is crooked or ground off-center it will tear up the thin metal of the pockets. Some nickel wire (24 to 16 A.W.G.) is now cut in lengths of about 7 to 9 in. and one end of each piece is fastened to a positive tube by passing thru the hole and twisting tightly to secure good connection; the other end is then secured to a negative pocket in the same manner. The joints must be tight or the battery will be terribly noisy; to make sure they had better be mashed down hard with heavy pliers or in a vise after twisting.

We now have pairs of elements connected by a length of wire so that they may be hung in small battery jars set close together or in test tubes set in a rack. We need separators and battery jars. The separators may be made by breaking up the rubber strip separators found in the large cells, so that one of the bosses is left at the end of each piece. The elements are then assembled with these spacers between them and held together by two small rubber bands. Almost any small jar may be used as a container but test tubes, specimen tubes or culture tubes are cheapest and are also compact. A good tube is the 20-millimeter by 150-millimeter culture tube. Fifty of these can be set in a wood rack six inches wide and a foot long, as shown tubes are to stand, the ½" augur should be preceded by a ½" drill as the worm of the augur will otherwise split the thin wood used for the rack. Because of the action of the solution it is well to use iron screws in assembling the rack.

The Solution

The tubes are now set in place, the elements inserted, and everything is ready for the solution. This is made of distilled water with potassium hydroxide added until a hydrometer test of 1250 is obtained, i.e., 21% solution. The solution should be made up in a carefully cleaned jar and the hydrometer well washed out if it has been previously used with lead-and-acid batteries. For a rack of 50 cells about a pound of potassium hydroxide will be needed. The kind that comes in white sticks is preferred and costs 50 to 60 cents a pound.

Now remove the float from the hydrometer and use it as a syringe to put in each tube enough solution to stand ½" above the elements. To prevent evaporation and also the very messy "crawling" of the solution it is well to put in each cell about ½" of paraffin oil, which will float on the solution. Water may be added at any time thru this oil layer. It is well not to use "any old oil;" better stick to paraffin, "Nujol," or some other oil that is sure to be non-acid and not likely to mix with the solution.

Suggestions

The procedure given above gives best results but need not be followed exactly. Iron wire may be used for connecting the elements if nickel cannot be secured. In filling the are and at all other times the solution should be handled with great respect—its destructive effect is much greater than that of the acid solution of a lead cell and its effect on the skin is much more prompt, painful and permanent. However, once assembled it is a perfectly safe battery.

Charging

The charging current for a battery like that described should be 0.3 amperes, to be continued for 8 hours. There is no way of telling when an Edison battery is charged. The specific gravity of the solution does not change so a hydrometer will always read the same, and the voltage has an unhappy way of remaining the same over quite a long part of the charge period. An overcharge does no harm, so one simply charges the battery about 50% too long and then uses it until it stops working. The charge may be rushed more than this—the only limit is that the cells must not boil; they should gas freely, however. When fully charged the voltage of the 50-cell rack will be about 70, which will run a detector and two-step amplifier nicely.

When charging on D.C. a series resistance (lamp) is all that is needed. When charging on A.C. the connection shown in Fig. 2 is used. The rectifier is a purchased or home-made electrolytic of the usual type with lead and aluminum plates. (If homemade it can have ¾" x ¾" plates in any of the solutions described in the "Rectifier Symposium" in June QST; see also the article on "An Electrolytic "A" Battery Charger" on page 39, December QST—Ed.)

Low-Power Transmission

As stated above, each 50-cell tray delivers about 70 volts. It is then possible to use five or more such racks to operate a sending set using 5-watt tubes, as the batteries are well capable of delivering a
The gang decided that "something gotta be elected president of the council. Primer evening of off by introducing Walt (alias called, after the time and place was chosen done, 'and so the Portland meeting was called, after the time and place was chosen by a vote of all the hams in the district.

The Northwest Radio Association of Portland extended the glad hand in great style to the visiting hams, and invited us all to help them enjoy their annual banquet, to be held on the 28th. As the mere mention of the word banquet makes every amateur's mouth water, the whole gang couldn't help but show up pronto on the 28th.

Entering the banquet rooms, we were immediately engulfed in a riot of handshaking and greetings such as we had never been in before. All we can say is that when we came to, we found that the whole gang was there. For some time, the din of good fellowship prevailed, until Jack Tait announced that the feed was ready. After the ensuing scramble, the gang fell to, and did full honors to their host. Mr. Meyers entertained with some dawg good magic between the courses.

When the last piece of cake had disappeared, 7IW, the toastmaster started the evening off by introducing Walt (alias "Tubby") Russ, president of the N.R.A. Russ extended greetings to the 200 guests, and spoke briefly of the history, and objects of the Portland Club. Howard Mason, A.R.R.L. Northwestern Division Manager was then given the floor, and began by announcing the latest results from the T-A tests, which was met with much enthusiasm. He then told briefly, the history of the League and its accomplishments to date, and explained how each amateur can play an important part, as a member of the A.R.R.L. Lt. Commander S. M. Mathes, U. S. N. was the next speaker. He made a valiant speech for the amateur, and brought forcibly to our minds, the needs for the utmost cooperation between every ham in the country. He also explained to the B. C. Ls present just what the aims and objects of the amateurs were in a clear, straightforward manner. (And believe me, he sure converted a flock of B. C. L.'s Dancing, and a general hamfest after the banquet continued till the "wee sma' hours."

The next day, Mr. A. H. Babcock, A.R.L. Director arrived from San Francisco. He was right on the job all the way through, and his assistance was more than valuable. Most of the day was spent in visiting the various ham stations where groups gathered and discussed the various points desirable in the Council organization. In the evening, the weekly meeting of the N.R.A. was held, and of course the whole gang attended and added considerable pep to the meeting.

The Executive Council was organized the following day. The meeting was called to order by the temporary chairman at 10:00 A.M. and the bunch immediately got down to business. The many and varied problems to be met were discussed from all angles. Delegates presented their views and contributed valuable material for the council organization. Finally, a committee of twelve was appointed to draw up a tentative constitution during the noon hour, and the rest adjourned.

This gang immediately pulled their coats off, rolled up their sleeves, pulled up

**Seventh District Executive Council Formed**

*Reported by H. F. Mason, 7BK.*

A MATEURS of the seventh district "made history" on December 30th, The next day, Mr. A. H. Babcock, A.R.L. Director arrived from San Francisco. He was right on the job all the way through, and his assistance was more than valuable. Most of the day was spent in visiting the various ham stations where groups gathered and discussed the various points desirable in the Council organization. In the evening, the weekly meeting of the N.R.A. was held, and of course the whole gang attended and added considerable pep to the meeting.

The Executive Council was organized the following day. The meeting was called to order by the temporary chairman at 10:00 A.M. and the bunch immediately got down to business. The many and varied problems to be met were discussed from all angles. Delegates presented their views and contributed valuable material for the council organization. Finally, a committee of twelve was appointed to draw up a tentative constitution during the noon hour, and the rest adjourned.

This gang immediately pulled their coats off, rolled up their sleeves, pulled up
their chairs to the long table, and went to it. It was a hard battle, but at two o'clock, they emerged with the constitution. The general meeting was again called to order, and the gang proceeded to adopt the constitution, section by section. In a few hours, everyone had a clear understanding of everything in it, and it was ratified by the gang.

We're blamed sorry that QST hasn't room to print the whole constitution right here, but a few of the main points embodied in it are:

1. Every licensed amateur is a member of the council.
2. Affairs of the council are handled by:
   (a) An Administrative Board, which consists of 14 delegates, elected annually, one from each congressional district in the seventh radio inspection district, by the amateurs in that district.
   (b) An Executive Board, which consists of the three council officers, who are elected by the amateurs at each annual convention.

The next business of the meeting was the election of officers, which resulted as stated above.

Immediately taking the chair, Mr. Maybee, the president proceeded to get the council on the right track, and off on time. (He's a railroad man.)

The question of amateur vs. B.C.L., immediately arose. After much discussion, and heated arguments, the whole thing simmered down to the one fact that everyone present agreed upon: That a uniform plan for quiet period for broadcasts must be adopted by the amateurs, and that we must stick together, not by the dozens, but by the thousands, and make a definite stand on our policy. We must, if necessary, arrange our various local schedules to conform with this plan, for the sake of having something that the whole gang is behind, in the event that the rights of we amateurs are in danger.

The plan adopted is the Revised Pacific Plan, so-called because it is the plan that has been in operation throughout the sixth District for some time, and is a revision of the original Pacific Plan. Now that the plan is adopted by the seventh district amateurs also, we now have a uniform plan of quiet hours for nine states. Howzat? The plan is flexible, yet defines clearly the working hours for the broadcasters and the amateurs.

It follows:

Sec. 1. That the half-hour from 7:30 to 8:00 P.M. be reserved daily, including Sundays, for the purpose of allowing long-distance reception by Pacific Coast stations without interference from amateur transmitters or broadcasters, and that during this half-hour listening period, no transmitting by amateurs or broadcasters be carried on.

Sec. 2. That all Pacific Coast broadcasting and amateur stations be allowed to operate up to the hour of 7:30 P.M. daily, including Sundays.

Sec. 3. That no spark, or damped wave transmitter be operated between the hours of 7:30 P.M. and 10:00 and that the hours from 3:00 to 10:00 P.M. be devoted exclusively to broadcasting, which shall cease promptly at ten o'clock.

Sec. 4. That amateur stations using the transmitting system emitting pure continuous waves be allowed to transmit at any hour of the day or night, with the exception of the silent half-hour as provided for in Section 1.

Sec. 5. That the traffic schedule after the hour of 10:00 P.M. daily, be maintained for the purpose of long-distance amateur transmission exclusively, and that the schedule remain in effect up to and including the hour of 12:00 midnight, daily.

So, we who contributed our part towards getting the council started all feel that we've done a good job by accomplishing what we did at the Portland meeting. To know that every amateur in the district is a member of an organization of just amateurs is a big step towards better cooperation, as is the fact that a uniform plan of quiet hours has been adopted and is being carried out throughout the district just the same as if it was a part of the Laws and Regulations.

Big things may be expected from the Northwest in the future, and we'll say we're on the job. 73's.
Conference on Radio Standardization

On Jan. 12th in New York City a conference was called by the Bureau of Standards in cooperation with the American Engineering Standards Committee, to consider radio standardization, at the request of the Institute of Radio Engineers, National Radio Chamber of Commerce, Radio Apparatus Section of the Associated Mfrs. of Electrical Supplies, National Retail Dry Goods Assn., the R.C.A., and the A.R.R.L. About one hundred representatives, from every radio interest, were in attendance.

After introductory remarks by various speakers the meeting took up the consideration of the Agenda, which had been compiled and circulated by the Bureau. Discussion on procedure for carrying out any conclusions which might be reached developed the fact that the procedure of the American Engineering Standards Committee is very suitable for the formulation of radio standards, and it was voted to form a sectional committee under the rules of the A.E.S.C. The conference then took up the question of sponsorship for this undertaking, as required under the A.E.S.C. procedure. After much discussion the American Institute of Electrical Engineers and the I.R.E. were selected as joint sponsors by a unanimous vote.

Motions were carried leaving to the sectional committee the decision as to the type and scope of the standardization to be undertaken immediately, including the consideration of testing facilities and other related lines of activity.

Dr. A. N. Goldsmith and Mr. L. T. Robinson, having consulted with one another in behalf of the Institute of Radio Engineers and the American Institute of Electrical Engineers respectively, made a statement acknowledging the expression of confidence in the organizations shown by the action of the conference. They appointed the following advisory committee to assist in the organization of the sectional committee and the necessary technical subcommittees:

Department of Commerce, Dr. J. H. Dellinger and Mr. L. E. Whitemore.

Navy, Commander S. C. Hooper.

Army, Major L. B. Bender.

National Radio Chamber of Commerce, Mr. G. H. Lewis.

Radio Section of the Associated Manufacturers of Electrical Supplies, Mr. M. C. Rypinski.

National Retail Dry Goods Association, Mr. Wm. A. Fitzgerald.

Pacific Radio Trade Association, Mr. Max Loewenthal.

Consulting Engineers, Mr. J. V. L. Hogan.

American Radio Relay League, Mr. K. B. Warner.

As a representative of the Standardization Committee of the Institute of Radio Engineers and former member of the American Institute of Electrical Engineers Standardization Committee, Mr. Donald McNicol.

Institute of Radio Engineers, Dr. A. N. Goldsmith.

American Institute of Electrical Engineers, Mr. L. T. Robinson.

The action of the conference may be summarized by stating that it agreed unanimously (1) that standards for radio apparatus and service should be formulated, and (2) that a broadly representative national committee on radio standardization should be formed under the leadership of the Institute of Radio Engineers and the American Institute of Electrical Engineers following the procedure of the American Engineering Standards Committee.

A New Amplifying Tube

The General Electric Co. has designed a new amplifying tube which is being manufactured by that company and the Westinghouse company and marketed by the Radio Corp. of America under the name U.V.201-A and by E. T. Cunningham under the name C-301-A.

The new tube is announced as either amplifier or detector, but it is primarily as an amplifier that it is interesting. Its ability as a detector is not as great as the U.V.500 (C-300) although it is better than the U.V.201. It is a high vacuum tube using a filament of new characteristics, the merits of which are long life, low power consumption, and copious electron emission. Similar to the U.V.201, it is 4.5" in maximum height and 1.7" in greatest diameter. The elements are much larger than in previous tubes. The vacuum is the "hardest" possible. It is obtained by a new process which leaves the tubes with a brilliant silvercolored metallic coating.

The most interesting thing about the tube is that it consumes but 0.25 amperes at a terminal voltage of 5.0, which is but one-quarter the power required by its
predecessor. Four of these tubes may be operated with no more drain on a storage battery than one of the old-style amplifiers. This is possible by a newly-developed form of filament, known as the “X-L,” about which no particulars are available except that it is neither a plain tungsten filament, as in older models, nor an oxidized filament as used by the Western Electric Co. Whatever it is, it is of very high activation, capable of emitting at least a thousand times as many electrons as preceding forms of Radiotron filament. It is accordingly possible to reduce the filament temperature greatly and still obtain 50% more electron emission than preceding models. The filament is sturdy and will stand rough usage; failure of a tube will rarely be due to actual burnout—the filament is gradually “used up” and the end of useful life is marked by a drop in electron emission. Due to the peculiar nature of the material, the tube may lose its activity if excessive voltage is accidently applied to it, but ordinarily it may be restored by “boiling out” more electron-emitting material from the filament by burning for a few minutes with plate voltage off.

Altogether aside from filament economy, the tube is an excellent amplifier. This is largely attributable to the dimensions of the elements and their relative spacing. The tube has a higher mutual conductance than any other amplifier available on the market. We amateurs should get better acquainted with this term “mutual conductance,” as it is the proper unit for gauging the “goodness” of an amplifier. We are accustomed, we fear, to content ourselves with a consideration of the μ or “voltage amplification factor” of a tube, but this is merely a measure of the number of volts by which the plate potential must be changed to cause the same change in the plate current which is produced by one volt change in the grid potential. This measure takes no account of the impedance of various tubes, which may vary greatly in tubes of the same μ, and which in any given tube is dependent upon the plate voltage used, etc. The real measure of amplifying ability is a tube’s mutual conductance, which at a given plate voltage and at a given grid voltage (usually zero) is expressed by the formula

\[ G = \frac{\mu}{Z} \]

wherein \( G \), the mutual conductance, is expressed in micromhos; \( \mu \) is the voltage amplification; and \( Z \) the internal plate impedance in ohms. The new tube has a \( \mu \) of 6.6 when operating with a plate voltage of 40, at which voltage (with zero grid potential) the impedance is 16,000 ohms. The mutual conductance is accordingly 300 micromhos. At 90 volts, with \( \mu = 6.7 \) and \( Z = 3,000 \), it is 750 micromhos. Just how good an amplifying action this denotes is evident in a consideration of the U.V.201, which altho it has a \( \mu \) of 6 to 6.5, has a mutual conductance at the respective plate voltages of but 300 and 400 micromhos, respectively. In the W.D.11, \( G \) approximates 300 for all the working plate voltages.

The 201-A (C-301-A) is particularly useful in phone work where a considerable volume of sound energy is handled. Because of its greater emission, saturation is not reached at reasonable plate voltages, and as a result there is much less distortion. Couple with this its economy and its greater amplifying efficiency and it will be seen to be a particularly useful tube.

At zero grid voltage, the plate current at 40 volts is 1 ma.; at 90 volts, 0.6 ma.; and at 100 volts, 0.4 ma. Accordingly a negative grid bias is necessary, not only for plate battery economy but for distortionless amplification. It is important that the filament rheostat be placed on the negative side of the A-battery and the return lead from the grid circuit connected to the negative side of the battery. This ordinarily provides sufficient grid bias, due to the IR drop in the rheostat, for operation of the tube on 45 volts. At 60 volts the bias should be 1 to 3 volts negative; at 80 volts, 3 to 4.5 volts; and at 100 volts, 4.5 to 6 volts.

Used as a detector, the grid return should be connected to the positive side of the filament and a grid condenser of 0.0025 mkfd. and leak of 2 to 5 megohms provided. Altho a soft tube is preferable for non-oscillating detection, such a hard tube as this new one of course is excellent for C.W. reception, and we have secured splendid results from its use.

The tube is also a good radio-frequency amplifier, so good in fact that the various “lossers” commonly used to stabilize R.F.A. circuits are quite unable to prevent oscillation. It is suggested that a variable non-inductive resistance be incorporated in the tuned circuit, after the manner described in our leading article this month, to control this tendency.

We had hoped that when new tubes came they would be cheaper in price, but the 201-A is $9. The Radio Corporation explains that the development expense incurred in research work in the development of any new tube, the changes in the lamp factories required for its manufacture, and the other difficulties involved, are so great that there is a considerable time after production before the cost of the public reflects the cost of manufacture.

Like most powerful amplifying tubes, when used in a multi-stage audio frequency amplifier, U.V.201-A gives loud noises when jarred. It should therefore be mounted on cushion or spring supports to prevent noise from vibration. K.B.W.
“To Be, Or Not To Be”

All eyes these days are turned towards Washington, anxiously watching the fate of pending legislation, on which the hope of unscrambling our country’s radio muddle so completely depends.

The White Bill passed the House on Jan. 31st and went to the Senate. Being there deprived of a place on the unanimous consent calendar it was on Feb. 8th referred to the Committee on Interstate Commerce. There it lies at the moment of writing, we fear with but slim chances of becoming law. Rumors are rampant that the folks who don’t like it are safe as it won’t be reported out of committee, and that even if it is the crowded Senate calendar will not permit its slating, so that it will pass out with the expiration of the 67th Congress on March 4th. Goodness only knows what actually will happen to it, but the die will be cast by the time this issue of QST reaches our readers and either we will have a new law or another year will have been lost.

The hearings on the bill (H.R. 11964) in the House Committee on the Merchant Marine & Fisheries were reported in our last issue. On Jan 11th Mr. White introduced a new bill, H.R. 13773, embodying the changes determined upon in committee, and this was reported out favorably. It came up for discussion in the House on Jan. 24th and was carried over to the 31st, when it finally passed at 4 P.M.

The changes made to the bill between the hearings on H.R. 11964 and the passage of H.R. 13773 were for the most part minor ones. The restriction in paragraph C of section 2 providing that licenses could be granted only to stations which were “in the interest of the general public service” was removed, as had been asked by A.R.R.L. representatives. The membership of the advisory committee provided for in section 5 was increased to fifteen, with eight representatives of government departments and seven non-governmental representatives, and the per diem of the latter originally contemplated was stricken out. And in section 10 A.R.R.L. desires were met in a change which provided that the words “naval and military stations” in the 1912 law should be changed to read “government-owned or operated,” instead of merely “government,” as the earlier drafts had it. Then there were small additions, of no importance to the amateur, respecting the revocation of commercial licenses, etc. And there you are.

Will it become law? We hope so, but your guess is as good as ours. Heaven knows this country needs a new radio law. We amateurs are well cared for by the 1912 law but we know other interests are not. It will be a burning shame if the White-Kellogg bill is not enacted, for, while far from a perfect document it represents substantial agreement among radio interests which have been trying for six long years to compose their differences, and without doubt it would be an immense relief to the general situation. We are watchfully waiting—and hoping.

A New Field

Have you ever noticed what a narrow escape 200 meters has from being the lowest amateur wave length instead of the highest? If you want to find almost blank silence, listen anywhere below 180 meters.

Notice we said “almost.” It isn’t quite blank, and it’s liable to grow rapidly less so as a result of some very interesting experiments now in process among a group of amateur stations. Last winter considerable work on waves between 80 and 135 meters was done between some amateur stations in Boston, Hartford, and Pittsburgh, but the data seem to have become commercially interesting and the fellows in possession of it have shut up like clams and there is slight hope that those particular results will ever become available to us. As a result some of our own gang have determined to dig up the dope for themselves and the preliminary tests have been most encouraging.

Do you know that 100-meter transmission between Illinois and Connecticut is proving F.B.? It is! At the present time there is of course practically no QRN on such wave lengths except an occasional harmonic. That alone makes it worth while. There seems to be an appreciable increase in the efficiency of radiation as the wave length
is dropped; and there is the "kick" the experimenter gets in trying something new—and succeeding.

We'll have some data in QST very soon—perhaps somewhere in this issue—on how this work is done and how much it is worth while. Meanwhile peel off some turns on that tuner, O.M., and take a listen at it. Any form of tuner seems to do, if it will get down and has enough reaction to oscillate at the low waves. Some of the transmitting is done by actually tuning down to the short wave on a small aerial using a series condenser, and some of it is done by tuning the tube plate circuit to a harmonic of a bigger antenna and radiating on the harmonic. Some of the fellows have got down as low as 50 meters.

Get in on it, O.M. And if a B.C.L. can get QRM from a 100-meter wave, then we know it's his bum tuner.

C.W. Licenses

Do you fellows know that your station license provides that the apparatus described in the application shall not be changed without permission? And that a license granted a spark station is not good for the use of C.W. equipment? It sounds queer, considering that any complaint ought to prefer a tube set to a spark, but if anybody wants to "get" you on it they can.

A broadcast listener recently filed a complaint with a radio inspector against a well known eastern spark amateur, alleging the use of an illegally broad and too-long wave. Called upon the carpet, there was no evidence that his spark, which was good as such animals go, was not entirely legal. But he volunteered the information that he was experimenting with C.W. anyway and the interference probably would be still further reduced. Whereupon, altbo his spark set was O.K., he was informed that the use of C.W. was in violation of his license, and it was suspended for three months.

Moral: If the equipment you are using is greatly different from that for which your license was issued, take up the matter with your Inspector and "get right."

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**Tuned Grid Chokes for Tube Sending Sets**

By R. C. Curtis

I wish to present an idea for increasing the efficiency of a C.W. transmitter. It isn't new but seems to have been forgotten lately. When a grid leak is used across the grid and filament to keep the grid condenser discharged it also causes the loss of some of the high frequency energy in the grid circuit due to the fact that the resistance is shunted across the grid inductance and grid condenser. When the tubes are worked at their normal ratings this loss is not bad but most of the tubes used today are doing the work of a "mightier tube" (Hi) and in this condition the loss is usually quite large. By placing a radio frequency choke, or better still a tuned circuit consisting of an inductance with a capacity in shunt in the grid leak circuit, this loss can be greatly reduced. The circuit shown is the reversed feedback but will work in any circuit where the grid leak is across the grid and filament.

With reference to the diagram, the action is as follows: When the circuit L.C. is tuned to the emitted wave the current thru the circuit is at a minimum and therefore the loss is at a minimum. In actual working conditions this state is indicated by an increase in antenna current and a decrease in plate current making it possible to use a higher plate voltage and consequently larger radiation without excessive plate current. The coil L, should be kept away from, or at right angles to, the main inductances of the set.

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**Diagram:**

A test was made as follows. A set using two Western Electric VT-2 ("E") tubes was connected in the "IDH" or British Aircraft circuit to an antenna of the inverted L type. The antenna height was 10 feet on one end and 80 on the other, the top had six wires and the ground connection was of low resistance. The plate supply was from a 600 volt D.C. generator. The readings were as follows:

- Antenna Current—2.3 Amperes
- Plate Current—40 Milamperes

The tuned choke arrangement was then added and another reading taken.

- Antenna Current—2.5 Amperes
- Plate Current—70 Milamperes

This represents a very nice increase in efficiency—nearly 50%.

The same sort of affair can be inserted in the plate supply leads, and although these all require adjustment for wave length changes, they will probably prove r.f. power savers.
This splendid report will speak for itself! There are just one or two things we have to say and after listing the 300 hitters and crowing about our biggest traffic month in the history of amateur radio we will let you pass on to the division reports. Three times in rapid succession this good old crew of the Operating Department came forth and smashed record after record until this total of over 80,000 messages was reached. Did we hear a whisper of 100,000 messages in one month? It took over 1,000 relayers of first order to ring up this figure, and if this pace keeps up it will be but a short time before we pass that mark of 100,000. 3ZO attempted to break 3XM’s record of last month but fell short by a few messages.

Our Hawaiian Division is being handled by K. A. Cantin since old 6ZAC left for the mainland. We look forward with an eager eye to the opening of 6ZY, who will endeavor to carry on where 6ZAC left off.

Of particular interest is our cover this month right in line with the great number of tubes blown by men of the O.D. How

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**Message Traffic Report By Divisions**

**JANUARY**

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<th>Stns.</th>
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With this heavy amount of traffic, it is high time that the check and date actually become part of each message. Delivery is considerably better and messages are moving faster, therefore it behooves us to use the check and filing date beginning right now.
an American amateur uses the interval de
Canadian-Canadian uses v
American-Canadian uses aa
Canadian-American uses fm

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<td>411</td>
<td>3BNU</td>
</tr>
<tr>
<td>1MY</td>
<td>308</td>
<td>9BJJ</td>
</tr>
<tr>
<td>9APS</td>
<td>404</td>
<td>3YO</td>
</tr>
<tr>
<td>1CMK</td>
<td>396</td>
<td>9COS</td>
</tr>
</tbody>
</table>

(*) indicates spark stations.

**TRAFFIC REPORTS FROM A.R.R.L. OFFICIAL RELAY STATIONS**

**NORTHERN DIVISION—C.W.:** KG, 18; 9CV, 104; 9DMJ, 116; 9РИG, 212; 9CFY, 27; 9CGE, 104; 9CЕE, 41; 9KO, 11; 9BED, 219; 9BZ, 65; 9N, 81; 9AAG, 222; 9ARG, 29; 9ADD, 7; 9AUK, 16; 9CTG, 142; 9RZ, 42; 9AGG, 68; 9BRN, 11; 9AON, 334; 9FPM, 190; 9BR, 174; 9DZY, 29; 9BND, 238; 9CLR, 185; 9DYPY, 12; 9DBS, 58; 9BRK, 40; 9BOK, 12; 9DJB, 25; 9DPD, 26; 9BRW, 25; 9CDD, 248; 9L, 69; 9BZG, 87; 9CAO, 73; 9HC, 90; 9DDP, 1; 9DLY, 39; 9AKZ, 172; 9AGM, 156; 9CFF, 141; 9MCU, 140; 9BHK, 94; 9UL, 79; 9ATN, 83; 9BYU, 56; 9AKA, 54; 9DAB, 229; 9GAL, 209; 9H, 183; 9DAA, 89; 9RZ, 80; 9D8, 27; 9HIT, 25; 9AXU, 20; 9BEZ, 19; 9ERD, 17; 9BYG, 15; 9RR, 29; 49F, 182; 9YU, 291; 9BXT, 119; 9AIN, 110; 9AT, 129; 9BIB, 158.

Spark: 9AB, 46; 9APL, 144; 9DMJ, 20; 9BRN, 180; 9WE, 6R; 9BG, 92; 9DOW, 35; 9DZY, 68; 9BPC, 125; 9CFF, 141; 9QQ, 27; 9DK, 12; 9AAG, 331; 9OAI, 76; 9AXU, 20; 9BEZ, 19; 9ERD, 17; 9BYG, 15; 9RR, 29; 49F, 182; 9YU, 291; 9BXT, 119; 9AIN, 110; 9AT, 129; 9BIB, 158.

Traffic Reports from the A.R.R.L. official relay stations.
Western New York report is missing, which if it had received may have been the means of bringing our traffic total in excess of the figure for last month. A summary of traffic is given by states.

ATLANTIC DIVISION

Chas. H. Stewart, Mgr.

This, with the traffic summary of individual stations by states, comes as the result of a suggestion by Dr. E. A. Cyriax, 2DI, assistant division manager of Eastern New York. (Mani tnx, Doc, it is a gud one—FS.)

EASTERN N. Y.: The most splendid cooperation is being received from all stations and the report is shown in the heavy traffic figures. 2TS continues to bat 'em out as before. It seems there is a little bit of jamming with the BCL on Long Island and unpleasant things are said of the amateurs. One must not overlook the fact that there are a good many commercial and Naval stations in that vicinity and not all QRM comes from the amateur. 2GK turned in a nice report from up state Brooklyn still lingers and reports are missing.

NORTHERN N. J.: For the fourth time in succession this half of the state leads in traffic work. 2AWS must have a pretty
good method of getting reports in on time as Pennsylvania is his only leader. Of course the spark stations made it possible for the great total. (Bet a taddie's pajamas that "Sink Spark Ostman" did this -FIS). 3XM bumped out 411 messages in ten days, which, by the way is going some 3XM threatens to smash all existing records for traffic handling, and a supply of over 1000 message blanks is on hand.

SOUTHERN N. J.: A change in the office of ADM is being made as Frye does not have time to handle the work. This half of the state will then be in a position to compete with the fellows up north.

EASTERN PENNSYLVANIA: Dist. No. 1. Reliable communication has been established by all the official stations in this district. Much credit is due to 3AWH, 3BNU, 3CC, 3BLU, 3AWF, and 3QN. Dist. No. 2. Traffic suffered a drop this month but a large number of stations reported which proves they are on the job. Effective short jumps have been established and the traffic moves fast. Dist. No. 3. At last we have a message report from this district, and it is hoped that all relay stations will cooperate with the district superintendent after his efforts in sending out a circular letter to promote better operating conditions. With the starting up of the Electric City Radio Club in Scranton, renewed activities from that city will be expected. 8B1Q was heard 2600 miles on 2 amplifying tubes, and worked many other DX stations. Dist. No. 4. 3ZO with 1204 messages, hung up a new record for the station. 3BJ, 3MB and 3LP are big boosters for Reading. Dist. No. 5: Traffic is increasing rapidly because of fine cooperation from relay stations. 3AGR, 3ACY, 3CCU and 3BIT are heavy traffic mowers. 3AU has a daily schedule with 5DI and one in daylight with 4BY. 3ARP is coming forward with C.W. and promises to increase it to 20 watts. 2BG handled a lot of local traffic. Dist. No. 6: 8BRE is finishing up his C.W. set. 8ANE has QRM from local power leak and suffered the loss of burning up a C.W. transformer. 3ABD is moving traffic on 5 watts C.W. 8BQ managed to erect his new cage while a severe snow storm raged and was forced to abandon the attempt to add the counterpoise.

PHILADELPHIA: Dist. 1: 3KD, 3BUT, 8HX, 3GR, and 3FM moved traffic in fine shape but most stations were remarked a lack of continuing interest not being able to work the usual DX. Many stations have increased power. Dist. No. 2. 3TA and 3UD are continuing to reach out on C.W. The sparks are NIL. Dist. No. 3. Only two stations reported. 3ANJ and 3BJY. Dist. No. 4. 3RB has a daylight schedule with 3ZO, 3QV, 3FS, 3HD and 3SM. All reported good traffic totals.

WESTERN PENNSYLVANIA: City Manager, Dawson Billey, Erie, Pa., has his hands full in securing much of a report due to a very heavy snow storm which wrecked every station but one, putting out of commission some of our best relay stations: SAHE, 3CNB, and SVH. 8AHE had been working only two weeks when aerial came to naught, but despite that fact, he rectified it and reports 36 messages handled, connecting regularly with 3AM and 3PD. Such spirit is surely commendable and worthy of mention. 8AGR is getting out fine with a 10 watt set, doing DX work every morning at 6:00 A.M. He handled 28 messages during the past month, while 8RC labouring under a heavy handicap cleared but three. Dist. No. 9. More relay stations are being added daily and cooperation is increasing all over the district. This spirit of cooperation is very noticeable around Connellsville, Pa., where Mr. Thomas W. Scott, of 8BJV is spreading the spirit of amateur radio. Mr. Scott is to be highly commended for his work in promoting the work of the A.R.R.L. Relay message handling seems to be on the increase considering that the only active period possible for relay communication has been since the transatlantic listening period. Right at the present time most all of the stations have their equipment in A-1 order. Then on a few stations, however, that seem too busy handling traffic that they can never find time to send in a report. One of these stations is 8ACF. The record for handling traffic this month goes to 8ALF. This station handled 417 messages which is indeed remarkable as the operator attends the University of Pittsburgh during the week and only has this week ends for operating. During the past month while in Pittsburgh, he operates 8ZD. 8EW has sent in his last report for the spark column as we have good information to effect the change. That a C.W. set is being installed. In the last report we predicted the downfall of 8EW as a spark station would be soon, and now it is a reality. The amateurs of Pittsburgh will certainly rejoice over this change. 8CEJ did not come up to the mark he made during the last period, but considering the time taken up by the transatlantic tests, his report is very good. This station has been using both C.W. and spark although the C.W. seems to be the best means of handling DX relay. 8CEJ recently reported that his station was to be closed by the Radio Inspector on account of interference with broadcasting. The claims filed against 8CEJ were not sufficiently proven to cause cancellation of the license, however. The Radio Inspector is giving the amateurs a square deal. 8CEJ has resolved to use only C.W. hereafter. 8CFY is one of the new stations reporting and is doing very well considering the fact
that there are so many other relay stations in Pittsburgh. This station will be operated two mornings a week from 4 to 7, and three evenings from 10:30 until 12:30. 8CJY's signals have been reported consistently within a radius of 1000 miles. 8BJV is doing good work handling traffic in all directions. Mr. Scott has an assistant operator and between the two of them, traffic is cleared rapidly. One of the rules at this station is that no message shall remain on the hook over 24 hours. This kind of work is what makes the A.R.R.L. famous. Connellsville is not only represented by 8BJV but we also have 8WR, 8BGG and 8ALT who also have the facilities for handling message traffic rapidly. 8ALT has been operating a 100 watt C.W. set and is now installing two 250 watt tubes. Uniontown, Pa., is represented by 8BDU and 8BRM, who both use C.W. These two stations work on schedules cooperative with the stations at Connellsville. All of this work for cooperating having been arranged by 8BJV. 8AAP and 8BUT are handling all traffic at South Browsville, Pa. Both stations use C.W. and are having very little interference in their locality and handle considerable traffic. 8DV is back with us again after a long absence. This station has always been considered one of the best A.R.R.L. relay stations in the valley. 8CKM is still building that 100 watt A.C. set that he reported two months ago. This station, however, does good work on the small set and we doubt whether he needs the 100 watts. 8AGY did not do much this past period on account of vacation. This station uses spark and does almost all of its work in the daytime with 8XE at State College and 3Z0 at Parkesburg, Pa. 8OW, who has been operating two 250 watters in a self-rectifying circuit, has a bushel basket full of cards and has now started in on a small set to see if he can duplicate his collection. This station does considerable experimental work and during the transatlantic listening period worked faithfully with superheterodynes, radio frequency and all styles of Reinhartz tuners, in an attempt to get the British and French stations. The transmitter at 8OW is at present one 5 watt master oscillator with four 5 watt power amplifiers. 8BRL is again handling traffic in his old style and doing it with a variety of transmitters. We have heard this station on lately with spark and C.W. and from the report we find that 8BRL uses one K.W. 60 cycle quenched, or 1/2 K.W. 500 cycle spark. 8BRL also uses phone for local work. 8AGO did not hand in a very big report this month for several reasons. First of all the transatlantic listening period took up a great amount of the time and then it is rumored that Mr. Arthurs took a trip to Philadelphia to pick out an OW for 8AGO.

SAIO has failed us for the first time and we are trying to believe that his report must have been lost in the mail. 8ZD is still handling its share of the traffic for Pittsburgh. During the transatlantic sending period this station had four 50 watters go west and is now using one 50-watt tube.

Dist. No. 11. 8CON has shown the real spirit in clearing 66 messages and handling all his school work at the same time and rounding up his stations. The reports received from him are fine in every respect and only show no report from 8BLT. 8CON does all traffic work with but 5 watts. 8AXD shows a total of 13 messages and is a very promising station. Assistant division manager 8LF reports no messages handled, but can report many of stations and much more compiling of reports during the past month, leaving that amount of time for the other fellow to clear some traffic. 8LF is now constructing a new 1/4 K.W. tube transmitter excited by motor-generator.

DELAWARE: At this time last year nothing at all could be obtained from Delaware. 3AFB is heard handling traffic almost every night.

DIST. OF COLUMBIA: The District of Columbia as reported by Herbert A. Wadsworth, A.D.M., shows a good increase for the month. The good work is undoubtedly due to more stations opening up and considerable more interest shown in DX work. Hastings has opened up old 3ALN again after being several months in Colorado and 3AR0 has at last succumbed C.W., leaving no "HE" sparks in Washington. 3SU continues to be the Star station of the District and deserves much credit. NOF is back with the amateurs again and his help with 4 operators to help move traffic is appreciated.

MARYLAND: The transatlantic tests made quite a gap in traffic handling. The stations in and about Baltimore have made a creditable showing during the past month. Many new stations are lining up for A.R.R.L. traffic. 3UC has abandoned spark and is installing a 50 watter. This will be welcome news as Bill Small had one of stations and marks more compiling of reports during the past month, leaving that amount of time for the other fellow to clear some traffic. 8LF is now constructing a new 1/4 K.W. tube transmitter excited by motor-generator.
maintains a schedule nightly with Washington through 3JJ. 3HG maintains several schedules and manages to hold the star for handling traffic. (His 100 watt C.W. holds all previous Baltimore records now as having reached across 3 or more times and he is receiving cards reporting signals up and down the west coast.) 3EM with 100 watts has already made a break into the traffic and will undoubtedly resume his old schedule with 3ZO and Washington through 3SU or 4AEO.

CENTRAL DIVISION

R. H. G. Mathews, Mgr.

All the assistant division managers have been helping in the drive for bigger message totals and the fact that their efforts have been successful is borne out by the biggest total we have ever had for this division. Every state is becoming better organized and despite the general feeling that amateur radio is not what it once was, it apparently is more flourishing than ever before in its history.

Illinois and Ohio are running a close race for the Star state honors of the Central Division with Wisconsin coming up at a high rate of speed. Note the very much increased activity in northern and southern Indiana as well. Michigan is also standing up well in a hard battle with the B.C.L.s. Kentucky unfortunately is not represented this month.

WISCONSIN: Dist. No. 1. Things are going fairly well in Milwaukee at the present time. 9DIO is making himself heard all over the country. Dist. No. 2. This district is certainly coming along nicely. There is a noticeable increase in traffic to and from Madison. Other good stations recently located are 9ABR, 9EEY, 9DB, 9CVZ and 9ARO. 9WPP is coming on in good shape. 9CVZ is rebuilding his antenna and going to get down on 200 and join the gang. This district now has a station at Platteville (9CHK) which certainly was badly needed. 9XM has not been able to maintain a regular schedule as yet for relay work and the messages handled in the last month took place during his test periods. 9AZA is doing remarkable work with 100 watts C.W. It took a long time to relegate the old spark to the dump heap.

Official Relay Stations in Wisconsin will be glad to learn that a silver loving cup is being awarded by Ben A. Ott, assistant division manager for this state. The station handling the most traffic each month will have its call letters engraved on the cup. The first station to win the cup three times, not necessarily in succession, will become the permanent owner of it. The first award will be made for the month ending March 15th.

Dist. No. 3. 9CZY is sure there with that 5 watt bottle, 9BHQ is now using 20 watts. 9DCT handles his share of Appleton traffic. 9DVY is on the job regularly and has been doing good work lately. 9BQG is the nucleus of a network of smaller stations in this district. 9FQ and 9DLN are on the air occasionally. Oshkosh is represented by five stations now, 9BCB, 9DHG, 9AMQ, 9GGB and 9BYE all doing excellent work. Dist. No. 4. All the traffic in this district is still being handled by four stations, 9AKY, 9AZN, 9ZY of La Crosse and 9CM of Trempealeu. Dist. No. 5. Superior fans are dead but not buried. 9DGY burned out a tube, got disgusted, sold his stuff and is now planning a bigger and better station. The Rock Crusher at 9YAC is being heard again and handling some traffic as is also 9QS.

NORTHERN INDIANA: Traffic is being handled regularly and smoothly in both districts. No difficulty is experienced in handling either inter-state or local traffic.

Dist. No. 1: The only activity reported in this district was in Fort Wayne. The active stations are 9DFB, 9DAX, 9CUI, 9DWW, 9UC, 9CNV, 9ME, 9II and 9BFW. 9DFB is doing very good work and has been heard by twenty-seven stations on the Pacific Coast and also in France. 9DAX is back on the air and doing good work. 9CUI is doing fair DX work on 5 watts, as is 9DWW, with the same power as 9CUI. 9UC is doing very good work on 5 watts, having worked 7SC. 9CNV is doing very good work but is not on consistently. 9BWF has a 10 watt set and is doing fair DX. The fellows in Fort Wayne have agreed to QRx until 10:30 P.M. for broadcast listening. Dist. No. 2. The active stations here are 9CP, 9AWZ, 9DITJ, and 9EFZ. Although 9EFZ has only been on the job a short time he will soon be a good one to help out things. He experiences a little trouble in getting east, especially to Fort Wayne.

SOUTHERN INDIANA: Several day-light routes are being worked. Nearly every station reported this month, except 9ARR and a few Indianapolis stations. 9ARR is a very valuable station as he is the only sure QSR west we have. 9BRK is doing splendid work with the four 5 watters.

OHIO: Very good work is done in all the districts, the state being so well dotted over with good stations that routes can be picked in practically any direction throughout Ohio. Columbus handled a large percent of traffic in all directions. Its a C.W. city now, all spark stations having been closed by the Radio Inspector—for Why? 8AWU opened up with a 10 watts C.W. 8ALC is using 50 watts but is not yet working up to the old 5 watt set with which 6XAD was worked. 8IF and 8BXH with
100 watts each are doing wonders. 8UR with 10 watts is doing good work and is now handling his share of traffic. 8ZAF has been making some noise with his 500 watts. 8GQ, 3BNQ, 3BRE, 8TJ, and 8SG will be C.W. soon. 8BDK has a 5 watt set with which he has succeeded in working 8ALC, at least 200 feet distant. 8BYN is capable of handling quite a bit of traffic. 8BEK has a bad case of the "CQ" they say, and a little code practice would not be amiss, but OM, you’re not the only one. Come boys, let’s give the other fellow a chance to answer between the CQs—now and then. 8AER, 8CWP and 8BHO of Lancaster, Ohio, are coming along fine. Our friend Mr. R. H. Howe, of Granville, Ohio, has opened a station. 8AJX of Delaware is also with us again. 8CJZ is a new station and is coming on fine.

Dist. No. 4. It would take the whole QST to tell of all the good work being done by these stations. 8ANB is reaching Hawaii on 20 watts and 8CWS has worked 7ZU using 20 watts. 8AIX is changing over from spark to C.W. 8BYN handled his 170 in three days. Dist. No. 2. The star of the state for this month is 8IJ. 8LT of Norwalk can QSR direct to 6XAD or 6KA any time. Give him your California messages boys.

MICHIGAN: All the Michigan stations are occupied with plans for the big Flint Convention, February 9th which is expected to be the biggest thing yet pulled off in Michigan. The Detroit fellows pulled off a novel stunt during the Christmas holidays in the distribution to all the retail radio stores of message blanks for various customers to file Christmas radio greetings. These blanks were plainly marked to the effect that the message was being transmitted by the courtesy of the Detroit Radio Association. This idea is helping a lot in acquainting the general public with the activities of the League and its local representatives in Detroit as well as with the work of the radio relay amateur in general.

ILLINOIS: Dist. No. 1. Besides the ten active official stations in this district we will line up 8DUH, 8CHF and 9BWO. 9CFK is doing himself proud with one 5 watt tube to the tune of 1.5 thermo amps. All stations but 6 and 7 to the present writing. Dist. No. 2. Very comprehensive as well as voluminous report from D. S. Bergman this month showing increasing activity. 9BJT of Streator is star station this month with sigs. from 6XAD to 10MP. 9DXL qualifies for ORS. 9AJH of Western Springs pushes close second. He is just beginning to step out with the C.W. (Continent Wrecker) 9ACL is back from the University on a vacation. 9APB with the OW back from school shared the total with 9CXL the other op. 9DCR continues to be high man in Champaign, Urbana. Sez T.A.T. knocked his total for a mock turtle, same seconds 9DHZ the x 8 amp. thermo spark. (Loc! the poor B.C.L.s in his home town.) 9ASD pleads school QRM but turns in 62. 9DBV sends two 5 watters west and T.A.T. gave him handicap. (9DBV. N.B. D.S.) 9BTA warms a couple of 50s this month. Works 1s and 2s like local but no sixes. Listen for him sixes he is QRR on you. 9WX has a casualty list of two 5 watters this month. No message as spark knocked condenser twice. 8DVL contemplates a 20 watt and 50 watt set. (In the tube business OM?—D.S.) 9UU falls from grace this month with only 76. 9DDY has a hard time to get any one to relieve him of messages. Some of you fellows hear him take 10 or 20 and help him get the hook clean. 9DDY squeak box C.W. artist can’t make the dynamotor perk like the 4D coil. 9EBN lost a 5 watt bottle so no messages. 9BXD has a tel. co. ringer sitting practically in his back yard. 9ARM slipping up on reports, none received for two months now. One more chance or off comes the head OM. Same applies to 9AP. 9CCM handles etc. with 1CMK, 9CM, 6XAD, but he does not report how many per month with the rest of the boys. 9DYN got 3.2 with a 50. Replaced with a 5 and got same with no heating. Some fellows have all the luck. 9OS, C.M. of Elgin reports activity increasing and a new special 92G in town. 9EBH, 9VM and 9OS expect to make Elgin boom for the A.R.R.L. 9DWS has a 2.75 amp on 15 watts and expects to wreck a few continents now. 9QAQ, the C.M. of Champaign-Urbana, reports no official relay stations all busy, 9DOG, 9BGC and those previously mentioned all helped.

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New York City. Dist. No. 5. From 4 stations we have a total of 89 messages. What's the matter fellows? Are all you loyal A.R.R.L. men dead above the shoulders down there or is there a loyal A.R.R.L. man down there? Speak up.

Dist. No. 6. District No. 6 had a Convention, and a real hamfest it was, D. S. Ridgway writes, "every district No. 6 station you hear every night was there on the memorable days of December 30 and 31st." The boys from Rockford drove over in 9BQW's tractors and the bunch was assembled in time for supper at 9AKU. Broadcasting was cussed and discussed over the tea cups. The gang split up to go to the different stations. 9EGN and 9DQR went to 9EGN. 9DVW and 9BQW went to 9AFN after 9DQW had made a fizzle of his pet RCA ckt at 9AKU. Traffic was handled hot and heavy until 6 A.M. by all, but 9DVW and 9BQW would make better mattress testers. At 6 the gang went down town where they battled royally with 4 rounds of hot dogs, after which they went over to 9AFN's where they blew 90 K.W. or KVA of onions in AFN's microphone. After a real breakfast later in the morning, traffic routes and schedules were planned. A REAL chicken DINNER was served by 9AKU's Mother and all the OMs demonstrated anti-capacity especially 9AKU.

**DAKOTA DIVISION**

N. H. Jensen, Mgr.

Probably in no other division is there as fine cooperation among amateurs as in this division. Practically every station is reporting traffic and nearly all stations are observing the quiet hours from 7 to 10:30 P.M. 9AIG is high for January with 324 messages.

Recent appointments made in the Dakota Division are as follows: Don C. Wallace, 92T, of Minneapolis, A.D.M. for Minnesota; Bert Wick, 9AEG, of Fargo, A.D.M. for North Dakota; Leonard Weeks, 9UH, City Manager of Fargo; and Edward J. Caveny, 9CDR, City Manager of Luverne.

**MINNESOTA:** Dist. No. 1. 9CDV was home from the U of Minnesota during the holidays and did fine work in helping out with holiday traffic rush. City Manager Hayes of Duluth reports that practically all traffic through Duluth has been handled by 9DAF. He now has his 100 watt set going and is in daylight communication with Twin City stations. City Manager McQuillen reports that Brainerd stations clear traffic in all directions daily. Much credit must be given to 9BAG for the large number of messages he handled. 9BAV says he will double his traffic report next month. 9AOR is doing well with his 10 watts. 9CMJ is clearing traffic daily with 9BAF. He is our best western outlet at the present time. 9ABB has been on the sick list. 9EAEU is trying for a daylight schedule with 9CM, 9BV and 9ADF. 9EGU will be on the air with 10 watts.

Dist. No. 2. District superintendent H. R. Skifter reports the loss of one of the best stations in the whole Dakota Division. Lloyde V. Beckner, 9AWM, of Sleepy Eye has left the state and is now attending a Radio Institute in New York City; to enter the commercial game. City Manager Wallance, 9AT, has maintained a schedule with IQP for some time with 100 watts. He is now installing a UV204. City Manager Goldberg, 9APW, has come across with a near record by working 40I in Porto Rico regularly. A schedule has been arranged between these stations. 9APW also leads the district in amount of traffic handled. 9BBF has been reported by the operator on 9IRX at Colon, Panama. Luverne is coming to the front as a real radio town. Already six stations have licenses and all have transmitters. 9BVY and 9CDR are the leaders in traffic handled.

**NORTH DAKOTA:** Most of the activities in North Dakota are centered in and around Fargo. City manager Wick reports stations 9GK, 9UH and 9EBT all active and handling considerable traffic, which moves over through Canadian 4BV to Montana and Washington. 9ABU and 9BFQ are doing good work. 9AMX and 9ADZ will soon be going with C.W. transmitters. 9AUB is also doing good work. 9DOH will be going again soon.

**SOUTH DAKOTA:** 9AIG is doing the best work in the district. With 15 watts, he is handling considerable traffic. Other stations in Sioux Falls doing good work are 9DKQ and 9DDP. At Yankton, 9CVY appears to be the only station on the air at this time, and in the northern part of the state 9FJ, 9ASF and 9TL are on quite regularly. 9YW at Rapid City is stepping out good. 9AVZ and 9CLS at Pierre are both going and in a few weeks will both install UV204's.

**DELTA DIVISION**

J. M. Clayton, Mgr.

**TENNESSEE:** Dist. No. 1. This district is rapidly coming to the front, while district No. 2 is practically doing nothing, or at least failed to send in a report, as evidence.

Traffic was held up somewhat during December on account of the transatlantic tests, however, the relayers in district No. 1 made a very good record. 5QM is getting in the game and handled 29 messages. We are glad to get a report from this station and to know that he is handling everything coming his way. 5DA was on every possible chance. However, he only handled 27 messages. 5NV takes the cookie this month.
for traffic handled, having pushed across 150 of 'em. 5EK comes next with 76 to his credit, using 100 watts C.W. 5NV uses 50 watts now and gets very good DX on it. 5IK is using 1 k.w. quenched, 100 watt C.W. and is buying a Government sparkler. (F.B., OM, more power to you.) He works the west coast frequently on the C.W. and got away with 26 messages last month 5ZB, 5MO and 5NV complete the Memphis list of active C.W. stations. All of them are doing good work, especially 5MO, who steps out to both coasts constantly. We are proud to transmit the news that 5EK was one of those stations that got away down to the South Seas, being heard 3400 knots S.W. Panama. Spark radio is hampered here by the awful QRM from several C.W.s here. The smothering blanket spread out by those C.W.s completely wipes out all spark sigs, local or DX. 5RZ has been going some time and gets good distance on the 4 k.w. sink, while 5RW and 5GD are also QSA at long distance stations. Each of these three spark fiends handled a few messages as the report shows.

EAST GULF DIVISION

B. W. Benning, Mgr.

The report for the East Gulf Division this month will be short. Only one superintendent sent in a report. There were no reports from South Carolina or Alabama, and only one from a Florida. Stations in this division are doing good work but they keep it to themselves.

FLORIDA: 4MT is the only station to report. He is ready for heavy duty and reports traffic going through regularly.

GEORGIA: 4PD has moved back to Midville to help 4GN out. Both stations are doing fine work. 4GE of Savannah is open for traffic. Atlanta stations are moving a lot of southern traffic and expect to double their total next month. 4AG is back with a 10 watt C.W. set. 4MY has been reported twice on the west coast on spark. Reports have been confirmed.

MIDWEST DIVISION

G. S. Turner, Mgr.

HURRAY! Another record of ours broken. The gang handled more messages last month than any other time since the Midwest Division was formed. Just think men, 12,154!

MISSOURI: 9AON first with 333 messages! 9AUK reports that Joplin has organized a radio club with F. Morton as the head. 9CHJ and 9AUK have put in new 10 watters. 9CUA is on with ½ K.W. spark. 9DOR uses a 20 watt set. St. Joseph is certainly going great and J. D. Cox, 9ANO, the city manager, claims that the fellows in his town are sure chesty these days. They handled over 250 messages and practically all in daylight. 9CTG is the banner station this month and is reaching out F.B. with 15 watts. 9ANO frequently works stations in Colorado and North Dakota in broad daylight. Occasionally works Milwaukee in the afternoon. A new station, 9DLT, is on the job. 9DRW has a 1 K.W. spark working again. 9BDS reports all routes working in great style. 9BED, reports the St. Louis gang going great. 9SOF. Yes, knew him once upon a time but don't just remember. How he looks now, haven't seen him for some time. Even the broadcast listener says so. The broadcast stations in St. Louis are cooperating splendidly with the amateurs and due to this, very few complaints from the listeners are being received. 9CEE has increased his power to 15 watts. 9AOJ of Columbia handled a raft of traffic this month. 9EQ of spark fame is back on the job with 50 watts. 9CPY is using 100 watts. 9BLG has doubled his number of messages and threatens to dethrone 9AON. 9DMJ has been converted to C.W. 9AAU is on with a 15 watt set and also a 200 watter. 9CGK is one of the more recent DX fellows. Laughter of western Missouri says that he is busy getting the gang lined up and promises to have some good news next month. 9CKS reports much doing in his town. He has a new 100 watt set and is now working regularly on route "B" during the daytime.

The routes as shown in December QST are all in perfect working order. Besides these old routes we now have one other in operation, i.e.; route "E" which is as follows: Cape Girardeau, Mo., 9BDS via Lawrence, Kan., 9AOG to Denver, Colo., 9AMB. That is surely great work, "eh men? Watch out for our Midwest Special. 9BOZ is a new station 9RB has put in a 50 watt and is working every one he hears. 9BKK and 9BIW are now partners to a 150 watt set. 9EFC ex-9DZI of Columbia is doing good work again. 9CUP another radioist gone wrong. Just getting lined up in traffic work and thought...
we had him setting pretty when along comes an incipient OW and runs off with him. 9DQQ is a new comer so far as traffic is concerned. The D.S. of western Missouri has discovered two fellows who are doing good work, 9CRR and 9DPY.

The following appointments have been made to our official relay stations: 9BKK, 9AYL, 9RR, 9DAE, and 9BLG.

KANSAS: 9DTA first with 330 messages! Our new R.M. showed himself off this month and handled the largest number of messages in the state. Then the OM excuses himself by adding that he would have made it more but he burnt out three tubes. The others with “empty sockets” are 9AOG, 9AOJ and 9CKM. 9CVT is now on with 50 watts. The Wichita bunch is pepping up considerably lately with 9KA, 9PS, 9CWC and 9BJN doing good work. 9ABV and 9CCS are both handling messages. 9DSD and 9DPD of Hutchinson are steadily heard from. 9EFA, ex-9DUN, is using both spark and C.W. Daylight routes are working smoothly to all parts of the state, thanks to 9DTA, 9CFI, 9BHN, 9AEY, 9CKM, 9CVT, 9AOG, 9CLW, 9BZZ, 9CCS, and 9CWC. 9AOG is increasing 2AMB on schedule at 7:30 P.M. C.S.T. This eliminates some of the QSR trouble experienced in getting west. A daylight schedule has been arranged with 9BDS to the east. 9CKM is appointed city manager of Kansas City, Kansas, to replace Wells who has not the time to devote to the job. There is a new station to help 9AOG, and the call 9EHT. Special mention goes to 9CCV for consistent good work in League affairs.

IOWA: 9BGH takes first honors with 351 messages. According to a wire received from Stover at a late date no report will be received from him for publication in this issue due to the fact that a fire at his place destroyed all his monthly records. Watts sends in the largest traffic report ever received from Iowa. Over 3500 messages being handled by Iowa alone, 9BZI, 9AXU, 9BCF, 9BIK, 9AMI, 9DKY, 9ARZ and 9CXP has established records over 4100 miles and 9CXP even over 8000 miles. The bulk of the traffic for the month was handled by 9BGH, 9AOU, 9BSZ, 9DRA, 9BSG, 9DKY, 9DAH, 9BFG, 9BZT and 9ARZ. Others did very well, averaging over one hundred, and as a whole, Iowa ranks first for traffic handled in this division. 9BSG handled 210 messages during the first ten days he was home from school. 9AMU is now doing good work. 9AHN, 9CHN, 9BLT and one or two more are wearing pennants of black ribbon emblematic of the “empty sockets.” 9DSL is leaving for school. 9BIK informs us that he will have to quit radio on account of eye trouble. 9FK is still keeping the connections open for across the state traffic.

NEBRASKA: 9YU wins first honors with 251 messages. The A.D.M. asks that you Lincoln boys speed up a bit on your report. 9CNS at Rushville is the only dependable western station. We have what appears to be a real daylight traffic route clear across the state. It starts at Omaha and goes via 9AIN at Hooper to 9CNS at Rushville. We have one starting at Lincoln, continuing over the same route. Although it is a long jump from 9AIN to 9CNS a large number of messages have been cleared. The south Nebraska district handled by far the greatest number of messages. Over 1000! You Northerners ought to be ashamed of yourselves handing only 710. What would you do without AD? The star stations for this month are: 9YU, 9BXT, 9DNC and AD7. Mr. Sanders of Hooper is back after a long illness and deserves special mention for his good work. He handled 110 messages. 9CKI has been doing good work. Omaha surely has a fine C.M. He reports 9ASO and 9ALK, sparks knocking ’em cold. 9EW and 9DXY have put in new C.W. sets. 9SM is doing good work on 100 watts, 9CTY and 9OMK are getting started. The D.S. of North Nebraska reports that with the exception of 9AIN and 9CNS, the north district has no dependable stations. 9BDU and 9DTU have increased their sets to 20 watts. 9ATS is building a 100 watter. In the southern district we will commend 9BWE for good work with a flivver C.W. set.

NEW ENGLAND DIVISION
I. Vermiliya, Mgr.

The following appointments were made during the month as relay stations: 1CKP, 1MY, 10V, 1B1Y, 1VK, 1CR, 1EX, 1ALZ, 1CPI, 1MC, 1ATJ, 1CJZ, 1CJA, 1CSW, 1GL, 1CSS. Mr. Neal Dow has been appointed District Superintendent of Rockingham and Strafford counties in the state of New Hampshire. Mr. Philip F. Robinson has been appointed Assistant Division Manager for Eastern Massachusetts. Business has been rather brisk this past month and from the look of things it is getting better and better in every way, every day. If it keeps up we will need a few more secretaries.

MAINE: The old Pine Tree state came through in fine shape this last month, and Mr. McShane, who is helping out Mr. Pierce, sends in a very good report. The Star station of Maine is 1BAS with a total of 238. Reports of the other Maine stations will be found in the station list of messages handled. 1BRQ deserves special mention for his 200 which shows mighty good work.

NEW HAMPSHIRE: This state is doing very well indeed under the blow it had
when it was allowed to sink below the usual A.R.R.L. standard. This state has some very promising material, and we hope to have some large message reports in the near future. We must be on the job, fellers, so let's get up and after them. I am not entirely satisfied with things as they are. The total messages are not enough as compared with the rest of New England.

VERMONT: Vermont also has a state full of enthusiasm, but we must have more than enthusiasm to swell the message reports. You fellows in Vermont and Hampshire must admit that a total of one hundred and six is a very poor showing for a whole state.

MASSACHUSETTS: This state, the old Bay State, has certainly come forward and held the lead of the rest of New England.

1CNI handled 428 messages. This is quite a burst of speed and this is the kind of work that counts. 1CPN with 656 messages is another of these "stay up all nights" and we surely welcome their reports. 1PM is another with 515 messages. 1CNI is planning on a tube set. A little bluebird saw him buy two 50 watt bottles—'atta boy—now watch the ammeters and the distance. 1AWW kicks because it takes too long to get these reports into QST. He is another 200 man—214. 1CMK deserves special mention—398. These are the men that count, fellers, and when you meet them, show that you appreciate their work. 1BSZ will shortly show the stuff he is made of. He shows real A.R.R.L. spirit, and we expect to see the traffic report jump another thousand down his way each month. 1CMK has received a report that his signals were taken on a dictaphone record in London. 1BYN handled 225 messages and deserves to be put on the honor roll along with the rest of the big fellows. 1BKQ has, month after month, consistently handled hundreds of messages. This time he rings the bell with 322. Taking in no consideration the time for the transatlantic tests, this is very good. He says 1,000 or bust next month. 1CJD handled 125 messages.

RHODE ISLAND: 1II has handled 301 and likewise his name belongs in the honor roll. He has certainly come forward with some good reports since his appointment and above all, he gets them in on time. 1BV handled 248 and we put a gold star opposite his name. This man has made wonderful strides in Rhode Island. 1GV handled 148, but we want more, from this good station, and this star operator. 1BV is going to have a Y. L. operator on the job to help him out. 1BES handled 271, and this entitles him to a seat on the Honor Roll.

CONNECTICUT: Reinzitz is doing great. His report was three days ahead of time and that's going some for him. Ye Division Manager wishes to publicly thank him for antenna dope and trick C.W. circuits. They sure are great.

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Reinzitz wants every certified station in Connecticut to communicate with him so that he can bring his list up to date. New London is full of pep, and messages moving nicely. Bridgeport is likewise moving the traffic in bunches of hundreds.

1AW has at last fallen for one of the big bottles, using one 250 watt. He makes lotsa noise. 1BGZ is in danger of losing his job, if he don't get busy. 1QP on his new antenna dope, has been heard in St. Louis in daylight and Denver and Arizona at night. He uses one 50 watt and puts out five amps. 1MY goes down on the Honor Roll with 408, while QP copped off 220.
NORTHWESTERN DIVISION
H. F. Mason, Mgr.

We are glad to be able to present more complete reports this month than for some time. This signifies general good times in amateur radio, with everything going smoothly.

MONTANA: The star station of the division this month is 7ZU. Using one 50 watt with 1400 V.D.C. on the plate, he is receiving so many cards that he will soon have to start lining the outside of his station with them. They include all districts. All messages were handled over distances of from 900 to 1350 miles. 7HM is handling the bulk of the traffic in Great Falls vicinity. He will have to watch his step when 7NV goes into commission. 7EX is on the job every night from 10 to 1. He has trouble in working west, but a large part of traffic of Canadian origin moves through his station. 7AGP is getting along nicely. Montana stations have an exceptionally hard time in working one another; it being easier to reach out 500 miles or so than do work in the state. 7ZL has lately been assigned THS, the second op, and Cutting have been doing more experimenting during the past month than anything else, but are now about all fixed up.

IDAHO: Dist. No. 1: Not much doing as 7JF, the only reliable station in the district has succeeded in burning out four 5 watters. Dist. No. 2: 7WG is keeping the hook cleared with the old spark and is installing C.W. Dist. No. 3: 7CG is on with a new 10 watt set. 7LN is having considerable trouble getting his set to oscillate without burning the shack down from the heat of the tubes. Dist. No. 4: Seems to be a hoodoo hanging over Boise. 7TA, 7AEM, 7OT and 7HJ have all blown several tubes each. (See cover on this QST). Traffic is traveling through in fine shape. The above stations have handled the major part of 7PJ, 7LO and 7WC assisting. 7AEM, 7TH, and 7OT have been doing some remarkable DX work during the past month.

OREGON: All district superintendent appointments in Oregon are hereby cancelled. Districts will be re-appointed, and those few good amateurs who have worked for the best interests of the rest of the gang will be given due recognition in the new order of things. The state will be reorganized.

In Portland 7TO, 7TT, and 7EY are handling traffic and reaching out. In Eugene and vicinity, 7NA, 7TQ, 7MF, and 7SY are handling the bulk of the traffic south. 7MF and 7NA can now QSR east, as they have no trouble working into the ninth district consistently. 7NA, on 10 watts has worked 4EB of Palmetto, Florida.

WASHINGTON: Traffic in this section is moving with a regularity never seen before. Stations are awakening to the need of reporting traffic handled, and the district superintendents are co-operating in good shape. The adoption of the Revised Pacific Plan has helped to smooth out a number of difficulties, and the amateurs in the larger cities are living up to it the letter.

Dist. No. 1: 70J has been off the air and has not handled the usual amount of traffic. Dist. No. 2: We are glad to have this district back in QST again. Stations handling traffic in Aberdeen and Hoquiam are 7ADR, 7KJ, 7NN and 7SC. 7RI and 7ADF, please note. TSC will soon have 500 watts of C.W. Dist. No. 4: 7GP is a good QSR for Seattle and Tacoma stations who have trouble in working east. Dist. No. 5: Traffic has been slightly less this month owing to the T/A tests, and to the antenna insulation at 7BJ going up in smoke. 7BJ's sync rectifier is also acting up. Traffic is not moving through any special line of stations in any direction but there are always enough stations on the air to keep traffic from being stalled. 7AIC is getting to be a regular traffic hound, and has installed a special waste basket in his station to receive the burned out UV-202's. 7BJ is switching over to chemical rectifiers, and putting in new antenna insulation.

Dist. No. 6: The honors go to the two members of the "boiled owl club" 7BA and 7WX. 7BA is on the job from 1 A.M. on while 7WX comes on at 2:30 A.M. and stays till 5:30. Give them a call, you ninth district stations, and they will QSR. 7QE is doing some good work. 7WM has cut down on the traffic, but as he is getting to be an old married stiff, that accounts for it. 7AW and 7BG are both having their first experiences in trying to make a five watt tube oscillate. Dist. No. 7: The star station is 7ABB. Seattle stations are off the air rebuilding their stations, but traffic is moving easier here than before. 7ADF, 7DU, and 7MH have been doing good work. 7BK has been too busy pounding the typewriter this month to handle any traffic to speak of. 7APF has been doing good work, and clears Northern and Eastern traffic OK.

Dist. No. 8: 7UD has dismantled and is attending the U. of W. 7AIO is installing C.W., although traffic honors for the district this month go to him on the old spark. 7JS, had the same misfortune as the ham on QST cover last month—Blew a tube. Dist. No. 9: 7NE has been getting south fine, but cannot QSR north Dist. No. 10: 7OM brought this district out of its heretofore peaceful slumber by
reporting traffic this month. (F.B. let's hear from 7EV too.) Dist. No. 11: 7GE has his hands full as President of the 7th District Executive Council, so has not had time to make up a complete report this month. 7GE and 7TH both report traffic handled, though. 7GE is now on C.W. Dist. No. 18: The amateurs of this district are going to make it a model for the rest of the division, and have nearly doubled last month's business. Six stations are on the job consistently, and work the sixth district with ease. All stations are putting forth every effort to lessen the QRM by pre-rectifying their plate supply, and are supporting the Revised Plan. 7NC takes the traffic honors. TDC and 7AIJ are working east OK. 7OE has been working in the interests of the Seventh District Executive Council and flooding all kinds of hose this month. Much credit is due him, however, for the success in the forming of the Council.

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

On, yes, the amateur is doomed—we don't think. Every district reports the old traffic rolling right along piling up the totals and if the other divisions this month are like the Ontario one we are going to knock all former records for a row of California bungalows. Boys, its sure a grand and glorious feeling when every station in the whole blame division is handling traffic.

Old 3BV is the top dog in Western Ontario with all sorts of traffic handling, and counting all kinds of rounds. The little note in last QST asking for dope on old stuff, brought forth results and the D.M. has received a fine newsy letter from him giving all the dope from the border. 3BS reports the passing of spark set at that station much to the sorrow of the BCLs (? hi.) 3XN is proving beyond doubt that London is not the dead spot formerly supposed and is reported QSA 1100 miles west of Frisco. 9BS says he is QRM in Ingersoll. He is also QRK to Can. ADK so should be an invaluable westbound link in Trans-Canada Chain. In fact it is under-standing that he has already cleared one Trans-Canada message unofficially started. 3MN on 1 five wattter clearing traffic regularly with 120 volts B battery. 3FA has all kinds of luck, mostly bad. 3KO hasn't been much on the air late-ly. 3IR in Leamington is back on the job. There is great competition between 3DH and 3BV for Windsor traffic honors. 3BV put it over this month. Both are spitting fire and blood from their aerials nightly and if the giddy pace keeps up 3ZO will have to watch himself. 3ABG is a new 5 wattter opened up in St. Thomas. London has a rival for 3XN in 3LW who is coming fast. He only has 5 watts so far, but he is a go-getter. 3ADT has opened up in Ingersoll with 5 watts to give old H. LeRoy B—a little competition. Go after him, 3ADT, and see if you can't drive 9BS into the 3BV-3OH class.

In the Central Ontario District, the air looks like the aurora borealis with the juice the boys are showing into it. Come on any time you like after ten thirty and you hear a dozen little canaries chirping—and isn't it sweet music to the ear? 3DE says the QRM, etc., is too much for him so he arises every A.M. at 4:30 and is on till 7. 3TA in Tillsonburg says he can work 1000 miles west but can never raise a Toronto station. Keep after 'em O.M., we are all a little deaf up this way, anyway. In Kitchener we have the live town for its size in Ontario. 3BQ is high man there this month, and great credit is due him for his fine biz when he has only been on about 3 months.

3DS reports great difficulty in working other Canadian stations, but plenty of Yanks. Toronto is full of C.W. sets doing fine DX work. 3FO has opened up a C.W. transmitter apparently having kissed his spark a lingering good-bye. Thank Allah! The combined set of 3J1-JK has been very busy the past month. 9BJ is another 50 wattter who is tickling the cans in California, and 9A9 has kept up his good work in relaying. 9BA is also a very busy station, and is reaching out very consistently. The Eastern Division is still the weak sister. Those two old timers 31L and 3HE in Kingston seem to be the only workers in that neck of the woods. The peculiar feature of Kingston bound traffic is that apparently it has to be routed across the lake to Rochester or Watertown, to arrive at its destination, as there seems to be an absolute blanket over signs between Kingston and Western Ontario. The great news from the East however, is that Montreal is coming through at last. Many stations have been in communication during the past month between the two cities and that part of the Trans-Canada chain seems easy. 2HG, 2BE, 2EI are particularly good in Toronto, and 2CQ is often copied in Kingston.

PACIFIC DIVISION
J. Vance Wise, Mgr.

There is a lack of material this month from which a concise report may be made. No reason is given for this, but it is believed that the Trans-Atlantic Tests was the cause of a good many tubes burning out when the gang kept pounding hard to get over.

ARIZONA: Traffic is moving in good shape in spite of the fact that it is un-
usually heavy. 6BBH is getting out better. 6ZZ has schedules with 5ZAE, 9BJ, 60D, 6ADA, and 9AY. 6AK and 6ZX in addition to several others. The lid is on from 8 to 10 P.M. every night.

NEVADA: 6QR has relocated at 812 N. Virginia St., Reno. 6ZO is back on the air with 100 watts and has schedules with 6AK and 6ZX in addition to several others. 6AJR is still pounding the brass and will add another 50 watt soon.

CALIFORNIA: Dist. No. 1: 6ANH is reaching out and is doing good DX work as is 6ZAH who has been reported 450 miles east of N.Y. and has been heard in 34 states and Canada. 6AVR is using the old spark until a new 50 watt can be purchased. 6ZB and 6EC will be back very soon with new layouts. Dist. No. 3: 6TC and 6CC did practically all the traffic handling during the month, both stations handling in large totals. 6CC has hooks of messages for the Islands where 6ZAC used to take them. We hope 6ZY will be in working condition soon. 6LU is back again. 6BBA and 6QM are not going regularly.

QUEBEC DIVISION
A. J. Lorimer, Mgr.

Reports show all around improvement throughout the vicinity of Montreal with traffic moving steadily. Regular schedules have been drawn up by the majority of stations and real traffic has been handled. Spark transmission is practically discarded, although 2AG has been doing some good spark DX when on the air. 2CG has increased his power to 20 watts and has no trouble getting through to the nines. 2HG, using two French 40 watters, has been getting out in great shape. 2EI is another reliable relay station and has been making good use of his low power. 2CG has joined the C.W. ranks. 2AF clears traffic with Toronto. 2BE, Mr. A. Reid, an old expression on the A.R.R.L. is our Government Radio inspector here and when not too busy takes a hand at the key. 2AN keeps schedule from 10 P.M. until 8 A.M. Traffic is handled with 3DS at Kitchener, in spite of bad QSS over this territory. 2AM has been quiet since a couple of 5 watters went west.

NORTHERN QUEBEC: 2EO has a C.W. set going but is unable to do any relay work on account of heavy QRM from a nearby power mill. 2EK has not been heard from for sometime leaving a blank route north.

ROANOKE DIVISION
W. T. Gravely, Mgr.

The division manager wishes to thank each one of the assistant managers for his splendid cooperation and to commend each one for his diligence, his unswaying loyalty to the A.R.R.L. and for his fine performances.

Your manager wishes to draw attention to the fact that in many instances detailed reports are missing. Unless the individuals will furnish his district superintendent or city manager with a detailed report in addition to his traffic report, he cannot possibly furnish the needed information to his A.D.M., and in turn, your A.D.M. cannot give it to your manager. Therefore, the situation sifts down to this—if you, the individual station, do not receive due recognition in the Manager's reports, it is because you are not on your job, or because your district superintendent is not on his. Now fellows, let's look up the word cooperation in our Websters', and let's apply the principles more diligently than ever before in the history of the A.R.R.L.

 VIRGINIA: Traffic seems to have fallen off on account of T/A tests, and QRXing for B.C.L.s and other causes, but some of the old gang seem to hang on and handle considerable traffic. With good efficient receiving apparatus it is unnecessary to QRX for the B.C.L., but since the single circuit tuners are cheaper, the transmitting gang have to suffer for the defects.

Dist. No. 1: 3ZI "got over" all right in the tests, but is still bothered with the QSS at his station caused by fog from Dismal Swamp. 3AAG is now in Government service. 3BVC, assisted by his 14 year old brother, is beating out the traffic. 3BNE lost his mast in a storm and is out temporarily. 3BSP and 3IN are back with C.W. and handling traffic. Dist. No. 2: 3BMM is the live wire in Petersburg. A new station is 3BCH. 3ATB, a new station, is working like an old timer and reports his traffic. 3TJ worked mostly in daylight and handled considerable traffic. Dist. No. 3: 3CEL, a new station on 10 watts of C.W., and is working in daylight into Pennsylvania. 3BIJ handled some traffic and was heard in California. 3MO is still short of antenna on account of red tape gang holding out on him. Dist. No. 4: 3BLF is using 15 watts now and worked the west coast. Dist. No. 5: 3IW had the misfortune to lose his father in December. (We extend our sympathy—A.D.M.—D.M.—T.M.) Dist. No. 6: 3BHL is still hammering at them. 3BFE is only sending a few. Dist. No. 7: 3ASP is operating spark now as he had trouble with his C.W. set. 3ZX allowed the B.C.L.s to bluff him off, and he is out of traffic. 3ZAA works several daylight schedules and he is handling traffic. Dist. No. 8: 3APR, working most on daylight schedules, is handling traffic but blows tubes rapidly. 3BZ is not on the air much on account of illness in his family. He expects to move the junk.
into a new shack shortly, and may resume the old "Boiled Owl" stunt. Dist. No. 9: 3HL is getting the "thing" going now and handling traffic. 3RF worked 401 one: and has been logged on the Pacific Coast. 3BY is still hanging on with a little work. 3BQ is a new station using 10 watts C.W. 3CU is out of commission as is 3AIR on account of tube trouble and sickness. Dist. No. 10: 3AOV, the old rock crusher boy, has sold out all the junk and gone to Florida to let the crocodiles take a look at him. A.D.M. Woldord has the following to say: "If you have any grouches, forget them and get in the game with the gang and fight right along. Don't be bamboozled by a lot is out of commission as is IAI, on account the old "Boiled Owl" stunt. Dist. No. 9: of guys that would not know a code station last month, was able to secure permission which was reported as closed by the R.I. a recent letter, our "super" spark station tigraphy shows that our inspector has a very lenient at- titude towards real amateurs in this district, and it surely is up to us in turn to carefully observe the law, and not abuse privileges. 3ZW is working on 500 watts. He evidently did not make any effort to figure in the game. Mr. Gantt (GX), whose expert work at 8BDA contributed much to their large showing, is leaving for Washington. D. C. 3AMD says he is getting back on the job and improving transmitter. 8AUE keeps plugging away with his 10 watts and reports a nice bunch handled. As usual, 8CHO, is out of it—sick- ness in the family and set being moved.

WEST VIRGINIA: The news seems to be rather brief this month, no one making any particular remarks. As explained in a recent letter, our "super" spark station which was reported as closed by the R.I. last month, was able to secure permission to re-open after they had returned and re- adjusted their set. The evidence shows that our inspector has a very lenient at- titude towards real amateurs in this district, and it surely is up to us in turn to carefully observe the law, and not abuse privileges. 3ZW is working on 500 watts. He evidently did not make any effort to figure in the game. Mr. Gantt (GX), whose expert work at 8BDA contributed much to their large showing, is leaving for Washington. D. C. 3AMD says he is getting back on the job and improving transmitter. 8AUE keeps plugging away with his 10 watts and reports a nice bunch handled. As usual, 8CHO, is out of it—sick- ness in the family and set being moved.

NORTH CAROLINA: Smith is wide awake at Wilmington and we should expect big things from the eastern section when 4FT comes on with that 300 watt C.W. A.D.M. Simpson states that he has not received detailed reports from the fellows, which means, of course, that he cannot report activities. (More cooperation here, fel- lows,--D.M.)

PORTO RICO: That "Pearl of the Antilles" is here with the report and right on time. Traffic with the U.S. resumed this month. 401 is back on the air and has handled a few messages, acting as relay between the New England States and the Gulf States. A queer route you will say, but effective just the same. 4JE has suc- ceeded in establishing connection to the mainland, handling a few messages with 4EL. 4KT at Carolina has been in- active the larger part of the month "THAT EMPTY SOCKET, NO DOUBT." The A.D.M. is trying hard to open a relay route to Central and South America. 401 works stations in Iowa, Oklahoma, Minnesota, and Illinois most any night. (F.B. OM--D.M.)

This winds up the report with the exception of the box. High honors go to a spark station again.

ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

Well, well gang, did you make the 1800 for January, I guess so and then some! Colorado still leads with an average of 124 messages per station; Wyoming second with 107 messages and Utah with 58 mes- sages per station.

3AMB's pole seems to be the only one that stood the hurricane which swept through Denver recently and he takes the "box seat" for individual traffic honors. Of late some complaints have come to this office that coast stations refuse to take traffic. (How cum?)

A new plan for distributing information through the division was originated by F. N. Mitchell, A.D.M. Wyoming. Each week there is issued from the D.M.'s office a weekly letter chuck full of the latest A.R.R.L. happenings, local and national, and the last few weeks, international. This letter is mailed weekly to each A.D.M. He reads this matter to various clubs and then has a chain of stations in the outlying sections of the state and he starts the letters on their way. As each station received the letters, he reads them and then forwards them to the next and in this way complete the circuit through the entire state. The one requisite is that you mail the letters out to the next station the same day you receive them, so they will not be too stale by the time they reach the last man. The last man forwards the letters back to the A.D.M. for filing in the A.D.M.'s office.

Within the next month, inter-division relay routes will be organized. The best stations we have will be the ones who will qualify for these appointments. We want a record smashing inter-division relay route so that our international machinery can function fast. This will in the end speed up delivery and the relaying of messages through the division and in the bordering divisions.

It looks like bad weather is in store for us men, so remember the "ASA" when your town gets smashed up or other emergencies present themselves. Let's make that "ASA" history for the division if the chance ever presents itself.

March, 1923  QST  45
COLORADO:

The following official relay stations have been appointed in Colorado since the first of the year: 9DTE, 9CAA, 9BXM, 9PV, 9CDE, 9XAO, 9CFY, 9RUN, 9BVO.

Our traffic report would have been larger had not the stations closed down during the transatlantics. We also would have had greater traffic totals if the wind storm would have sought other regions.

9CFY reports traffic is moving through QRM for the first time in a long while. 62Z is handling most of his traffic for southern California. Eastern traffic is moving thru many stations. 9DHI just completed his new cage antenna and is sure getting results. 9BJI has been heard in the first district seven times during a period of ten days. He uses 50 watts and has the flute like note, with liquid clarity. 9DTM reports his tower down but at that got over 200 messages through. 9CAA is a new station in DX circles. He is a 5 watter and is getting out very good. 9DTE has worked all districts, also Mexico and Canada. Due to Xmas vacations at the college the total of 9XAO was lower than their average. 9BUN burned out his generator twice the last month. This kept him somewhat out of the game but "he came up smiling." 9BVO reports that he will handle 100 messages or bust. 9BXQ dropped a line that his aerial went the way of many during the storm but will be back soon with a 75 footer as a memorial to the one lost in the smash. 9CFY put through 15 messages with more promised in the future. 9BXM is a new station with 10 watts rectified A.C.W. and put through 60 messages for a starter.

UTAH: The best showing in months, maybe years, was made in the northern district for January. Traffic seems to be moving freely in all directions through Salt Lake City. 6AWH, formerly a 1/2 K.W. spark set is replacing it with 10 watts of C.W. 62Z is changing equipment also. Four 5 watters along side of each other will be doing duty. 6ZA was silent for a few days pending changes in location and license, but we expect this old timer to be up and at 'em soon. 6OT, 6ATEB and 6SJ are all silent and it is not known when they may be expected on the air again. 6RM wins the laurels for Utah this month with 179 messages to his credit. A schedule with 9CFY is in the making. Sigs from 6RM are QSA on the Atlantic Coast. 6ZT continues to push through. 6BOE and he are working in shifts. 6ZT is on to midnight and 6BOE after midnight until all is cleared. 6BGE is changing equipment. 6RE, Ogden, is on nights with 20 watts. The big station at 6ZM is doing duty now on 375 meters. Trouble is experienced raising anyone on this wave but a new aerial will enable them to get down to 200 meters. A railroad storm route between 6ZM and 6BKE, Richfield, is established to a degree and will be perfected soon. 6BKE has the kinks out of his spark set and is moving traffic. 6APL blew the Dublier for good and they are going to use 5 watts until signs of new equipment for a larger set show up.

VANCOUVER DIVISION

J. T. North, Mgr.

Traffic is still on the increase, and as yet there is no indication of its returning to the low totals of a few months ago. Far be it from us to boast, but we are making no secret of the glad news that we have an OW in the Division now. Mrs. 4DQ has "come out" and we welcome her most heartily.

VANCOUVER: 5CN again gets the honors in this division. 5GO is doing very good work on 10 watts, and being on regularly he handles considerable traffic. 5AC was also doing well on 10 watts until one of the "globes" blew up. 5EJ has put in a rectifier and has no trouble working any station who comes back at him. 5AK has had 5 watts going a couple of days and has junked the spark. 5FC is the only spark left and he is cussed most heartily by all hands.

VANCOUVER ISLAND: 5CT is the only station showing a decrease in traffic this month. He has been heard by 4HH in Sask. and is QSO 9BP in Prince Rupert. Reeves reports communication with Seattle very irregular on 12 K and the rest of the job. 5DX in Victoria is putting in C.W. as he is too close to VAK for spark.

(Continued on page 49)
March, 1923

U. S. Sigs Heard in Iceland

Another country has been added to the list to which American amateur signals are reaching in the reception of two stations at Reykjavik, Iceland, by Mr. Snorri P. B. Arnar, who has been mentioned several times heretofore in our columns as one of our far-distant A.R.R.L. members.

On Jan. 20th at 0407 G.M.T. and again at 0414, 9DPF was heard calling CQ. As 9DPF is in Lincoln, Neb., this is quite a reach. At 0400 G.M.T. in New Ulm, Minn., was heard answering 9DPF. A Grebe CR-5 and one Radiotron tube were used.

Altho Mr. Arnar is a commercial operator and has long been interested in our amateur radio work, this is the first recorded reception of such signals in Iceland. We hope he will continue to listen.

B. W. R. L.

The move for a British Wireless Relay League has now got under way. Approval of the P.M.G. has been secured, and at a meeting on Jan. 11th it was decided to circularize the British societies to obtain their co-operation in the management and control of the League. The success of the A.R.R.L. Transatlantic Tests and the enthusiasm shown in Britain, France, Switzerland, Holland, and America has given new impetus to the project. Mr. Hugh S. Pocock, Editor of the Wireless World & Radio Review, has been elected Hon. Secretary and the Wireless World adopted as the league’s official organ.

This movement, as our readers will remember, is being promoted by the Manchester Wireless Society, and the question of its more elaborate organization and co-operation with other British radio activities was placed on the Agenda for discussion at the Annual Conference of Wireless Societies held in London on Jan. 24th under the auspices of the Radio Society of Great Britain. At time of going to press we have heard no particulars as to the decisions arrived at.

The objects of the society are intercommunication between members with a view to improving existing transmitting circuits; relaying of messages thru member-stations, to perfect a service of utility; strict observance of radio laws and regulations; co-operation with wireless leagues of other countries; and the advancement of the science generally. Apparently to meet the restrictions of the P.M.G., all messages relayed are to be confined to the business of the League.

Mr. Harold Green is president; Mr. Y. W. P. Evans the traffic manager; Mr. W. H. Lamb the hon. treasurer; and Mr. Pocock the hon. secretary.

British Notes

A well-posted English amateur waxes ex pressive in a recent issue to the editor, part of which we reprint because of its graphic portrayal of British conditions:

“Business over here is very brisk altho the broadcasting itself is rotten and of very inferior quality. Most English amateurs have gone down to 200 meters and on this wave length they are obtaining surprising results; the telephony is good and sharp. With regard to DX work, most stations appear to be able to cover this entire country with 10 watts transmission (sometimes these 10 watts are more like 50 watts) so that we are sighing for more worlds to conquer. It is quite an easy matter to transmit to and receive the French amateurs and one of our best transmitters (2AW) is regularly working with Geneva, Switzerland. Everybody is hoping that before long we shall be working with eastern American stations. We are afraid, however, that if we obtain any satisfactory results our good old Post Office will step in and forbid intercontinental communication. We wish we could get somebody like your Secretary Hoover at the head of the radio department over here.

“I do not know whether your people are going to bring in any law to forbid regenerative receivers but I will give you a tip right here: do not encourage them to do it, as altho it is all right to use a non-regenerative receiver nearby a broadcasting station, in distant localities where they are dependent on broadcasting for their sole joy they are very disgusted with the results. People over here are beginning to find out how to make a non-regenerative set regenerate by putting in illicit coils. A man, when he starts wireless, may be a fool but if he is at all interested he does not remain a fool very long. He soon finds out how it works and sets about improving matters.
Our Post Office in their simplicity think that the average Englishman is a fool. They have every reason to believe it, as they have sufficient proof for their assumptions in the fact that the English people tolerate the Post Office to exist as such at all. You may be surprised to hear that the Post Office monopoly is such that it is an offense against the law for intercommunication between two houses which are next door to each other, and I believe if the whole matter were carefully gone into that it would be an offense against the Post Office to have an electric bell connected up between the dining room and the kitchen, this being means of communication between “A” and “B,” within the monopoly covers!

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**Australian Letter**

We take great pleasure in publishing some interesting news furnished by Mr. W. Bell Taylor, of WQUA, who has been spending two months visiting amateur stations along the Australian coast.

“The situation in Australia at the present time is not unlike that of the English amateurs, that is, the requiring of a license for all receiving apparatus at a cost of two pounds a year and a transmitting license practically impossible for the average amateur to obtain. However, this country has a lot of men and women very devoted to the game and of course if the restrictions were taken off and regulations made that would encourage amateur radio, there would be many more, who cannot afford the necessary license cost at the present time.

“Mr. Hughes, the Prime Minister, has promised new regulations for the amateurs. The writer has interviewed many amateurs in every state in the country and it is their opinion that these new regulations will be in effect in the near future.

“There is much organization work going on here and the amateurs have learned that if they present their views in a united body they will accomplish a great deal more. The Wireless Institute of Australia, following the principle of the A.R.R.L. with the states as divisions, is the most noteworthy organization and has brought the amateurs into unity throughout the country. These clubs are certainly doing their bit to bring about the long desired regulations.

“As to the practical work that is being done, Mr. Charles Maclurcan of Sydney, New South Wales who is considered as Australia’s foremost experimenter, must surely be congratulated for his excellent work. He maintains a regular Sunday schedule at 7:30 p.m. on 1650 meters and with 18 watts input his concerts are heard in many distant parts of Australia and with modulation all that could be desired. He has worked many times on as low as 3 watts and has covered remarkable distances. His transmitter is continually being improved upon until it has reached a high state of efficiency.

“The Australian-American Trans-Pacific tests are being arranged now with Californian amateurs and if these tests are as successful as were the Trans-Atlantics, it will be one of the greatest things in the annals of amateur radio as the distance from San Francisco to Sydney is around 6,500 miles. Many amateurs are hearing NSS consistently here and many other foreign long wave arcs in the Pacific and Europe, which speaks well of their long wave receivers.

“If conditions continue as they are now, it will not be long before the Australian amateurs will be on a par with the Yanks.”

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**The British Radio Trade**

Mr. Milton B. Sleeper, well known in this country, has recently returned from a trip to England and tells us many things of the conditions he met, from which the following is excerpted.

The radio business, broadcasting, and public interest, so popular last fall, has taken quite a slump. After holding up progress to prepare themselves to take all advantage of the “boom,” they tied themselves into such knots that, even tho the revival is now taking place, radio is not getting the send-off that it had in the States. Everyone attributes the delay to the desire of the British Broadcasting Company, the organization which has arranged with the Post Office to limit the number of broadcasting, to avoid the “chaos” experienced in America. The idea has been drilled into the public, dealers, manufacturers, and engineers by thorough propaganda to the extent that nearly everyone discounts by 90% the reports of conditions in America as they actually are. Moreover they think that Wannamaker advertise’s bargain sales and cut-price goods by radio, and that the Detroit News has ruined its circulation by giving away all its news. The conception in England of affairs in our free air country is impossible to imagine, according to Mr. Sleeper.

To make things more difficult, the trust, or B.B.C., has arranged with the Post Office to limit the number of licenses for experimental receiving sets. Such a license is necessary for any set not bearing the B.B.C. mark. Consequently the small manufacturer of parts has had his market taken away, except among the 6,000 experimental license holders. A small concern must buy B.B.C. stock and deposit $250 as a guarantee of good behavior. Since most of them are running hand to mouth, they cannot raise the money. In addition to the surplus of war material still on hand, quantities of sets not conforming to the new regulations and all kinds of separate instruments are being
dumped by despairing manufacturers. Conditions are worse than existed in the States last fall.

From our point of view, the retail and distributing situation is in very bad shape. Most of those trying to operate stores have no conception of merchandising, service, or methods of popularizing radio with the public. They have tried to organize against the trust but against heavy odds and in additions are torn by dissection and lack of mutual confidence. The only thing really low in price vacuum tubes which have been selling for $3.94, in the case of detector and amplifiers, until Mullard won the suit brought against them by Marconi and now they sell at $3.38, while Dutch and German types can be bought for $2.25 or less.

Receiving sets are made very expensive by the high tax. A license fee of $3.38 per socket must be paid to Marconi. Almost everything has a tax on it. The total royalties on a non-regenerative receiving set with a detector and two-step amplifier are $3.38, an amount nearly equal to the manufacturing cost. The attitude seems to be, "Yes, I suppose things do seem bad, but you know the English always muddle thru somehow."

The most striking thing about English equipment is the elaborate array of lacquered brass. It is fairly dazzling. Efficiency has not been made a paramount consideration, nor have they achieved adaptability, mechanical strength, or permanence of construction. The finish generally stops at the surface. English apparatus is distinguished by the free use of hard rubber, the mounting of the tubes outside the cabinets horizontal or sloping panels, and the absence of stamped or moulded parts. The interior of the sets is not open to inspection without removing the screws that hold the panel, and in the opinion of Mr. Sleeper the appearance inside is in no way equal to American equipment. The use of straight lines, real bus bar wiring and square corners is, at least for the present distinctly ours.

OPERATING DEPARTMENT

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ALBERTA: 4DQ reports regular work with 5CT and has worked 6LV and 6BIP. 4AB is doing a little work. 4CW is using C.W. and is QRK at 4DQ on 5 watts. There isn't much life in Alberta and its not the fault of the D.S.

PRINCE RUPERT: 9BP has his C.W. going now. He handles considerable traffic with 5GO in Vancouver and has worked 6PH, 6AJF, and Canadian 4BV. This station has opened the route to the North. 5OS will be on deck with 10 watts, and with a little luck we'll have an A.R.R.L. division out here yet. We also got a little boost when 9BP sent greetings via 5GO from the Mayor of Prince Rupert to Sir Henry Thornton, President of the Canadian National Railways, who was out here for the first time.

WEST GULF DIVISION
F. M. Corlett, Mgr.

If it wasn't for the excellent cooperation and support of the assistants this division managers job sure would go to and stay put, but I couldn't quit if I wanted to with you fellows, most of you, backing me up like you do. Once in a while some of you fall down and I know you hate to have me tell the world about it through QST, but every member reads QST and that is the most logical method of letting the membership know just what their traffic department is doing, where the weak links are in the chain so that they may help strengthen them. Now this months report from our busy relay friend Louis Falconi, assistant division manager in charge of New Mexico, is missing and I'll just bet he moved a thousand or more messages himself 5ZA. Then how many messages other stations in New Mexico moved of course we don't know, they were beyond the break in the chain. Then too, I have noticed that district 2 of Northern Texas has not been represented in our reports for some time, there is evidently a broken link in our chain down that way. Roy L. Layton, 5AEJ, of Corsicana, Texas, is the district superintendent of district No. 2. This district includes such towns as Corsicana, Waco, Temple, Cleburne, Frost, Waxahachie, Ennis, Kerens, Teague, and Willis. Marshall hall and Naucodoches all having A.R.R.L. relay stations in them, surely you fellows are handling messages every day and night. Is it that you are not reporting them to your district superintendent, or are you reporting them and he is not doing his duty in representing you? Let's find these weak or broken links in our organization and strengthen them. Call a SPADE A SPADE and let's have the facts.

The star station of the division was 5SF of Fort Worth with 50I. This of course makes him likewise the star of northern Texas too. 5IX of Dallas was next with 326. Southern Texas star station for the month is 5XV of Port Arthur with a total of 237 and 6KP of Elgin comes next with 175 to his credit. Oklahoma star station is 5XT of Oklahoma City with a total of 216 and 5AE of Oklahoma City next with 101.

NORTHERN TEXAS: Cow Town again ran away with the first place with a grand total of 1402 messages handled by the stations in Fort Worth. 5TC has only worked two weeks and handled 190 on 5

(Continued on page 57)
A. H. K. RUSSELL

A. H. Keith Russell, the genial manager of the A.R.R.L. Ontario Division and one of Canada's best-known amateurs, was born in Hamilton, Ont., in 1893. He first became interested in radio in 1908 and operated a pre-war station rejoicing in the call XRE with one of the old "Hytone" sets.

Graduating from the University of Toronto in 1915 as a Bachelor of Arts, Russell immediately joined the radio division of the Royal Naval Canadian Volunteer Reserve and served until the fall of 1917 with this unit at the transatlantic station at Newcastle, N. B., on interception work. He then joined the Royal Naval Air Service as probationary flight officer, and after flight training in France and England he got his wings and went on seaplane service flying from Taranto, Italy.

Opening up after the war it was not long before Russell had a C.W. set with the special license 9AL. He is known as one of

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JOHN L. REINARTZ

John L. Reinartz, more commonly called "Kewpie," is the noise behind the key at 1QP and known to our readers as the perpetrator of a carload of tuners and myriad variations thereof. Hardly does a reader out in the wilderness order and pay for the parts of one tuner before this man Reinartz comes out with one guaranteed to do even more wonderful work. Some have said, "Aw shucks, he designs good tuners faster than I can make them. I give up. Me for the tuning coil a while longer." Such is about the case.

Too much of his early life is dim and obscure, we know his literary talent started early for at the age of two he ran out of his tub and was found sitting on the curbstone reading a newspaper upside down. Things happened rapidly from then on. In 1911 an aerial consisting of a piece of tin about a foot square was nailed to the chimney with the lead-in tacked to the
1XM, the station of the Massachusetts Institute of Technology Radio Society, Cambridge, Mass., was one of our consistent calls to get across the Atlantic, the code word being verified several times in England, France, and Switzerland. 1XM was the first eastern station to be heard in Honolulu and has been reported many times on the west coast down to Panama. As 1XM is primarily an experimental station, the new layout was arranged expressly to provide facilities for such work, and at the same time permit a set to be operated for traffic purposes.

Turning to the antenna system, a good idea of its arrangement can be gained from the photo. Although the down lead looks like a single cable in the photo, it is in reality a cage of the same size as the top section. One section rises nearly vertical for 50 feet and the other extends 50 feet more at a slope of about 45 degrees. The top end is supported by the powerhouse brick stack and the other is guyed back upon the building. The counterpoise system consists of a network of wires suspended over a cement court under the aerial. The antenna system has been designed so that the ends will electrically balance each other in order to bring the antinode of current directly in the transmitting inductance, which is in accord with best theory. The antenna current on 218 meters is 6 amperes with 100 watts.
On the left side of the operating table appears the old half K.W. quenched spark set, the type supplied to the U.S. Navy by the Wireless Specialty Apparatus Co. Next is a Signal Corps five watt radio phone which also includes a three tube receiver. The spark set graces the table for old time's sake and is not used at present. The small telephone set is used as a low power C.W. transmitter for local work, especially during such hours as interference with phone broadcasts is taboo. The plate supply from the dynamotor is filtered and is sufficiently smooth as to cause very little interference. A wouff-hong is kept handy for emergencies.

The regular receiving equipment and control switches appear in the center of the photo. The receiver is continually being changed, depending upon the type loaned or tested at the time. The control panel is so designed as to furnish the operator with direct control of all parts of the equipment. Controls are provided for tipping the mercury arc rectifier for starting the arc, for starting the 500 cycle generator located in the adjacent room, as well as controlling the power input to the tube set. The mercury arc rectifier is automatically cut out when 500 cycles is used for plate supply.

This brings us to the C.W. transmitter which is shown on the right of the station, or in more detail in another photo. The thing that is impressive is the fact that everything is where it can be plainly seen and easily gotten at, as well as the heavy wiring for high frequency circuits. The filament and plate transformers, rheostat, filter condenser and chokes are directly beneath where leads are brought up thru the table to the tubes.

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Radio Club of Hartford

Members of the R.C.H. were given a treat on January 24th, when the club put on a "mock trial" in which a broadcast listener prosecuted a radio amateur. The picture speaks for itself. "Judge" Freeman fined the amateur $10,000.00 and sentenced him to 20 years at hard labor for causing such interference as static, squealing, whistling, clatter, Naval stations, commercial station, arc lights, and what not. The bro. BCL was forced to pay the judge and jury for letting him off so easy and was further penalized by being forced to buy all equipment from the Rattling Radio Co. in the future.

From left to right in the photo are C. D. Tuska, O. Bates, R. S. Miner, L. W. Ripley, F. H. Schnell, Harrison B. Freeman, C. A. Service, E. C. Adams, J. Furey, Boyd Phelps (Beep), Hiram Percy Maxim, and K. B. Warner. The group on the left excepting FHS represents the BCL, his witnesses and attorney; H. B. Freeman, judge; C. A. Service, clerk of court; E. C. Adams, sheriff; J. Furey, dago foreman of the jury; the remaining three and FHS being the amateur crew. The implements (?) on the table were used as evidence in connection with the trial. A true setting of the court room was arranged in the Bond Hotel. A very large crowd attended the hearing and during the course of examinations and cross examinations many ridiculous things were said which brought roars of laughter from the audience. One may see from the expressions on the faces that no love existed between the two factions. Space does not permit a detailed account of what went on, but detailed information is available at A.R.R.L. Headquarters for clubs wishing to put on the "mock trial."

Radio Club of Hudson County

New officers for the year are: P. V. Zeyn, pres.; G. U. Smith, vice pres.; W. Arp, treas.; P. Rank, secy. A 1 K.W. spark set will be installed with a good receiver. Splendid programs have been arranged for coming meetings to which all are invited. All correspondence should be sent to L. M. Argush, asst. secy., 59 Eldorado Place, Weehauken, N. J.

Atlanta Radio Club

A special reorganization meeting was held January 3rd and the following officers were elected: W. E. Dobkins, pres.; H. L. Reid, vice pres.; F. F. Merriam, secy.; H. A. Cole, treas. Because of the friction between BCL's and the A.R.R.L., a committee was appointed to redraft the constitution so that the club, in the future, will be made up of members interested in experimental and relay work. The club meets twice a month at the Chamber of Commerce Building.
The Columbus Radio Club

The C. R. C. has now established permanent quarters in the Columbia Hotel. The club has one room on the ground floor which is open at all times, and has the use of a large parlor on the second floor.

With Fred W. Redding as President and Fred S. Harmer as Secretary the club is progressing splendidly and very active is shown by the members.

The club members are being treated with talks by such men as Paul F. Godley, Major Armstrong, Captain H. W. Webb, of Ohio State University, E. O. Evory of the Ohio Inspection Bureau, Col. R. L. Krumm of Erner & Hopkins Co., Prof. R. A. Brown, Ohio State University, and O. E. Marvel of the Dayton Fan & Motor Co.

Milwaukee Amateurs' Radio Club

The M. A. R. C.'s first meeting of the new year was devoted to reports of the results of the 1922 trans-Atlantic tests of the A.R.R.L. The signals of one member, Marian Szukalski, Jr., 9AAP, were reported heard in Manchester, England. Attorney L. J. Topolinski, the club's recently appointed general counsel, reported the progress of the case of “McWilliams vs. Bergman” in which an Illinois radio amateur is being sued on grounds of interference by a broadcast listener.

The Fourth Annual N.E. Convention

The Fourth Annual New England A.R.R.L. Banquet will be held at Walker Memorial Building, Massachusetts Institute of Technology, Saturday, March 31st. It is planned to call the traffic men's meeting and a meeting of club representatives and A.R.R.L. officials in the afternoon at three o'clock. At that time the election of officers for the New England Council will take place, as well as a discussion of all matters regarding amateur radio in New England.

In the evening, in the same building the Fourth Annual Banquet will be held, followed by the usual program of comic movies, specialties, stunts and speakers. The following speakers will be present: E. H. Armstrong, H. P. Maxim, Charles C. Kolster, F. H. Schneil, and E. B. Warner. This is run under the auspices of the M.I.T. Radio Society and they want every New England amateur at this convention.

Third Radio District Convention

The coming Third Radio District Convention to be held in Baltimore April 13-14 means lots to the fans who are nightly punching the air with their friendly communications. The “G.E.O.M.” and the “C.U.L” “With best 73's,” only express lightly the bond of friendship, the very heartbest of Brotherly feelings, that has always been a most important fact of this wonderful game. The American Radio Relay League has made many things possible and through and by this wonderful organization we are now known, and recognized the world over, and looked upon by our own Governments as a very useful servant in time of need. We have been most successful in our tests and relay work, and have demonstrated to all that we are not only capable of handling traffic, but that we can also construct and maintain complete radio equipment.

Now fellow fans you have all worked and worked hard, now the time is coming for a little play. A time when you can ease up a little and talk in person to the ones you work so often on the air. This convention is your convention. It is your recreation, your holiday; come and enjoy it—be one of the merry crowd, and let the fellows know you are here.

You are promised a wonderful time, namely; good exhibits, excellent program, banquet, and a chance to see and hear your own A.R.R.L. officers. Now is the time to talk convention and keep it up and by your efforts we will all greatly benefit.
The spark coil I.C.W. set or spark tube set is nothing but a low power tube sending set with plate power supplied by an ordinary spark coil. Such sets, first described in our pages by Herbert Wadsworth of 3JI (October 1921, p. 32), are rapidly crowding out the ordinary spark coil sets. The beautifully sharp wave of the spark-tube combination makes almost no local interference and has a much greater range than the spark coil alone.

One of our best spark-tube stations, 9DDY, has worked 160 miles in broad daylight and has repeatedly worked 400 and 500 miles at night. This is with a one-inch coil, a 5-watt tube, and an antenna current of half an ampere. 3BGs, at Bristow, Va., works a daily schedule across 45 miles of mountainous country with another station which receives him strongly enough to use a loud speaker. He also has worked over 500 miles. The best distance reported so far is that of 8AEW who has worked SXAC in daylight and has been heard at 1100 miles at night. These distances were once considered good for one kilowatt sparks. For a set using a receiving tube, a half inch spark coil or an automobile coil will answer. For a 5-watt tube a one inch coil is better and for a 50-watt tube the proper thing is something like the Amrad spark coil or the old Duck "half kilowatt" spark coil. Spark coil secondaries are wound with a great many turns of very fine wire which give a high voltage but do not deliver enough current to operate a power tube properly. This may be partly corrected by connecting a condenser across the secondary. This is the condenser marked C4 in Figs. 1, 3 and 4. It must be large enough to keep sparks from jumping inside the tube and not so large that the voltage gets too low to operate the tube. 3JJ has a .01 microfarad condenser used, at 2CEI there is a glass condenser with 38 plates of glass 5 x 7 inches with tinfoil 4½ x 6½ inches, and at 3ABJ a pair of Murdock moulded sections serve the purpose.

A better way of lowering the plate voltage is to dig out the wax around the coil secondaries (a lukewarm soldering copper helps) and re-connect the secondaries in parallel instead of series. This is possible only if the secondaries are alike.

**Figure 1.**—The Circuits at 3JJ and 3BGs

- **L1 & L2**—Quaker Oats box with 25 turns of bell wire, 9 above the filament tap and 16 below.
- **C1**—Faradon U.C.1014 mica condenser, capacity .0002 microfarads.
- **C2**—Variable condenser, capacity .0005 microfarads.
- **C3**—Any sending condenser.
- **R**—Radio Corporation 5000-ohm grid-leak.
- **A**—Hot wire or thermo-couple ammeter—0 to 1.5 amperes.

**Figure 2.**—The circuit at 2BCF

All coils wound with annunciator (bell) wire on a 4 inch pastebord tube. Leave from ¼ inch to two inches between antenna coil and the plate-grid coil.
The best plan of all is to remove the secondary entirely and re-wind the coil with wire 6 or 8 sizes larger. Robert Kraus of 2CEI finds that for a Ford spark coil the best secondary is one having 5000 turns of number 92 A.W.G. (B&S) double-cotton-covered wire. When the secondary is re-wound in this fashion no shunt condenser is needed in Fig. 4 and even for the other circuits it can be reduced to .001 microfarad. Three sheets of 4 x 5 tinfoil between 5 x 7-inch glass sheets 1/2 inch thick is more than enough.

**Figure 3.**—The Circuit at BAER

L1—25 turns bare No. 10 wire on a 5-1/2 inch tube.
L2—20 turns No. 18 S.C.C. copper wire on a 3 inch tube.
C1—Mica condenser of .00025 to .0005 microfarads capacity.
C2—Variable condenser, .0005 microfarads.
C3—Glass or other sending condenser.

With a half inch spark coil a hard receiving tube may be used; either the Cunningham C.301 or the Radiocorp U.V.201 is suitable. For larger coils the 5-watt C.302 or U.V.202 may be used but less filament power is consumed by the Western Electric "E" or VT-1 tube. No 50-watt tube with proper plate insulation for spark-tube work is available just now but the C.303 or U.V.203 can be made to do.

Various circuits have been described in our pages in a paper called "A Spark Coil C.W. set," by Samuel Kopelson of 2BCF (May 1922—p. 66), and in "A Spark Coil C.W. Transmitter," by F. J. L. Duffy (March 1922—p. 28). In The Modulator for January 1923 there appeared on page 17 a concise paper by M. Joffe describing his spark-tube set at 2BYO. These various circuits are given herewith; for details the reader is referred to the original papers or to the station owners, whose addresses are in the call book. The simplest and cheapest circuit of all is that of Figure 1, originally described by Wadsworth of 3JJ whose paper in our October 1921 issue was referred to at the first of this article. The beginner is advised to start with it. It is much easier to adjust the set if one has a small antenna ammeter with a one ampere scale; a larger one is not much good. A small tungsten filament flashlight bulb in the antenna lead can be used but is not a very good substitute.

Because the circuit shown in Fig. 1 is the simplest we will start with it. Begin by putting the grid and plate clips at the very ends of the helix and setting the variable condenser C1 at its largest value. Then light the filament, hold down the key, and adjust the vibrator of the coil. A smooth tone is the best, no matter what the pitch is. One may as well stop right here and work with the coil till such a tone is gotten. At 3JJ the vibrator was loaded with solder until the tone was exactly that of a "sink" spark gap at its best. This had much more "punch" than the high mushy tones. There is no objection to a good high tone but few coils will give it and still fewer will put any "pep" into such a tone.

If no antenna current appears, try moving the plate clip up six or eight turns, jumping two turns at a time. After that put the plate clip back and try moving the grid clip down two turns at a time. Finally try adjusting the condenser C1. If none of these things start the tube to oscillating try reversing the secondary leads of the spark coil and go thru all the adjustments again. Finally try shorting the grid condenser at a lead and repeat the entire performance once more. If the tube still does not go to work the filament is too dim, the coil not powerful enough, a connection is wrong or the antenna is no good. Go over all of these things and pay especial attention to the notes on antennas.

**Figure 4.**—The Circuit at 2CE1

L1—25 turns edgewise strip 7 inch diameter.
L2—15 turns No. 18 D.C.C. wire.
L3—250 turn honeycomb coil.

Note—Do not use bell wire, as the wax prevents it from working properly.
When an antenna current is finally obtained it will very likely be on some "off" wave—270 or 100 meters. If no wave meter is handy the receiving set may be used to check the wave.

Light the tubes of the receiving set and move the plate variometer or the tickler over until the receiving tube oscillates. Now with the antenna switched to the sending set light the sending tube and hold down the key. Then tune in the signal on the receiving set. One should be able to tell from the position of the dials whether the wave is about the same as that of other stations. This does not work with a single-circuit tuner. The wave can be reduced by reducing the setting of the condenser $C_2$, at the same time moving the plate and grid clips to get the best antenna current. During this performance the antenna current will probably fall off, but this does not matter as the lower wave will "get out" better.

The adjustments of the circuit shown in Figures 3 and 4, the wavelength is fixed by the position of the antenna and counterpoise clips and the condenser $C_2$ must be very carefully adjusted to get good antenna current. To change wave move the clip and swing the condenser.

![Fig. 5](image)

The Circuit at 2BYO

Because the power is low the antenna must be as good as it can possibly be made. The insulation should be the best, the leads made in the form of a four or six inch cage, the top either of cage or flat top form and the greatest care taken with the joints, of which there should be as few as possible—there is no call for any joints in an L-type antenna run all wires clear down to the switch. If a counterpoise is used it must be made as carefully as the antenna; if a ground connection is used make it with the greatest care. With a properly made antenna system and a 5-watt spark-tube set the antenna current will be between .3 of an ampere and 1.6 amperes.

For very short distances, a half mile at the outside, the spark-tube set can be used as a radiofone by screwing down the vibrator tight and putting a microphone transmitter in the series with the coil primary. Not very much power can be used as the microphone will "fry" on half an ampere. This limits the stunt to sets using receiving tubes or Western Electric 5-watt tubes. Spark tube set can work down to 50 meters without any trouble. Attention is especially invited to the work of 3RP described in the article "Exploring 100 Meters," which appears in this issue.

OPERATING DEPARTMENT

(Continued from page 46)

watts. The general radio situation in Fort Worth is fine, there being very few complaints from broadcast listeners and usually these few are remedied by the Fort Worth Radio Club. 5EL is doing good work and is getting out fine. 5UN is back on the job and is doing good on his 300 watts. 5ZADA has changed to 15 watts and is doing some fine work. 5CY has just installed a 20 watt C.W. set. 5OK comes in this month with a report. (Thanks OM.) 5UO was reported QSA 2700 miles southwest of Panama, also on the Hawaiian Islands on 15 watt (F.B.) 5IX handles 386 messages this month. He has junked his transformer and is using a generator on the plates. He has received 11 reports from stations over 1500 miles. 5KK has started up on 5 watts A.C. C.W. and has done very good work during the 15 days that he has been working. His best DX so far is slightly over 500 miles. 5JL has turned in no message report but has been working steadily and has been receiving reports from both coasts and Canada. (F.B.) 5VA, City Manager for Dallas, has burned out his fifth antenna ammeter. He has managed to handle 55 messages and is getting his forces organized to beat Fort Worth stations in handling message traffic. 5ZH has had his 50 watt bottle going several times and as many times has had troubles with defective insulation on transformers, but says he will make a 50 watt tube harness with another and percolate or bust, that Sherman might have known something about war but if he had tried to make two 50 watters work, his opinion of War would no doubt be changed.

The transmitters of Dublin, Texas, have had trouble with the broadcast listeners the past month. They want them to QRK from 6 to 12 P.M. even on C.W., when their 25c sets won't even tune a C.W. using motor generator with a good filter system, whatenel next.

SOUTHERN TEXAS: No cold weather has yet reached us in these parts, and although C.W. is cutting through in fine style, one would really enjoy sitting-in some few nites this season when static is entirely absent as it has been for many weeks at a time during past winter seasons. The El Paso district fails to come up to expectation this month, and District
Transatlantic Flash!

In collecting dope on transatlantic stations, while pawing thru the government call book we find that 8ML and 8SP are listed as using over a million watts and that 8XE uses a wave of 200,375 meters. No wonder!

In the transatlantics probably fewer tubes got over east than the much larger number that "went west." Due to the strain many power tubes have gone dead since the tests (See Operating Dept.) It has been suggested that when your transmitting tubes blow, you should send the signal "QGD" so as not to keep the other fellow waiting.

1QP has had a couple 50-watt Radiotrons go bad in operation by the puncturing of the glass seal by the plate voltage. The rupture takes place under the band which surrounds the seal-stem for the purpose of supporting the plate. The potential punctures the glass and jumps to the grid wire. Now 1QP safeguards his 50's by the following process: A knife-blade is run around the bottom of the base until the porcelain is loosened; the terminals are unsoldered from the contacts, and the base removed. Heavy glass tubing (1QP uses gauge-glass, ½" center hole, ⅛" wall) is then slipped over each of the four electrodode leads, and the base restored. Try this if your tubes have punctured in the seal.

Concerning the Englebreton S/R article, there seems to be an awful lot of worry about some of the details. Let's explain. The condenser C, in the diagram at the bottom of page 38 is supposed to be a variable. It is connected to the switch half way up the left side of the panel shown on page 37 and that switch throws the condenser in series or parallel with L. In the same diagram C, is shown as a variable condenser. That too is a mistake and as shown in the table on the opposite page, C, is a series of small fixed condensers.

2KG comes along with the bright suggestion on a high antenna having minimum insulator leakage, absorption, hysteresis losses, etc. His method is to use a hollow wire filled with hydrogen gas and the bottom end merely tied to the radio shack.

The daylight transcon reports continue to straggle in but are still so fragmentary that there will be no further report. Next time we will have to make everyone swear to report.

The January 2d issue of the Radio Service Bulletin contains a warning to broadcasting operators that operators indulging in point-to-point communication may have their license suspended or revoked and that the station licenses of such stations are liable to the same penalty. Broadcasting licenses do not permit point-to-point operation and operators are cautioned not to communicate with other stations. The transmission of acknowledgments to individuals relating to the receipt of letters, telegrams, etc., is direct, communication and not authorized. This means the exit of broadcast station "clubs" which have held nightly "initiations" on the air to the accompaniment of much jangling hardware. Even the B.C.L.'s will be relieved to hear of this.

The mayor of San Francisco recently dedicated a broadcasting station in his city and in his talk invited everybody who heard him to send him collect telegrams telling how far his voice was carrying. By midnight of that evening at least one telegram had come from every state and by daylight it was estimated that the mayor had incurred a toll bill of $3,000, with the possibility that the figure might be doubled. This sounds funny to you, gentle reader, but just imagine how funny it must have seemed to the mayor.

Even President Harding gets radio QRH. The New York Tribune reports that the President recently sought melody over his receiving set but all he could get was two concerts on the same wave, so he finally gave up in disgust.

Last Call for the Antenna Number

In spite of the delay there is going to be an antenna number of QST. It has taken time to get the material together but we think we are going to have something worth while now. Therefore, if anyone amongst us has any thoughts that belong in the antenna number, send them in now or at least make a reservation for them.
Read ‘Em and Weep

From the large volume of reports received for this department each month it appears that a station is one of the very best when on 5 watts it can work 1500 miles and be heard at times across the continent (Examples: 8CK, 4JK, 1BOE, 6ACB. 9AHC has heard the following five watters: 2AFP, 4LP, 5PF, 5XV, 6AOW, 61JC, 6BQD, 6BQZ, 6GD, 6GX, 6GQ, 6VM, 7H8, 7MP, 8SMK, 8CBX, 6ZTQ, 7AFW, and probably more). On ten watts the following have been heard by 9AHC: 1AK, 1AXD, 1RWJ, 3BNU, 3DA, 8SM, 10GC, 4EB, 5SF, 6ABX, 6AÜÜ, 6BF, 6BGQ, 6EB, 6KU, 6NX, 8ALF, 8BUC, 8KH.

A 50 or 100 watt station should be heard across the continent often to be classed as one of our best, or if nearer the central part of the country should work all districts and be heard in Europe or Hawaii occasionally, depending on how much the station is on the air. Stations with 250 watt tubes should handle transcontinental traffic on very good nights and freak distances of several thousand miles in excess over water should happen now and then. About a tenth of one per cent of the licensed amateur stations in this country would be included in any of the above classifications.

1MY on three 5 watters heard 1160 miles west of San Francisco. 4EH used the same power when he was heard 3,675 miles west of S.F.

Probably the greatest distance a Canadian has heard a Canadian was when 9BP heard 3GK. Their logs check.

4EB has been several times logged by 6ZY in Honolulu. 4EB uses two 5 watters and puts 2.1 amperes into the antenna. 6KA, 6EM, 6JD, 6BES, 6AVD, 6XAD, 6Z2Z, 6AWT, 6CF, 6BKE, 6EA, 6AOU, 6BB, 6BCE, 6ABB, 6AT, 6CU, 6BQG, 6KU, 6AMT, 7Z0, 7ZU, 7SC, 7ZV, 7ZK, 7ABB, 7AFW, 7BJ, 7LU, and others, are heard quite regularly in states bordering the Atlantic.

SOS to Meter Makers

We urgently need a voltmeter that will work on either A.C. or D.C. voltages between 1,000 and 10,000. It need not have laboratory accuracy but it must be economical of current. A meter to measure the voltage on a fifty watt tube now days consumes as much power as the tube and perhaps drags down the voltage. Some time ago we saw a tiny electrostatic meter made by Mr. Everet Edgecumbe of London made for an aircraft radio set. It fitted the requirements exactly and in addition was very small, dead simple, and very rugged. The moving part was a single aluminum leaf shaped like the moving plate of a decimeter-type variable condenser and stiffened by pressed-in ribs. The area of this leaf was not over 1½ square centimeters. Such a meter takes no current at all and ought to be inexpensive. Could it be produced in America for $7.00 or so?

“If you see the prefix micro-tacked on to any electrical term you know at once that it means ‘millionth of.’” So says an American text book, but our microphone simply won’t believe it.—Thermion in the British Amateur Wireless.

7ZU and 6Z0 made a good amateur speed record in handing 29 messages in 33 minutes.

If 9ZN goes much lower in his short wave tests he will begin to run into negative or minus wave lengths.

No Known Remedy

A doctor asked the Chicago Tribune something like the following: “I have a terrible new malady which is bothering me. The name of this new affliction to mankind is Radiocitis. Caused from wearing radio head receivers for several weeks. Symptoms: Ears flattened against head with upper tips turned out. Patient very grochous and sour. Talks very loudly and says, ‘Static, static,’ whenever anyone speaks to him. Pays no attention to wife, family, or friends, and even refuses to eat at times. Sits up at all hours of the night muttering to himself and feverishly turns numerous dials and dodads. Is far worse than a golf nut when he meets a fellow sufferer—talks loudly and waves his arms—paying no attention to the other bug who does likewise. Would appreciate suggestions for treatment—even if relief is only temporary.

(Signed) Doc. W.”

What causes the wave of a C.W. set to swing? Why do some never swing? No one seems to know. Please list the steady stations you hear and let us have them. Please note we are not talking about fading. Never mind the fellows that do not fade—that is due to plenty of power and a good location—what we want is the dope on stations whose wave never shifts.

Some days we have gotten as many as five punk poems in one mail. QST’s absorption factor for this wasted energy has been less than one-half of one percent. Here is a typical one, selected merely because it portrays “how they get that way.”

The Boiled Owl’s Lament

Sleepless, heatless, catless am I,
Shooting my traffic all over the sky,
Ring-eyed, weary, witless as well,
Slowly, slowly going to *****.
Calling and signing and working them all,
Till I’m exhausted and ready to fall,
Chills, colds and fever all rack my poor dome.
The college infirmary now is my home.
—3KM‘J’
Where Are We?

Editor, QST:

I have decided that it is a fruitless thing to put up an antenna at all because it is certain to be utterly worthless. According to this dope in Balantine, my antenna is not worth the price of the screw eyes in the main mast and the 9ZN gang had better pull theirs down because it will never get out of town.

Is there such a thing on this earth as a perfect antenna? Can one be built? If so, where? You can't do it on the Sahara because the ground is N.G. and you can't do it in the hills because there are trees around. And almost anywhere except in the State of Indiana you have to start leveling the neighborhood with a steam shovel.

And then this antenna resistance thing. Does it mean anything at all? At WNY we used to make measurements an hour apart and get totally different results. We blamed it on the instruments then. Now I read that the thing isn't constant anyway. Now where are we?

ED.

Calling

Editor, QST:

We could learn a good lesson from the method of calling used by the high power stations of the United Fruit Co., who in turn learned it from the commercial wires. The almost universal method of making a long call is this—3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ 3JJ de 5ZA 5ZA 5ZA 5ZA 5ZA 5ZA. (I never heard Falconi make such a call but am using him to illustrate the idea.) Now suppose you tuned in on the last quarter of this show—you would not be at all sure who was being called, and if there is QSS or QRM on any part of the performance the whole call is wasted because some portion is blanked out and is not repeated.

The United Fruit method of calling would have been: 3JJ 3JJ 3JJ 5ZA 3JJ 3JJ 3JJ 3JJ 5ZA, so that any operator hearing a part of this call would have the whole idea at once. It takes less time and is more effective. The idea is especially useful where CQ is being called. How often have you listened to a string of CQ seven yards long and then have the three lone-

sion signatures fade or be blotted out by QRM? All of this is neither defending the long call or the CQ—both of them are infernal pests—but with C.W. they seem more necessary.

Sincerely,

9KW.

Re Bum Locations

Editor, QST:

Just want to tell the gang a little about why Birmingham has not been on the relay map very strong.

For one thing the geographical location of our fair city is all wrong, we are hedged between two mountains of ore, coal and other minerals. Last winter our station was the only one to work out of town. 5XA is only a hundred miles and it took three operators to work us, one to copy, one to tune, and one to cuss. For fading we get the cast iron insulators. The same way here when we tried to work them, they would come in strong on the "5" and fade completely out on the GI. The Bureau of Standards should have made their tests for fading here.

Now the funny part of it is we could work north and west fine, but south, ND OM absolutely. We have worked as far north as Clinton, Iowa, and have been heard in Colorado, but we couldn't get that paltry hundred to 5XA with four amps. in the aerial.

All the above was experienced with spark, we just put in a fifty watter and added a sink to the spark so hope we have better luck this winter, but if you have a msg for us and can't raise us, just say that two mountains of iron ore stopped us.

Best 73's,

5ZAS (ex 5GI).

Whoops M' Dear

Dear Editor:

A long time ago, you asked me to tell how it seems to be a radio man's wife. Well, I'll tell you, and you can tell the world—if you dare.

As to being a radio man's wife—I like it. For sixteen years I have been the faithful wife of a golfer, a camera fiddler, a mountain climber, a camper, a fisherman, and now a radio man. After sixteen years of trying to keep up, I find being the wife of a radio man the most restful of all. It hasn't, so far, involved climbing anything
higher than the ridge-pole of the house. It doesn't mean waking up at three A.M., like camping, because the true radio family is always awake at three A.M. anyway. It isn't as bad as fishing; it doesn't require scaling anything slimy or skinning anything—only being skinned occasionally.

Only one thing worries me. This is the man I promised to love, honor, cherish, and obey. Of course I don't obey him—he never expected I would, so I didn't put anything over on him there. I can love and honor him without bothering him much. But cherishing is a different proposition. My idea of cherishing a man is everlasting-ly and affectionately keeping after him about something, like telling him to wear his rubbers, or change to his winter under- wear, or eat his dinner before it's cold, or the money's gone and where will we get some more. This doesn't go any more. He doesn't mind—he simply isn't there. In mind and soul he's listening in (usually all at once) to Newark, Pittsburgh, Los Angeles, and Atlanta, Georgia, and if you'll kindly quit talking he expects to hear Mesopotamia.

I have learned much in a technical way. The secret is careful attention to details. How few, for instance, understand the art of soldering. Every electrical contact must be soldered; every soldered connection must be scraped clean, smeared with hot rosin-core solder, and then neatly damned into place. Skillful damning is what does the trick. The art is best acquired, not in a technical school, as some think, but in a well equipped garage. If you pick it up as some do around old fishing boats and mule trains, it may do as a makeshift, but it will never have a fine finish.

There is one thing more that worries me, and worries me a lot. It would anybody. So far the Old Man has been merely a listener. Now I see signs of his learning the code. I hear him singing da-da-da-da at his morning bath. He is making en quiries about the A.R.R.L. Now I have seen some of these A.R.R.Lers and the thought of being cooped up for life with anybody like them is awful. I need a bit of expert advice from the experienced—shall I leave him at the first signs, or shall I turn in on the code myself and beat him to it?

The absolute necessity of my remaining anonymous will make it well nigh impossible to send on check for this. But in ease I am caught, friends are requested to send flowers. As for the check, I don't suppose QST pays contributors anyway—who would ever have to pay a radio man to talk? In fact, I have always suspected that they paid the subscribers to listen to them.

E.G.C.

Welcome Signs

Editor, QST:

Well, OM, we saw in December QST an appeal for an A.R.R.L. welcome sign, so we are sending a photo of ours. QRV?

When we finished building our C.W. set we found we had quite a sum of money left so we decided to make a sign for our station. QRK? We obtained a bakelite panel, 72" x 12" x ½", and proceeded. Having pronounced abilities along artistic lines, our preliminary training being barn painting, we undertook to decorate the sign. Hi-jacking an old miser (who sold radio apparatus) we secured a supply of $5.00 gold pieces which we hammered flat and with which we inlaied our panel.

Next, feeling nothing was too good for an A.R.R.L. man's sign, we seized upon our battered and dilapidated wouf-hong and, shrieking and screaming as only a harassed ham can do under stress of extreme QRM, we assembled a broadcaster, and cheerfully, happily, murdered him. He said narry a word. Catching the gushing, gurgling, gore as it flowed from his body, we rushed it to our station where we exposed it to the Z-(b) rays of an old rotary spark gap, and thru this treatment retained the brilliant hue of fresh blood of bull. With this we smeared our sign, shading the gold very beautifully. This panel we hung high up on a mast where it now reposes, serving as a constant reminder of modern science and a scarecrow for the neighborhood gardens. Here is the photographic proof.

Truthfully,

5KE.

Broadcast QRM

Editor, QST:

At a time when considerable comment is being made regarding the amateur interference with broadcast reception, and especially where the bulk of the complaints come from those who are unable to read the code, it seems advisable, in the interests of fair play, to bring to your attention the condition that exists here in Salem. Regardless of the type of receiving set used on a regular type of antenna it is impossible to tune out station WBF or to prevent
them from entirely breaking up either local or long distance broadcast reception.

Inasmuch as the amateur is required to stay on or below 200 meters it would seem that such commercial stations should stay sharply tuned on 600 meters, and any movement which you can start bearing toward this end would be very much appreciated by the writer, and any other listener—either broadcast or code—in this vicinity.

Sincerely yours,
Kathryn M. Estey.

In Memoriam

We quote from the Washington (D.C.) Star, for January 12, 1923.

"Andrew J. White, of the firm White & Boyer, 812 13th St. N.W., disappeared last night, after leaving a note announcing his intention of "ending the whole thing," Mr. White had been in very poor health for some time, suffering from violent headaches and insomnia. No trace of him has yet been discovered but the third district gang still hope that he will be found. We have a mighty soft spot in our hearts for the man that engineered the wonderful banquet at the last Third District Convention, whose broadcasting station WJH did everything possible in cooperation with us, who did much for the Washington Radio Club, and whose little shop on 13th Street was famous for its friendliness and fair dealing. "Daddy" White was to us a good and unselfish friend and his going leaves a gap that will not soon be filled. ***

We also regret to announce the death of Arthur Gardenhour, 3DY, of Waynesboro, Pa. He was seventeen years old, a junior in high school, secretary of the local club, and representative of all that is good in amateur radio.

Sparks May Come, and Sparks May Go, But the A.R.R.L. Forever!

The gap it roared both loud and long, The spark it sang a mighty song, The key did flame, the ham was proud, No other note was half so loud.

The bottles glow with quiet light, The key has lost its arc so bright, A motor purrs on the station floor, And the meter reads just two point four.

But whether you care for the roar or the squelch, There's only one way that a ham should feel.

Put thru your traffic and boost as well, And stick right by the A.R.R.L.

"Continuously," C. W. Paddock.

OPERATING DEPARTMENT

(Concluded from page 57)

Superintendent McCracken who expresses it as an "off month." Enthusiasm seems to exist, but there is a general disregard of traffic work. The San Antonio district shows an encouraging increase in traffic this month, which is largely due to the reappearance of that station of last season 52AK. Serious illness of 5MT at Laredo caused a very big drop in traffic in the valley. 5ADI has changed over to C.W. but as report goes to press, best results have not yet been found with present adjustments. We are strong for 5ADI because of the splendid possibilities in his section. District Superintendent Wall, has been getting some dandy reports from his new 15 watt and is almost a top-notcher with his 108 messages this month. 5KP and 5GR run very close for honors this month, being the two best stations in the second district of southern Texas. 5YK is now 250 watts—rock crusher "never again"—writes District Superintendent E. A. Sahm. Where is 5NH, 5ZAG, and several other old faithfuls? District Superintendent Sundstrom at Houston has the same complaint to register this month. Stations who have applied for and been duly appointed official relay stations won't come across with the necessary dope to be included in reports. What's the matter with 5XAD this month? Eastern Texas district leads easily this month with but about half of the busy stations reporting. This sort of stuff can't continue fellows, if you believe in the principles of the A.R.R.L. Let's all pull together this next time, and put the thing over 100% as it ought to be.

WINNIPEG DIVISION

J. A. Gelhausen, Mgr.

4CE reports that traffic is on the increase and that amateurs around Winnipeg are beginning to show more interest in the game. 4AS has a 5 watt set and is reaching out. 4CE has a 5 watt C.W. but as yet has not been able to get much DX. 4CJ and 4CX are still working on a 10 watt set and will be in line as soon as the new Government regulations are out. 4CN on 5 watts of C.W. is getting out in great shape. 4DK seems to be the best DX station. He started on 5 watts and did fine work, then went up to 10 watts and was logged in Frisco, Calif. Now he has 20 watts.

MOOSE JAW: 4HH is keeping the other hot around Moose Jaw and doing F.B. DX work. LOREBURN: 4BV is still going as strong as ever and stronger as he has worked right across the U.S. The other terminal being U.S. 4EB. 4EZ at Stenen...
works 4BV OK in daylight. MORSE: 4CB is again on the air. His call, however, is now 3BX, special license on 275 meters.

SASKATOON: We have broken out and 4FN is going OK with two 5 watt tubes. We will be open for traffic at 4FN after 10:00 P.M. each night.

Mr. Paul Sooofsky, 4BV, of Loreburn, Saskatchewan has now been appointed Division Manager of the Winnipeg Division. 4BV is well known throughout Canada and the U.S. through his DX work. He sure is a live wire in amateur radio and will no doubt make a good division manager. It is up to each and every one of you to blow your horn to the District Superintendent of your district. The District Superintendents make their reports to the Assistant Division Managers, and they in turn make their report to the Division Manager. The final report which the Division Manager sends in to the Traffic Manager of the A.R.R.L. depends on YOU. BLOW YOUR HORN to your District Superintendent.

1XM

(Concluded from page 52)

Filament voltmeter, relay, etc. The maximum power employed for any length of time has been 100 watts and a large part of the work has been done on only fifty watts. Several interesting features in the transmitter may be gained by a close examination of the wiring diagram and the photos.

The experimental work is carried on on a long bench on the other side of the room where apparatus of all sorts is handy. Outlets are provided for filament battery, 110 volts A.C. and D.C., 220 volts A.C., and 500 cycles A.C. Bulbs of antenna and ground leads are run along the table and switches are arranged so that an experimental transmitter set up on this bench can be controlled from the regular operating desk, and given a thorough test under actual operating conditions. A large number of circuits have been tried out for transmitting and receiving without interfering with the regular operation of the permanent installation, and this arrangement should be of interest to colleges, labs, and individual stations where experimental work is being carried on at a handicap to the station proper. From practically every point of view, 1XM is one of the best stations in America.

A. H. K. RUSSELL

(Concluded from page 50)

the leading Canadian amateurs and has been Division Manager of the Ontario Division since November, 1920. He is in his second term as president of the Wireless Association of Ontario (affiliated) and was toastmaster at the recent First Canadian Amateur Radio Convention in Toronto. Subsequent to his release from military service Russell entered as a student at Osgoode Hall, Toronto, where he graduated as barister and solicitor in the spring of 1920. After several years of practice he has now become a member of the law firm of Foster, Lester & Russell, in which new connection he is now accepting congratulations.

J. L. REINARTZ

(Concluded from page 50)

roof. This not working, he went to the other extreme and strung 500 feet of No. 6 stranded wire along the tops of trees. This picked up NAA fine. Not satisfied with just listening, he had to have a transmitter so a spark coil set was fixed up and the distance to his neighbor's house was covered OK in spite of an untuned helix. During the war he served as an instructor in one of the state schools and later went to Camp Upton.

At the end of the war, Reinartz set about building 1QP. He too experienced that thrill in working the first DX station. He has been improving his education and learning the reason why everything in his station works as it does, and in delving into these mysteries he has constantly found places for improvement. His first job was to convince his wife that when he raves about LC that it is not a girl. Being located near our headquarters, QST has been in close touch with his work and has forced him to write up his interesting results. (Right here let us state that there may be others who have just as good dope but we aren't where we can jump on their heels continually to get them to write it up.) His first masterpiece to attract attention was described in June 1921 QST. The improved tuner was brought to light in March 1922 QST. Then in the following June issue a new circuit for a transmitter was described, which was also worked out by 1QP. Our October 1922 issue contained as many refinements and attachments for the Reinartz tuner as there are "glihikkies" and "gooljads" for
a Ford. The improved tuner that appeared in the March issue has met the most favor and thousands are probably in use. This article has been reprinted in many newspapers, club papers, and has been translated and reproduced in the radio magazines of nearly every civilized country in the world, attracting world-wide attention. Who would think an amateur in a shop in South Manchester could do such a thing? QP has an analytical mind and is still working out things and we have not heard the last of him by any means. He is held down by hundreds of letters most of the time but still finds time to be on the air and handle the job of A.R.R.L. Assistant Division Manager of Connecticut.

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Will tell you he wouldn't take twice the price he paid for it, if he couldn't get another.

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Not only excel all others in quality but it is impossible to lose the parts and they are surprisingly low in price.

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Scientifically developed in our own factory—built for service and backed by our good name; MAXEFF Quality Products insure perfect satisfaction.

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<tr>
<th>Product</th>
<th>Price</th>
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</thead>
<tbody>
<tr>
<td>Vacuum Tube Receivers</td>
<td>$30</td>
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<tr>
<td>2-Stage Audio Amplifier</td>
<td>$35</td>
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<tr>
<td>Detector Units (Less Tube)</td>
<td>$7</td>
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<tr>
<td>Amplifier Unit (Less Tube)</td>
<td>$12</td>
</tr>
<tr>
<td>V. T. Sockets</td>
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Sebring, Fla., using a Model X Crosley Receiver—price only $55 for this four tube set—"clearly hears three selections and two announcements from KDYX at Honolulu, 4900 miles away."

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They know that every Crosley Model does everything claimed for it—and more besides. They have found by experience that they are building a clientele of satisfied customers by pushing Crosley instruments.

From our smallest complete receiving outfit at $25 including other sets incorporating Crosley radio frequency tuned amplification at $28, $48, $55 and up to our beautiful console Model XXV, price $150, Crosley instruments offer the highest efficiency at the lowest cost.

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Write For Complete Catalog.

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The Three Most Popular Receivers on the Market

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A four tube set that gives remarkable results. Combines one stage of tuned radio frequency amplification with a tuner, audion detector and the Crosley Two Step Amplifier. Price without bulbs, batteries or phones $55.00

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A two tube set that gives uniform satisfaction everywhere. Combines one stage of tuned radio frequency with tuner and audion detector. Price without bulbs, batteries or phones $28.00

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Remarkable records are being achieved by owners of the Crosley Model V regenerative radio receiver, which is the greatest result-producing one-tube set being manufactured today. With a range of from 150 to 600 meters, this little wonder brings in amateur, broadcasting and commercial stations. Concerts broadcast more than 1000 miles away are heard by those who own the Model V. The name "Crosley" is used by permission of the Crosley Manufacturing Co. The regenerative feature licensed under Armstrong U. S. Patent No. 1,113,149, October 6, 1914. Made in two models.

Model V-C $20.00
Model V-D 19.00

Model V-D is the same as V-C but with overhanging lid.

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CROSLEY MODEL XX

This beautiful cabinet is practically our Model X built into a highly polished mahogany cabinet. A hinged lid, when raised, allows the operator access to every part of the receiving apparatus. Directly under the receiving apparatus is a highly finished board that slips in and out forming a desk for the operator. Wires lead from the binding posts on the receiver to batteries in the lower compartment. A loud speaker is contained in the middle compartment which makes it possible for music, etc. received, to be heard all over the house. This cabinet is a beautiful addition to any room.
Price without tubes, batteries or phones, $100.00.

CROSLEY MODEL XXV

This is a cabinet model of unusual beauty equipped with four tube panel incorporating the same units as the Model X, but the panel is of different shape as will be noticed from the illustration. This cabinet is arranged to take the Model R-3 Magnavox and also contains space for "A" Battery and "R" Battery and battery charger if desired. Guaranteed to bring in distant broadcasting stations 1000 miles or more loud enough to be heard all over the room. Price without tubes, batteries or phones, $150.00.

CROSLEY MODEL XV

The same receiving apparatus is incorporated in this model as in the other receivers on this page with the exception of compartment for batteries. This set will bring in distant broadcasting stations loud and clear. Price without tubes, batteries or phones, $70.00.

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Wherever you may be—at a hunting lodge, in camp or on an automobile trip—Crosley Portable Sets have made it possible to have an unlimited supply of entertainment at your command.

Packed complete with batteries, tubes, phones and aerial in a neat, substantial case these sets may be conveniently carried any place with very little trouble. Crosley Portable Sets will be found a great help in relieving the monotony of a dull evening and in offering a variety of entertainment that everyone present will enjoy.

These sets have been thoroughly tested and found to be highly efficient and accurate in long range reception.

Take a Crosley Portable with you and you take a wide variety of the best entertainment obtainable.

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RADIO

CROSLEY MODEL VI PORTABLE

This set consists of detector and one stage of tuned radio frequency amplification. As the illustration shows, there are separate compartments for batteries, phones, etc., the aerial wound as shown in the picture, is supposed to stand in front of the set when the case is closed. We have received favorable comment from satisfied users all over the country on this set.

Price without tubes, batteries or phones, $40.00.

CROSLEY MODEL VIII PORTABLE

Consists of one stage of tuned radio frequency amplification, detector and one stage of audio frequency amplification. The general construction of this set is the same as Model VI portable and a wider range and slightly better results are guaranteed. That this is an efficient set is confirmed by the hundreds of letters we have received telling us of the remarkable results obtained with it.

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CROSLEY RADIO PARTS are manufactured from the best materials money can buy and are the acme of quality. We draw your especial attention to the CROSLEY patent BOOK-TYPE VARIABLE CONDENSER which impartial tests show to have less resistance than any other condenser on the market.

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The CROSLEY VARIABLE CONDENSERS are unquestionably one of the most radical improvements in radio during the past few years. By using it, louder signals are obtained as it not only is simple and easy to tune, but also has less internal resistance and no body capacity effect.

**Model A.** .0005 Mfd. (Wood Frame) ........................................ $1.25
**Model B,** as illustrated, .0005 Mfd. ........................................ $1.75
**Model C.** .001 Mfd. (Porcelain Plates) .................................... $2.25

CROSLEY RHEOSTAT
Note the new Crosley Rheostat with ball bearing contact, patent pending.
This rheostat permits exceptionally accurate and delicate variations of the filament current. With it, the best possible results are received from expensive vacuum tubes.
Unique construction allows the CROSLEY RHEOSTAT to be mounted on a panel of any thickness up to and including ½ inch. A special grade of non-corrosive wire forms the resistance and results in highly efficient service.
This rheostat is much more attractive, works better and is easier to assemble than the old Crosley Rheostat. It is better in every way and yet the price is the same. ..........................50¢

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The stationary washer of our own design has a soldering lug which makes possible a bus wire connection. All CROSLEY TAP SWITCHES are furnished with a newly designed tapered knob and nickel-plated switch arm and bushing.
Price each complete ............................... 30 cents
Switch Taps for the above made of brass, nickel-plated and complete with brass nut. 3½ cents each.

Your Dealer or Jobber should be able to furnish you with Crosley Apparatus. If not, send us his name and order direct.

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FORMICA
Made from Anhydrous Redmanol Resins
SHEETS TUBES RODS
Manufacturers use and like

FORMICA

The radio engineers of the leading radio manufacturers all over the United States have approved Formica in the most sincere and convincing way—by adopting it and using it in their production of radio equipment.

No other insulating material for panels, tubes, and other parts can show a list of makers of high grade radio equipment using their material that is comparable to that printed on the page opposite. It is practically a directory of independent radio manufacturers in the United States.

This overwhelming preference for Formica among the men who, among all others, know most intimately the qualities and characteristics of radio insulation means only one thing.

IT MEANS THAT FOR YEARS FORMICA HAS MAINTAINED A QUALITY AND UNIFORMITY THAT IS NOT TO BE HAD ELSEWHERE.

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The Detector and Amplifier units are complete including all necessary grid leak condensers, 'phone condensers, transformers and rheostats.

Hear an Atwater Kent set at your dealer's.

Atwater Kent Manufacturing Company

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Your dealer sells Frost Fones
See him today

No. 162 2000 Ohm Set
No. 163 3000 Ohm Set

$5.00  $6.00
The superior performance of Giblin-Remler Inductance Coils is responsible for their big demand

Interchangeable with all coil mountings

The Most Efficient Compact Inductance Ever Used in Radio

An Engineering History of the Most Efficient Inductance Coil Ever Developed

Theoretically, the ideal inductance coil should have all inductance—no capacity—no resistance—and no natural period. Such a coil would result in maximum signal strength with no interference from signals that were not on exactly the same wavelength as the signals being received.

Thomas P. Giblin, the radio engineer who originated the compact inductance coil, has been working on coil design for many years with this knowledge of the theoretically "perfect inductance" constantly in mind. The first of his coils to appear on the market used the single lattice, or so-called honey-comb winding. After a great deal of study and research, this winding was slightly improved by staggering the turns between layers resulting in a multi-lattice, or so called duo-lateral winding.

However, Mr. Giblin was not satisfied. He felt confident that he could produce a coil that would come much nearer to having the characteristics of a theoretically "perfect inductance." Complete success was at last achieved when the present Giblin-Remler coil—THE MOST EFFICIENT COMPACT INDUCTANCE EVER USED IN RADIO—was developed.

In this coil the turns are wound close together, resulting in a greatly increased inductance for the same amount of wire. Hence the resistance is lower for a given inductance. The slight increase of capacity between turns has been many times compensated for by a greatly decreased capacity between layers resulting from spacing the layers with a cotton yarn of high dielectric strength. The result was a new coil having MORE INDUCTANCE—LESS DISTRIBUTED CAPACITY—AND A LOWER NATURAL PERIOD THAN ANY PREVIOUS COIL. Furthermore, the new coil has maximum insulation between layers at the point of greatest potential difference.

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THE finest adjustment necessary for even the most critical filament. Smooth, positive control—no jumping—no flickering of light. No variation in resistance with change of temperature — no consequent "mushing" of signal—not the slightest. Small knob regulates initial adjustment—large vernier knob, the final sharpening-up of the tone quality.

You need a BASCO for maximum clear-tone quality. They are small, compact and easy to install. Only one panel hole to drill—no bother lining-up two or three screw holes.

$1.25

Resistance coils are rigidly inset in heat-resisting fibre—coils cannot shift in operation. All metal parts, binding posts, etc., heavily nickel-plated. The highest type of workmanship in every detail.

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View of BASCO Vernier Rheostat showing resistance coils.

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A.—The wire!

Yet we've seen wireless apparatus that seemed almost to take its name literally—as far as having had any serious attention paid to its wire.

Magnet wire is the basic material of radio equipment. For the manufacturer it holds a dual significance. It must perform economically in his plant, in the hands of his operators; and it must perform efficiency in the finished jobs, in the hands of his customers.

Acme Magnet Wire was made—long before the days of practical radio—to meet these two standards in the field of general electrical manufacturing. It winds easily and economically, because it is uniform, free from imperfections, and its insulation is scientifically applied to insure smooth, rapid production. Its long-continued use by the leading makers of standard electric equipment is ample testimony of its quality in performing the work expected of it.

Acme has pioneered in the development of the finer sizes of enameled magnet wire for radio use and, in winding hundreds of thousands of transformer coils in the Acme plant, has gained the practical experience in this field that is of such estimable value in improving the quality of Acme Wire and maintaining the Acme Service in radio work.

THE ACME WIRE CO., New Haven, Conn.
NEW YORK CLEVELAND CHICAGO
Radio Frequency Amplification TRANSFORMERS

200-600 Meters Air Core

Use the same transformer in your set as is used in the famous Mu-Rad Sets. Increases the range, the clarity and the efficiency of your set by eliminating iron losses, eddy current losses and losses by capacity effects.

Sold at All Good Radio Stores

If your dealer cannot supply you, send us your order with his name.

Three Types
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Charges both A and B Radio Batteries

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Attach the Charger to your home lamp socket—attach the clips to the battery terminals and you will get a quick, tapering charge which just exactly charges your battery, but cannot overcharge it or harm it in any way.

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Valley Electric Co., Dept. Q, St. Louis, Mo.

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Name
Address

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Switching from stage to stage is instantaneous, positive, noiseless. This switch may also be used for an unlimited combination of vacuum tube circuits. 2¾ inches in diameter, 3½ inch in thickness. No. 90.

Paragon V. T. Control No. 70
Attractive — compact — efficient
$6.00

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Perfect contacts — heatproof — mirror finish — non-breakable
Standard
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Rugged — dependable — smooth action
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300 ohms — economical — rugged
$1.75

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PARAGON

REG. U. S. PAT. OFF.

RADIO PRODUCTS
Here's the Radio device that you have been waiting for. These Phone Tip Jacks assure quick connection and a positive contact. They replace unsatisfactory binding posts. Soldering lug incorporated but use optional.

Accommodate any standard round phone tip and several sizes of bare wire. Great for W D 11 connections and coil mountings. Save buying expensive telephone plugs and jacks. They live up to the Union Radio Standard of Quality. Guaranteed to satisfy. Only 25c a Pair.

FOR ASSURED RESULTS you should "try out" Union Radio Tip Jacks, Variable Condensers, Rheostats, Vacuum Tube Sockets, Condensite Dials, Complete Receiving Sets and Two Step Amplifiers.

Union Radio Apparatus and Accessories are sold by most good dealers. If you can't obtain them from your local store mail your order to us. Write for a copy of our Catalogue D Radio Apparatus.

WHOLESALE AND RETAILERS:
Write for our liberal proposition. Dealers Catalogue D and Price List also samples sent on request.

UNION RADIO CORPORATION
300 W. PLEASANT ST., NEWARK, N. J.
NEW YORK OFFICE - HOWZT-327 STREET.
Building Good Will
with a Quality Material

The high quality of much of the Radio apparatus available today is due to the consistent policy of leading manufacturers in this field, who early adopted the phenolic resin material Bakelite, Condensite, and Redmanol, for their electrical insulation. Its uniformity assures them of a constant, unvarying standard. Its dielectric and mechanical strength, dependability, and fine finish, and its availability as a molding material, or in laminated sheets, rods, and tubes, or as varnishes and cements, have met the exacting needs of manufacture.

Write for a copy of Booklet C.

BAKELITE CORPORATION
Address the Divisions

Bakelite, Condensite, and Redmanol are the trademark names for the phenolic resin materials manufactured by the several Divisions of the Bakelite Corporation. Each Division maintains a research laboratory which will gladly cooperate with manufacturers in the working out of new applications.
FRESHMAN PRODUCTS

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VARIABLE RESISTANCE LEAK

With .0025 Mfd. Micon Condenser Combined $1.00
Without Condenser 75c

Unbroken range—Zero to 5 Megohms, Clarifies signals, lowers filament current, increases battery life, eliminates hissing.

"MICON"
TESTED MICA CONDENSERS

Size   Price
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.0005   .35
.001    .40
.002    .40
.005    .75
.006    1.00
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Assure absolute noiselessness, clarity of tone, accuracy, constant fixed capacity

"0.06 Micons and Variable Resistance Leaks, especially adaptable for Fleweling Circuit.

ANTENELLA

No antenna or aerial needed. Eliminates all the inconveniences in radio. Operates from any light socket. Price only—$2.00

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Your RADIO BATTERY for A NICKEL

Enjoyable concerts and maximum receiving range are obtained only when your battery is fully charged.

THE HOMCHARGER

charges your “A” or “B” battery over night for a nickel without removing it from your living room. No muss—no trouble—no dirt—requires no watching.

After the concert connect to any lamp socket, snap the clips on your battery and “turn in.” While you sleep the HOMCHARGER is silently charging your battery, the charging rate being governed automatically. In the morning it is fully charged. No OTHER battery charger can boast of such QUICK and ECONOMICAL performance.

The HOMCHARGER is the only battery charger combining all of these NECESSARY HOMCHARGING features—SELF-POLARIZING—FIVE to EIGHT AMPERE charging rate—UNDERWRITERS APPROVAL—beautifully finished in mahogany and old gold—UNQUALIFIEDLY GUARANTEED. OVER 60,000 NOW IN USE.

Sold complete with ammeter, etc. by all good radio and electrical dealers for $18.50. (25.00 IN CANADA.)

See the Radio HOMCHARGERS DELUXE at your dealers or write for our FREE circular showing why the HOMCHARGER is the BEST battery charger at any price.

MOTORISTS

The HOMCHARGER will also charge your AUTO battery.

THE AUTOMATIC ELECTRICAL DEVICES CO.
127 West Third St., Cincinnati, Ohio
Largest Manufacturers of Vibrating Rectifiers in the World.
How to get distant stations clearly

Why the Acme Radio Frequency Transformers eliminate distance and distortion

Before you purchase a radio frequency amplifying transformer find out if it has marked depressions and peaks in its amplification range between 250 and 500 meters (indicating absence of amplification in the depressions)—or whether the amplification range curve is uniform.

A Test

The two charts above tell a graphic story of tests made on radio frequency transformers in the laboratories of a well known concern. The chart at the left plots the amplification range curve of 12 Acme R-2's taken from stock.

(Note: The Acme R-2's are made with a special iron core and windings.) The chart at the right represents a composite plot of the curves of 6 ordinary types of different makes taken from stock. The superiority of the Acme R-2 is self evident. Note its steadily increasing amplification curve with its maximum at 300 meters—just where it is most needed.

Better results—greater distance

To hear the distant stations is not enough. To understand them—to be entertained by them—that is the real thrill.

The Acme R-2 used in a radio frequency amplifier builds up wave energy without distortion before passing it onto the detector. Even the simplest and most elementary types of set either vacuum tube or crystal receiver type will have its useful range tremendously increased when the Acme R-2 and a vacuum tube are employed.

The best method

To get the distant stations clearly, use Acme Radio and Audio Frequency Amplification. This insures maximum sensitivity and intensity, quietness in operation and freedom from distortion. A small indoor antenna or loop may be used and sufficient intensity obtained to operate the Acme Kleerpeaker providing perfect entertainment for a roomful of people.

You can get these and other Acme Products at radio, electrical and many hardware stores. Write for booklet R-2 showing proper hook-ups and other information.

The Acme Apparatus Company
Pioneer transformer and radio engineers and manufacturers
CAMBRIDGE, MASS., U.S.A.
New York, 1270 Broadway
Chicago, 154 West Washington Street

For Amateur Wave Lengths Use R-1, R-2 and R-4

ACME ~ for amplification
Holtzer-Cabot
No. 2 Universal

The Latest Achievement in Radio Head Sets

After exhaustive experiments and actual manufacturing experiences we have produced a receiver which, for tone quality, has no equal.

It is tested, not by “listening-in,” but by a specially designed scientific instrument which gives its true tone quality by actual sound measurement.

Our new head bands are covered with flexible rubber, making them comfortable and sanitary.

Weight, only twelve ounces
Price $12.00.

The Holtzer-Cabot Electric Co.
Boston and Chicago

The Radio Manufacturing Company
of Springfield, Massachusetts

Quality Apparatus

<table>
<thead>
<tr>
<th>Style</th>
<th>Price</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td></td>
<td>250 to 600 meters</td>
</tr>
<tr>
<td>DX</td>
<td>$3.50</td>
<td>150 to 350 meters</td>
</tr>
</tbody>
</table>

A radio frequency transformer that will add quality and distance to your receiving apparatus.

This transformer is efficient in operation over a remarkably wide band of wavelengths showing nearly a flat curve from 250 meters to over 600 meters.

Style A transformer will bring in clearly all Broadcasting Stations up to and including NAA, the new Government Broadcasting Station at Arlington, Virginia, transmitting on 710 meters wavelength.

Style DX transformer is designed for amateur use and will tune in both CW and spark stations from 150 meters to 350 meters wavelengths.

97 Dwight Street Springfield, Massachusetts

We’re amateurs, too

All the members of Chi-Rad’s staff are old-time A.R.R.L. operators. With them, radio is more than a business—it’s a fascinating hobby.

You can be sure that when you deal with “Chi-Rad” you’re dealing with men who understand your wants—who can help you with your radio problems.

Paragon, General Radio, Western Electric, etc. are among the many manufacturers we represent—if it’s in radio, you can be certain that “Chi-Rad” has it.

—Write for free catalog—

Chicago Radio Apparatus Co.
415 S. Dearborn St., Chicago

Always mention QST when writing to advertisers
Enjoy Radio at its best

Dependable, even-powered batteries mean better control—quicker and sharper tuning—more complete and constant mastery of your radio set. Westinghouse Batteries are right in step with the latest advancements in radio receiving. Can be easily and repeatedly recharged. No discouraging results from rundown batteries!

Westinghouse "A" Batteries

are carefully constructed, full-capacity, slow-discharge, long-life batteries. Made in 4-, 6- and 8-volt sizes with 8, 6, 9 and 13 plates per cell, to meet all filament-battery requirements.

Westinghouse "B" Batteries

The Westinghouse 22-MG-2 (22 volts) is a marvel for steady, noiseless, full-powered service. Glass case; visible interior; sealed-in tops. Larger types, too; also 2-volt single cells for "C" batteries.

At radio dealers and Westinghouse Battery Service Stations everywhere.
Write for illustrated folder, "Westinghouse Radio Storage Batteries."

WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.

WESTINGHOUSE

RADIO "A," "B" and "C"

BATTERIES

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Radio's Biggest Hits This Season
THREE OF 'EM

REGAL NO. 164
INDUCTANCE SWITCH
(Complete with Knob and Dial)

A 15-point switch complete in one unit. Requires but one hole to mount on panel. Smooth wiring contact over heads machined to same height on one piece contacts. Complete soldered assembly attached, or removed from panels by means of one threaded shaft bushing. Gives inductance regulation by dial contact.$2.00

REGAL NO. 220
SILVERED KNOB AND DIAL

Handsome 3 inch Silvered Dial with new style Regal Knob. Not to be compared with the common moulded knob and dial. Gives rich appearance to receiving set.$0.75

REGAL NO. 140
FILAMENT RHEOSTAT

Has full exposed resistance wire, giving critical adjustment so necessary to the efficient operation of a vacuum tube. Fine, smooth working control. Handsome knob, heat resistance base and highly nickel-plated parts. 6 ohms resistance—1.5 amperes.$1.00

Other Regal Radio Products

Condensers, Crystal Detectors, Binding Posts, Switch Points, Knobs, Tube Sockets, Vario-Coupler, Variometer, and Jacks

If your dealer is not handling REGAL Products, send your orders direct.
THE AMERICAN SPECIALTY COMPANY, Bridgeport, Conn.

GREATES of all AMPLIFIERS
with WD-11 tubes,
UV-201, UV-201-A, UV-202 or
Western Electric Tubes

Price $7

Audibility amplification. $8.5

The AmerTran
A transformer based on the sound engineering experience of a specializing transformer manufacturer. It does not have a high turn ratio, but it does have the highest known broad-band audibility amplification without distortion.

American Transformer Company
Designers and builders of radio transformers for over 20 years.
176 Ennet St., Newark, N. J.

Sidsbene!
LASTS 5 YEARS

"B" BATTERY

Exceptionally powerful. Makes weak signals strong. A single charge will last six months, recharged (for less than 1/2) from any lamp socket or farm lighting generator. Patented high amperage plates charged and formed before leaving the factory. Positively eliminates battery noises often blamed on static.

Container will not leak and is made of genuine hard rubber. Size 3 1/2" x 3" x 4 1/2".

You assemble the battery easily and pleasantly in less than ten minutes. Complete illustrated directions with each battery. LARGE ILLUSTRATED CIRCULAR ON REQUEST.

Price 22½ volt, unassembled. $4.25

Rectifier for A.C. unassembled 4.35

SIBBENE! RADIO EQUIPMENT
MFG. CO., Inc.
1663 Jerome Ave., New York City

ALWAYS MENTION Q.S.T WHEN WRITING TO ADVERTISERS
This combination completes any RADIO RECEIVING SET

MAGNAVOX Radio

The Power Amplifier and Reproducer Supreme

R-2 Magnavox Radio with 18-inch horn: this instrument is intended for those who wish the utmost in amplifying power; for large audiences, dance halls, etc.

R-3 Magnavox Radio with 14-inch horn: the ideal instrument for use in homes, offices, amateur stations, etc.

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Radio. 2 and 3 stage.

When you purchase a Magnavox product you possess an instrument of the highest quality and service.

Magnavox products can be had of good dealers everywhere. Write us for copy of new illustrated booklet.

THE Magnavox, in amplifying with extreme sensitiveness every signal supplied to it from the receiver, must necessarily amplify any extraneous sounds which may originate in the receiver or power amplifier itself.

Therefore, the combination of Magnavox Reproducer with Magnavox Power Amplifier (as illustrated) is very desirable. By this equipment, in connection with a good receiver, you get the music or speech with true clearness—and in practically any volume required.

To own a good receiving set without Magnavox equipment, is like having your house properly wired and then using only small, feeble candle-power lamps in the sockets!

The Magnavox Co., Oakland, California
New York: 370 Seventh Avenue

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS
N a a i d

A L U X E

u s r i c A P !

B . E L - c A N

L o u d  S p e a k e r

A m p l i f i e s  W i t h o u t  D i s t o r t i o n

Built along scientifically correct principles, following minutely the natural functions of the human throat. The unexcelled acoustical amplifier!

The receiver is the vocal cord (A); the long tapering inner horn is the throat (B); and the sounding board at the top is the roof of the mouth (C).

With this superlative amplifier you can readily distinguish the delicate tonal differences between the harp and the piano, even when the two are playing together. A test never before equalled.

BEL-CANTO CORPORATION

417 East 34th Street

New York City

It's the contact that counts

The special phosphor bronze clips of the Na-aid W. D. 11 Socket maintain perfect contact regardless of any variation in tube prongs and bases.

Moulded from genuine Condisite, these sockets are made for use with the famous W. D. 11 tubes, operated by a single cell battery.

The Na-aid De Luxe V. T. Socket is of highest quality throughout. Its laminated phosphor bronze strips press firmly with a side wipe action on the contact pins, keeping surface clean and insuring perfect contact.

These sockets retail

at 75c each

Send stamp for dial, small space socket, condenser and R. F. Transformer circulars.

ALDEN MFG. CO.

formerly

ALDEN-NAPIER CO.

Dept. M

52 Willow Street

Springfield, Mass.

NA-ALD

AUDIO FREQUENCY AMPLIFIER

MOUNTED TYPE M

Silicon Steel Cores; Shell Design—Bakelite Terminal Board; Ratio—9 to 1; Insulation tests 1500 Volts.

Mounted Type M—$5.00

Semi Mounted Type SM—$4.50

Unmounted Type UM—$4.00

Discount 10% for cash with order

Designed by

Packard,

Engineers—

A quality Name in Radio

THE STANDARD TRANSFORMER CO.

Warren, Ohio

Patent Applied for

Special phone, cord and plug, price $30.00 F.O.B. New York. If dealer can't supply, we can.

Full line of radio parts.
Audiola adopts the Bradleystat

Another Radio Manufacturer discards the wire rheostat!
Why? Read this letter—

January 2, 1923.

Allen-Bradley Co., Milwaukee, Wis.

Gentlemen:

Regarding the Bradleystat in the Audiola Receiving Set, we wish to advise that while your rheostat is more expensive than the wire-wound type, we would not go back to the wire rheostat and have standardized on the Bradleystat.

The Bradleystat is noiseless, permits more accurate tuning and increases the loudness of signals and the range of our set. Since incorporating the Bradleystat, we have received many letters from dealers and users stating that they are receiving stations 700 to 1,100 miles distant with our single tube detector set.

Yours very truly,

AUDIOLA RADIO COMPANY.
"ESCO"
BATTERY CHARGERS

To meet an insistent demand for
RUGGED—RELIABLE
NEVER-FAILING
MOTOR-GENERATORS

For charging Batteries

Used in Wireless Operation

We have developed a complete line of
MANY SIZES.

With or Without panel Boards.

"ESCO" QUALITY thruout. You KNOW
what THAT means.

Ask for Bulletin 242.

ELECTRIC
SPECIALTY
COMPANY

225 SOUTH STREET
STAMFORD,
CONN., U.S.A.

Pioneers in developing
Quality Wireless Apparatus

Kellogg Radio Equipment
for Better Results

RHEOSTAT

The Kellogg rheostat
is simple in design,
having but one mov-
able part. The resist-
ance wire is carried
on a rotor of high
grade insulating ma-
terial and the contact
arms are so placed
that a slight move-
ment brings in the
one-half turn of the wire, giving a
vernier effect.

The knob is the same type as the
one on the Kellogg dial.

No. 501 Rheostat. .............$1.50

Use, Is the Test

Kellogg Switchboard &
Supply Company
Chicago

New V. T. Socket
Illinois Cushion-Resilient

(Pts. Pend.)

This final improvement in Vacuum Tube
Sockets is to protect your vacuum tube from
vibrations and shocks, which cause distortions
and many of the noises in phones, especially
when amplified.

Furthermore, a sudden jar or shock has
caused the parting of many an incandescent
filament—Save yours from this danger.

Bakelite base mounted on live rubber moulded
ring sub-base, not in contact with electrical con-
ductors. Long smooth-acting sure-contact springs.
Metal parts N.P. Price $1.00. Bracket for
direct panel mounting 25c. Adapters to fit the
WD-11—1½ volt Peanut tube 50c. These sen-
sitive little tubes particularly need cushion
mounting. Ask Dealers or write direct to manu-
facters for circular 3.

ILLINOIS RADIO CO.
Springfield, Illinois

98

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Do You Want a REAL Headset?

The Dictograph is the Best Headset in the World at ANY Price

This is the same supreme Dictograph Headset that has always sold for $12—same in quality, same in guarantee, same in everything but the price—$8 complete. Made by the makers of the world standard Dictograph products—the marvelous "Acousticon" for the Deaf, the famous Detective Dictograph, the Dictograph System of Interior Telephones and the Dictograph Radio Loud Speaker for the Home.

Read a few of the many letters we have received from Dictograph Headset users. You, too, can enjoy the utmost in Headsets if you own one.

"The undersigned has for the past sixteen years been an amateur, commercial, and government operator, and has used every known make of radio receiver on the market. On April 21st one of your Type R-1 3000 ohm receivers was purchased, and it can be safely said without dispute that they are absolutely the best radio receivers on the market today; bar none."

G. H. West, U. S. P. H. S.

"I wish to compliment you on the 3000 ohm Headset you now have on the market retailing at $12.00, (now $8.00). I have been experimenting with the radio game for the past year. In my experience I have tried out 14 different headsets, including the ----- which I purchased for $18.00. I at last have found the ideal phone where tone quality excels, and harshness is eliminated, and I cannot express myself in words as to the wonderful results I have obtained."

J. T. Bachman.

"We are using a Dictograph Headset, also Dictograph Loud Speaker. Both are O.K. In fact I would not trade my headset for any other I have ever listened through."

Dan C. Outis, Radio Operator.

Havana, Cuba.

"In my long distance receiving set I have four pairs of Phones, a 3000 ohm French make, two Pairs of ----- and a pair of your Dictograph 3000 ohm and I assure you that none of the others afford me the service I get from the Dictograph. The Dictograph gives me a truer clearer tone than all the others combined. I use them in extremely long distance work (phone). I hear Chicago, Schenectady, Iowa and Frisco most every night with one detector and two steps of amplification using the standard regenerative honey comb sol."

David R. Masataka.

The Standard of the World

Type R-1, 3000 ohms. For all types of crystal and vacuum tube receiving sets.

Go to your dealer's today and listen in with this supreme instrument. Note the difference. Buy two or three Dictograph Headsets and let the rest of the family enjoy your set.

Always insist on Dictograph Products. They are fully guaranteed.

If your dealer cannot supply you, send direct to us.

DEALERS:—The Dictograph is the choice of all experts and radio fans. Order through your jobber or write direct for names of authorized distributors.

DICTOGRAPH PRODUCTS CORPORATION

Suite 1304, 220 W. 42nd Street, New York City

Branches in all principal cities

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
"96% Perfect"
Highest Rating Awarded any Condenser by
"Radio News" Laboratory

"HAMMARLUND"
Vernier Variable
CONDENSER
Assures improved Vernier control for super-accurate tuning: enables you to eliminate annoying "cut-ins" from undesired stations. A permanent instrument of precision and accuracy, mechanically perfect and ruggedly constructed.

Pat. Appld For
Special Alloy For Panel Nickel Plated
Aluminum Plates Mounting Brass Plates
$7.00 .001 mfd. 43 plates $5.50
6.00 .0005 mfd. 23 plates 7.00
5.50 .00025 mfd. 13 plates 6.50
3 1/2" Bakelite Dial 1.00
Legs for Table Mounting .50

At your dealer’s—otherwise sent post-paid, insured, upon receipt of purchase price.

Hammarlund Mfg. Co., Inc.
144-146 West 18th St., New York City

RHAMSTINE*
Amplifying Transformer for
WD-11 Tubes

MODEL B
PRICE $4.00

You are assured of the best results if you use the Rhamstine* Model B Amplifying Transformers with the new dry cell tube, WD-11.
Each transformer is guaranteed to give satisfaction. Order yours today.
Dealers write for discounts
Manufactured by

J. THOS. RHAMSTINE*
2152 East Larned St., Detroit, Mich.
*Maker of Radio Products
You can now obtain
CONDENSITE CELORON
RADIO PANELS
cut in standard sizes

YOU can now get radio panels
already cut to a size to fit your
needs. For your convenience we are
making Condensite Celoron Radio
Panels in seven standard sizes. No
longer will you have to wait and pay
extra cost for having your panel cut
to order.

These sizes have been so designed
as to meet practically every need of
the set-builder. Each panel comes
trimmed and wrapped separately in
glassine paper to protect the surface.
They are all ready for immediate
use. On every one are full instruc-
tions for working and finishing.

What Condensite Celoron Is

Condensite Celoron is a laminated
phenolic condensation product used
by many of the leading manufac-
turers of radio equipment. It has
high insulation resistance, high die-
lectric strength, low dielectric losses
and is easily worked. Because Celor-
on has these qualities it has
received the approval of the U. S.
Navy Department Bureau of Engi-
neering and the U. S. Signal Corps.

You can obtain any of these seven
standard sizes:

1. — 6 x 7 x $\frac{1}{4}$
2. — 7 x 9 x $\frac{1}{2}$
3. — 7 x 12 x $\frac{3}{4}$
4. — 7 x 18 x 3\frac{1}{16}
5. — 9 x 14 x 3\frac{1}{16}
6. — 7 x 21 x 3\frac{1}{16}
7. — 12 x 14 x 3\frac{1}{16}

Select the size you need for your set. If
your radio dealer has not yet stocked them,
ask him to order for you. Or write direct to
us, designating by number the size you want.
We can make prompt shipment.

To radio dealers: Write for special dealer price list showing standard assortments

Diamond State Fibre Company
BRIDGEPORT (near Philadelphia) PENNSYLVANIA
BRANCH FACTORIES AND WAREHOUSES
BOSTON CHICAGO SAN FRANCISCO
Offices in Principal Cities
In Canada: Diamond State Fibre Company of Canada, Limited, 245 Carlaw Avenue, Toronto
Look At This Little Transformer!  
—A GIANT FOR WORK—

Strengthens Weak Signals!  
An Audio or Radio Frequency Amplifying Transformer—regular Tom Thumbs in size but Giants for work. That's the Sterling. For pure amplification, reducing distortion and increasing your range, make sure you ask your dealer for the STERLING. Size 1¼” by 2” by 2¾”.

BIG PROFITS IN  
R. T. S. EQUIPMENT
R. T. S. Equipment converts the one-time buyer into a profitable, permanent customer. By handling R. T. S. Standard and Special Equipment you can fill every demand promptly, with satisfaction to your customer and profit to yourself.

The R. T. S. Condenser, shown here, is proving unusually popular. They make the tubes perform properly, cut out “bowling,” and clear up phone speech. Furnished complete with mounting ready for connection.

THE STERLING MANUFACTURING CO.  
2845 Prospect Ave., Cleveland, O.

TRADE MARK
PATE NT APPLIED FOR

The Missing Link in RADIO

WAVE TRAP

STOPS INTERFERENCE!

Get that elusive DX station thru heavy QRM. With the “WAVE TRAP” you can do it and greatly increase your range.

It is installed in a minute by changing only one connection and is indispensable on any receiving set, with any type of antenna. It is mounted on a Formica panel in a handsome mahogany finished cabinet 8x5x6, and is a high-grade instrument throughout.

Fer bend Electric Co.  
19 E. SOUTH WATER ST.  
CHICAGO

Charge Prepaid

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Your Battery

Should be Kept Fit

The Tungar Battery Charger makes it a simple matter to keep your storage battery tuned-up and fit. With it you can recharge your battery at home—and at little cost.

Tungar is a small, compact rectifier, which can be connected with any a-c. lighting circuit. It is easy and safe to operate—in fact, requires no attention after starting. And when properly connected, the current can go only the one way, eliminating any danger of ruining the battery.

There is no excuse for allowing your battery to run down and spoil the evening’s fun. A Tungar doesn’t cost much—and it charges the starting and lighting battery in your automobile also.

Send for our new booklet on Tungars for radio, if your dealer cannot supply you.

Address Merchandise Dept., General Electric Company, Bridgeport, Conn.

General Electric Company

Schenectady, N.Y.
TELOS VARIO-TRANSFORMERS

for
Tuned Radio Frequency Amplification

are

Grid circuit tuning variometers of the "Telos" interleaved double D coil type coupled to a fixed plate coil in such manner as to increase transformer coupling on the longer waves.

Telos Vario-Transformers tune and amplify between 160 and 480 meters with more amplification per stage than the best audio and with no distortion of tone.

Telos Vario-Transformers have closed magnetic circuits and can be symmetrically mounted next to each other with no local oscillations due to magnetic coupling. The automatic change in coupling minimizes local oscillations due to tube capacity. Grounding the metal spider frame eliminates hand capacity disturbances.

A tuned radio frequency amplifier using Telos Vario-Transformers will greatly increase the range and selectivity of any receiver.

SPECIFICATIONS: All types require space 5"x5" back of panel.

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Depth back</th>
<th>Wave length</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T4A Vario-transformer</td>
<td>31/2&quot;</td>
<td>160-480m.</td>
<td>$6.50</td>
</tr>
<tr>
<td>T46 Vario-transformer</td>
<td>4&quot;</td>
<td>200-750m.</td>
<td>7.50</td>
</tr>
<tr>
<td>A4 Variometer</td>
<td>31/2&quot;</td>
<td>130-480m.</td>
<td>5.50</td>
</tr>
<tr>
<td>A6 Variometer</td>
<td>31/2&quot;</td>
<td>160-730m.</td>
<td>8.80</td>
</tr>
</tbody>
</table>

SHIPPED DIRECT ON RECEIPT OF ORDER

Kindly give your dealers name.

DANZIGER-JONES, Inc.
(Sole Licensees)

143A PRINCE STREET

NEW YORK, N. Y.

SAVE 50%
BY PURCHASING

Automatic Condensers

They are constructed along standard lines with the following features:

(1) Perfect insulation and electrical contact.
(2) Adjustable tension on shaft of movable plates and stops at 0° and 180°.
(3) Plates accurately spaced.
(4) Smallest dial will cover panel screws.
(5) Guaranteed as good as others selling at double the money.

PRICES (panel mounting)

Include PP for 1# to your Zone, with

43 plate... $2.75 21 plate... 1.85
21 plate... 1.85 11 plate... 1.55
11 plate... 1.55 3 plate... 1.00 3 plate... 1.00

Dealers write me for proposition.

CLINTON H. TURNER
North Reading, Mass.

BUY IT IN CARTONS

"COPPERWELD"

LEAD-IN AND GROUND WIRE

 blender insulated copper lead

Conducting to Specifications of the National Board of
Fire Underwriters for Radio Receiving Stations

Underwriters rules and instructions

on reverse side of carton

HAS THE UNDERWRITERS' O. K.
The Building of Radio Sets Simplified

The enjoyment which every Radio Fan derives in constructing his own receiving set is due, in a large measure, to the feeling that a practical knowledge of Radio is in this way acquired. Naturally, a more thorough understanding of the subject is obtained. It does not, of necessity, follow that the assembly of a receiving set must involve tedious labor.

Heretofore, little consideration has been given, in the design of radio parts, to their adaptability for use by the individual who does not possess an elaborate set of tools. The necessity for the use of panels of insulating material; the lack of provision for mounting the different units, and the possibility of improper wiring have all contributed to making the assembly of a receiving set a laborious undertaking.

In Eisemann Radio Parts and Panels a combination of excellence of electrical characteristics and provision for ready assembly is found.

Aluminum panels, in four stock sizes, with uniform size openings permit interchangeable mounting of Eisemann Parts. All drilling of holes is eliminated, and the use of shielding made unnecessary. Proper spacing of units—a most important factor—is assured. Binding posts, properly located on each unit, give positive connections and obviate the necessity for cross-leads.

The concave dials and bar control, a distinguishing feature of Eisemann Parts, present a most attractive appearance when mounted on the Aluminum Panels, which have a crystal black enamel finish.

The building of a finished receiving set, without turning the home into a work-shop, is made possible.

*Send for Descriptive Literature*

EISEMANN MAGNETO CORPORATION
William N. Shaw, President
DETROIT
BROOKLYN, N. Y.

CHICAGO
Want to Get More Distant Stations and Bring in All Signals Twice as Clear and Strong?

Then Install

“All American” Audio and Radio Frequency Transformers

R10—Radio Frequency (150-550 meters)
R12—Audio Frequency (Ratio 3 to 1)
R13—Audio Frequency (Ratio 10 to 1)
R21—Audio Frequency (Ratio 5 to 1)

Send 2¢ stamp for Book of Radio Hookups. Over twenty-five different Audio and Radio circuits. Write today for this valuable book. Its yours for the asking.

RAULAND MFG. CO.
35 So. Dearborn St., Chicago, Ill.

PANEL SERVICE

We offer to the amateur and dealer

REAL PANEL SERVICE

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8” per square inch $0.02
3/16” per square inch .02½
1/4” per square inch .03

We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

PITTSBURGH RADIO
AND APPLIANCE CO., Inc.
“Pittsburgh’s Radio Shop” Desk B
112 Diamond St., Pittsburgh, Pa.
HERE'S A PAIR OF WINNERS

THE WIMCO CONDENSER
Made to meet a demand for quality — highest efficiency, 3 plate, 23 plate and 43 plate sizes.

Very low resistance and very low zero capacity. The phase angle does not depart from 90° sufficiently far to be detectable. Highly recommended for the fine tuning necessary in amateur apparatus.

THE CARCO COUPLER
Just the thing for the popular receiving set. Bakelite tube and rotor, silk covered wire, perfect contacts. Designed and developed by an amateur for the amateur.

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WIMCO SOCKET FOR WD-11 TUBES

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The "POSACO" condenser has made for itself an enviable reputation. It is a real instrument. The single knob controlled vernier is an absolute necessity for efficient tuning in radio frequency, super-regenerative and regenerative circuits. The regular variable is unexcelled for use in circuits which do not require a vernier adjustment.

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Manufactured by

THE C. D. POTTER CO.
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By J. O. Smith

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PAT. APPLIED FOR

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ROLLER-SMITH COMPANY

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ECONOMIC APPLIANCE CO.
IRWIN, PENNA.
From One Who KNOWS —

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Editor, Radio Broadcast.

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Sincerely,

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of the A.R.R.L. Board.

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Entertaining—Always a Lap Ahead!

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F-F RADIO RECTIFIER

They also charge auto batteries overnight right in your car.

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The New Grebe Radio Frequency Amplifier Type RORN represents one of Grebe's finest products.

One user states "the sweetest music I ever heard over the Radio was with the New Grebe Radio Frequency Amplifier together with the regular Grebe C-R8."

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F-F Radio Rectifier

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**UNIT TAPS**
on the
Original and only coupler using
**THE PERFECT MOUNTING**

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THE NEW IMPROVED
WIRELESS B BATTERY
REFILLABLE VARIABLE
NOISELESS IN OPERATION

The Switch Makes It 100 p.c. Perfect

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YOU never know—unless you have the proper instrument to indicate it. Using too much or too little voltage means poor reception and difficulty in duplicating results. Excessive voltage also means shortened life of tubes—and often premature burn-outs.

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Electrically Indicating Instrument Authorities since 1888

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This Standard Headset has unexcelled tonal qualities. Reproduces accurately faint long distance signals; fits comfortably and is quickly adjustable to any size head. The forked cord permits separation of the receivers for use by two observers simultaneously.

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for use in amateur stations
and for radio experimen-
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contrast with dial panel. Workmanship—manufactured accord-
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Matches the above in size and construction. The greater
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No aerial necessary. Insist on the
original.

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Prices, mounted as illustrated!

3½ to 1 ratio transformer $4.50
"with black label"

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"with red label"

Get a supply of Thordarson Transformers from your jobber now.

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500 W. Huron St., Chicago, Ill.
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of the
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Baltimore, Maryland
Hotel Emerson
April 13 and 14—1923

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are now made for this convention. The trip to "NSS" assured.
This is your chance to see this wonderful station; also, a delightful trip
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Excellent technical program by speakers well known to us all.
a five dollar ticket entitles you to all.—Boat trip to "NSS," technical
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Come on Third District
Show the world your strength. Let all know that the "Knights of the
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Listen in for nightly broadcasts

"EURACO" Products
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60 Cents per Unit
60 Cents per Unit

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Interesting proposition for dealers
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Univox 90° Coupler
For Single—Three Circuit or Armstrong Super Hookup
A high grade unit priced right & unconditionally guaranteed.
Formica tubes—Green silk wire, nickel plated brass fittings.

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Honestly made—Honestly priced
Bulletin R gives complete data. Splendid discount to the trade.
Successors to
Walter R. Horning, Inc.
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All orders with remittance promptly delivered, Post or Express paid

Up-to-Date Stock of Dependable Radio Equipment and Parts

IMMEDIATE DELIVERY ON ALL ITEMS LISTED

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<tr>
<th>Item Description</th>
<th>Price</th>
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<tr>
<td>De-F. E Crystal Receiving Set-24 Jr.</td>
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<td>Radiola Sr. Receiving Set.</td>
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<td>Radiola Sr. 3 stage Amplifier</td>
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<td>Type RC Receiving Set</td>
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<td>Radiola Grand-Type RG</td>
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<td>King Amplitone</td>
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<td>Hotchner-Cobot 2000 ohm Head Set</td>
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<td>Standard Horns-7&quot; Bell</td>
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<td>Standard Horns-6&quot; Bell</td>
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<td>R-K Horns</td>
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No. 2-A Headset, $7.50 Enclose Certified Check or P.O. Money Order with orders.

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<th>Voltage</th>
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<td>9 Volt, 60 Amp.</td>
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FOR SALE

CW-986 Sub Chaser Telephone Transmitting and Receiving Set including—Remote Control System, Power Amplifier, Loud Speaker, Tubes, Spare Microphone, etc. Can be tuned down to 200 meters.

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TYPE A4
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6 Volt 110 Amp. Guaranteed 2 Years .... 18.95

All orders must include Parcel Post charges.

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The Steinmetz Amplifying unit selling for $8.50 will enable you to hear any crystal set all over the room. No storage battery required.

STEINMETZ 3000 Ohm Phones ............. $6.50
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Equal to any $10.00 or $12.00 Phones made.

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Unequaled Quality of Volume and Purity of Tone

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No. 3

PRICES

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The best and most complete line of condensers in existence.

Write for our catalog No. 7.

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250 WATT set complete, slightly used. Will sell cheap. 4217 Sheridan Ave. So., Minneapolis, Minn.

VARIOMETERS—built and nationally advertised to sell for $5.00. While they last $3.00 each. Radio? You bet. Box 31i, Warrenton, Mo.


200-30,000 METER Receiver including Radiotron $35.00. Box 205h, Williamsport, Pa.

$34 CYCLE ICW apparatus, includes 270 W Telefunkcn generator-excitier, transformer, 1200 V secondary, and centerpiece for rheostat, inductances etc. and Spark transmitter for same generator. Charging generator thrown in if taken prior to March 15th. Price $10.00. 2AMH

NEW JEWELL Voltmeter, 0-500 D.C., $12.75. 2AJC

FOR SALE—2D1’s ½ K.W. 500 cycle spark set complete with motor generator, $5.00. Write for particulars to 2D1.

THORDARSON one kilowatt fifteen dollars, 2HQ.


EVER HR 8ANB—C.W. and tone. Pse, QSL-CRD 8 C WE.

FOR SALE: 1 K. W. Thor. transf. kickbacks and magnetic key $25.00; oil cond. .007 $5; 3 Leyden jar $2 each; Radiotron $3.00; jewel thermo 0-10 meters $10.00. All letters answered. 8IL 41 Beattie Ave., Lockport, N. Y.


FOR SALE: Complete fifty watt transmitter. 2CWE.

9APS 100 WATT C.W., complete. Record 5600 miles $75. 1623 Russell Ave., Covington, Ky.

SELL OR SWAP: Reinartz, det. and 2 step with automatic filament control an’ everything. Guaranteed a fine OX receiver, $35.0011 or swap for C.W. equipment, crystal receiver, 1½ L.F. and power dope. What have u? 9CHF, Princeton, Ill.

QRA of 9ICD now Box 5, St. Croix Falls, Wis.

BARGAINS: (Six) Kloeser vernier rheostats, Postpaid at $8.00 each. Quarter kilowatt spark transmitter—Thoridarson special, Benwood disc, RollerSmith meter, antenna switch, Key, Oscilatior Transformer, cabinet and rubber panel. $25 Letters answered, other bargains. E. G. Balier, 255 Ninth St., Brooklyn, N. Y.

FOR SALE: All wave Reinartz Tuner with One step $75.00. Gibson Guitar in good condition with extras $75.00. Set of Encyclopedia Britannica 15 Vol. $15. William Barnes, Station “B”, Superior, Wis. 27

A BLUEPRINT of your complete hookup is a mighty handy thing. Let us make you one, size twelve by eighteen inches suitable for framing, with your name, call sign, etc. Price dollar fifty and two dollars. Send rough sketch of hookup for estimate. D. Barnhart Co., Warren, Penna.

FOR SALE: Paragon RA-10 $52; Paragon 2 Step $46; Western Electric new Amplifier $110; Baldwin Fones $100; 10 amp. D.C. Farny Gap $20; National Portable Typewriter $30; New W.E. VT-1 $60.00; 1 KW Amrad Quench Gap $15. Lawton Biddle, 442 Bosart Ave., Indianapolis, Indiana.


FOR SALE: 10 “E” Tubes, $5 each. 250 Watt “P” Tube $75; 500 Watt DeForset Tube $75; 100 Watt C.W. Set with Tubes $150; 10 Watt C.W. and One 5e with Tube $50. A. B. Brown 3MK, 1526 Moran Ave., Norfolk, Va.

FOR SALE: ½ KW transmitter on marble panel, Leyden jars, O. T. etc. Also 12 v 10 amp. D.C. generator. R. M. Browning, 221 Maple St., Norwich, Conn.

IF INTERESTED in two or three step regenerative outfit at lowest prices, write. These two sets working great. W. B. Butcher, Waynesfield, O.

RUSSER STAMP with large call letters 50¢; Radio-gram and Relay Radiogram blanks 25¢ per hundred Post Cards 60¢ hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

BARGAINS: 1 New R-2 Magnetox $94.00; Moorhead detector tubes $4.50 ea.; A few A-P Moorhead amplifier tubes $3.00 ea.; 1500 meters to 500 meters $7.00 ea. with mounting; Murad T-11 radio frequency transformers $4.50 ea.; Westinghouse Master storage cond. $5.50 ea. Chesaning Electric Co., Chesaning, Mich.

SPECIAL PRICES on Radio supplies, new and used receivers $25 and up. Two step amplifier $17. Magnavox $38. All apparatus at reduced prices prompt shipment. Send for list. The Cherokee Store, Colby, Wis.

FOR SALE: 1 KW transmitter complete. Also few Reg. tuners. Roy Colebear, Lee Center, III.


FOR SALE: Two type R3 Magnetox $35 each. Also one new $125. General Electric Receiving Set $10.00. K. Cooper, Williamson, N. Y.

FOR SALE: 20 watt C.W. and Fone, new panel mounted in cabinet. Radiates 3.7 T.C. includes 7 tubes, key, microphone, M. G. filter unit, R.L. trans., Send for parts used and photo. A beauty and works either coast and offers splendid performance. Electric loud speaker outfit and Crosley X and $65.00 if trade. L. E. Crossman, Ogden, Iowa.

FOR SALE: One KW Acme transformer $25, Thor- darson oil condenser, with oil $18, Bell Gap $25, Amrad quarter wave quenched gap $25.00, 1500 meters to 500 meters $7.00 ea. with mounting. Murad T-11 radio frequency transformers $4.50 ea.; Westinghouse Master storage cond. $5.50 ea. Chesaning Electric Co., Chesaning, Mich.

SEND STAMP FOR LIST new radio parts 40 to 70 off list. Cunningham, 290 East 155th St., New York City.


FOR SALE: Receiving set regenerative two steps of amp. with A Batteries and B Batteries. $20.00, First tubes, George Dunham, 7230 Yates Ave., Chicago, Ill.

FOR SALE: Nine UV-201 tubes, one A-Amplifier tube, $3.50 each. None burned over 25 hours, all good amplifiers; 23 plate unmounted condenser, $1.25; quarter wave cold quenched gap transformer and intake coil $15, Radio Corporation C.W. transformer, new, $20. All excellent. J. E. Cullen, Altamont, N. Y.


FOR SALE: Receiving set regenerative two steps of amp. with A Batteries and B Batteries. $20.00, First tubes, George Dunham, 7230 Yates Ave., Chicago, Ill.


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STOP, LOOK, READ. C302 Cunningham 5 watt trans-\mitting tubes, $6.75; 3 inch bakelite dials, $0.34; \Monitor conduction plates, $0.34; Amplifier and detec-\tor tubes special, $4.25. Send for our price list and \details of contest in which we are giving away a 50 \watt Cunningham transmitting tube. N. & S. Radio \Company, 63 West Main Street, Salem, Ohio.

SELL: 1/2 KW Thorndarson, .007 Dubillier, rotary gap, O.T. key, ammeter, protective device, $5000. Harold \Koontz, Buffalo, Wyo.

GREBE RADIO FREQUENCY NEW never used cost \$40. Quick sale $40. Dr. Gibson, 927 Eye St., \Washington, D. C.

BURNT OUT TUBES repaired. Satisfaction guaran-\teed. The following makes only, Radiotron, Cunning-\ham, General Electric, and Marconi: Detectors $3.00. \Amplifiers $3.50, W. D. 11 $3.50. Tubes returned \Parcel Post C. O. D. E. E. Gillmore, 46 Thomas St., \Newark, N. J.

EDISON STORAGE “B” Battery Elements, 6e per \pair, will make one 22.5 volt Battery. Gilman’s \Battery Shop. Chelsea Square, Chelsea, Mass.

6XZ and see FOR SALE AT REAL BARGAIN \PRICES! KW Transformer, 01 Dubillier, 26,000 \volts; Benwood rotary; Thorndarson O.T.: 2KW \United Wireless “Coffin”; Homemade 01 plate glass \of electrode, good condition. For $10 J. D. Jewell \0-10 T.C. Ammeter, H. J. Goddard, Ellendale, \North Dakota.

GENUINE GERMAN TELEFUNKEN H.W. AM-\METERS with scale reading 0-4 amps. Fitted with \shunt for half scale reading and adjustment for tem-\perature variation of scale. Ammeter accurate and sensitive. Brand new with original seals unbroken. Diameter \2 and 7/8 inches. While they last, $3.50 each. \Robert E. Goll, 1924 East 22nd Street, Brooklyn, N. Y.


FOR SALE: Like new 1/2 KW spark set. Bargain. \All letters answered. P. B. Greig, 1100 Womelah Ave., \Oak Park, Ill.

EDISON ELEMENTS for storage B batteries, six to \ten cents per pair postpaid, depending entirely upon \quantity ordered. A. J. Hanks, 608 Montgomery St., \Jersey City, N. J.

FOR SALE: Detector and two-stage regenerative Set \7F. December 14th, 1925. Two tube amplifiers \$2.75, One Cabinet 21x8x8 $2. Full wave recti-\fier, with tubes $20, C.W. Receiving set as described \in general price list. Nov. 29th, 1925, No. 1209. \tube $15, McTighe “B” battery $4. For further information, \write L. G. Hess, 311 Allen St., San Angelo, Texas.

BARGAINS: 1/2 KW Thorrdarson $6.00, Five Murdock \Condensors $8.00, Eldredge 0-5 H.W. Ammeter $3.50, \Benwood Super 12 Stud Gap $15.00, Robbins Myers \1/10 Horse D.C. Motor $12.00. Makes a good gener-\ator. Ellwood Hoepfner, Palmyra, N. J.

WANTED: Weston Voltmeter type 301 mounting for \plate voltage reading from 0-100 volts surface mount-\ing only. Also DeForest honeycomb cores. Leroy \Hoppe, Kenton, Ohio.

FOR SALE: Long and short wave set with detector \and 2 amplifier in same cabinet $100.00. Rate \ arts with detector and 1 step amplifier $30.00, 500 \Volt, 100 watt Peerslee generator $39.00 (or trade \for good Marconi) $40 volt, 1200 watt Western \Electric generator with riboset $50.00. Satisfied or \money refunded. J. P. Hyde, Markham, Va.

9VM has been reassigned to Albert Millington, Canton, \Illinois.


COMPLETE TELEFUNKEN 500 cycle sparks—1500 \volt 500 watt self excited Crocker Wheeler generators \$80. Western Electric Subchaser fone set complete, \New, Henry Kienzie, 501 East 84th St., New York.

2C5Q-QRA John P. Kingman, 422 West 24th St., New \York, N. Y. All cards answered.

WANTED 6 or 8 inch spark coil. Good condition. \Reasonable price. Andrew Fisher, Warren, R. I.

DEFORSET HONEYCOMB COILS for sale complete \set of 16 absolutely new. Bargain. Write, offer \Louis Krieg, 28 Kent Street, Gloverville, N. Y.


SELL—Thorndarson 1/2 KW transformers; six sections \Clapp-Eastham condensers. Westinghouse and Hitco \cabinet and wiring. Radio Corporation of America \rectifier outfit for four 5 watt power tubes. Charles Laper, 116 \Williams St., Greenville, Mich.

SELL: Two new Phillips (Holland) 250 watt trans-\mitting tubes, filament nine volts five amperes, plate \2500 to 6000 volts. Price 45 dollars each, half cash \with order. Levey, 223 Division St., New York.


FOR SALE: One 2201 Universal Colin B. Kennedy \Receiving Set, 180 to 25,000 meter, absolutely new \and unused, cost $250. Will take $175. A. J. Mann-\ing, 18 Ohio Ave., Salem, Ohio.

MOTOR GENERATOR WANTED: High voltage, D.C. \five description and price in replying. The following \for sale or exchange: “B” range—step R.F. detector \condenser sacrifice thirteen dollars. Simon open core \coffin, one half K.W. Navy transformer ten dollars, \Telefunken quenched gap ten dollars. New Mexico 111/2 \inch spark coil. Bargain, eight fifty. Menier, 536 \East 88th St., New York City.

FOR SALE: Brand new 20 watt C.W. and Phone set, \all Benwood parts, copied after Benwood set. All \letters answered. A. F. Stanfield & Co., 267 North \Northcott, 1204 Blyrne St., Bay City, Mich.

SACRIFICE FOR CASH: 3 step R.F. Detector and 2 \step A.F. in beautiful cabinet. Uses “Miller” all wave \transformers. Good for 180 to 200,000 meters. Connect \viewing waves at 6 tubes. 2 step step condenser and \2 step modulator $35. Rebuilt receiver and 2 step, \head Harvard and California $35. Small varimenti set (Estru) $15. \Sent C.O.D. H. Oge, Box 35, Boonville, Ind.

SELL OR TRADE: 250 W. tube $70; Navy E tubes \$7; Navy Moonbeats $60; 1600 v. 300 w. Exc. genera-\tor $70; R.F. $50; $150; Navy tuner with detector, \listed $955, $150; Parts 100 w. transmitter—everything in 600 cycle appar-\atus wanted. Give us your best offer. Edw. Page, \Cazenovia, N. Y. $AO $9XH.

FOR SALE: 8CP’s C.W. transmitter, also 1 K.W. \spark. Orlo Palmer, 233 E. 11 St., Holland, Mich.


COMPLETE HALF KILOWATT TRANSMITTER in-\cluding Dubillier, $125. Roland Place, 350 Sprague \Street, Fall River, Mass.

BROWN PHONES Adjustable Diaphragm 4000 ohm \Headsets. Now, as for the past eight years, stand-\ard Radio receiver of the British Army and Navy and \cabinet and bell, and the best made. Excellent and \efficient receiver in existence. Unexcelled as a loud \speaking unit due to the adjustable feature. Cannot \rattle under extreme pressure and vibration. Completely \unmatched. Excellent for DX reception. Original \price in U. S. A., $20.00. Our price, Singles, $5.50; \Headset, $10.00. The Radio Import Sales Co., Temp-\orary Address, Box F, p. o. box 971, Hartford, Conn.

BIG THIRTY DAY CLEANUP SALE—$45 R3-Magnavox, \$250 3-Step Power. $86 R-2 Magnavox, $49.50; \Magnavox two-stage power amplifier, $49.95; $110 \Magnavox 3 stage power amplifier, $64.95; latest \type with remote control horn or receiving set. Order \once from this ad. Terms cash with order. Other \bargains in proportion; write. Radio Exchange, Sioux \City, Iowa.

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IT'S NOT VOLUME you want but DX and clarity. 4GL Radio Frequency Transformers do the trick. Made right; priced right. Savannah Radio Shop, 1223 East Dufzy Street, Savannah, Georgia.

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FOR SALE: One 3 step Magnavox power amplifier and one step slightly larger. Six Dayton 5-250 and six Dayton 6-250 and six Dayton 5-120. 6 Myers tube sockets @ $4.50 each; 6 Myers A.F. chokes @ $3.00 each; 6 Myers B.F. E. 1500-H; and following coils: one 1500, two 500 one 400, one 150, one 100, three 35, one 50, used slightly, all for fifteen dollars. One Grebe CR-3, $55. One Grebe tube unit $6.00. First M.O. received takes all or any part. Jos. R. Tate, Dorisville, Illinois.

FOR SALE: My 20 watt radio phone and C.W. $159.00. Grebe CR-3 $45.00. Exceptional loud 2 stage receiver $70.00. J. C. Thomas, David City, Nebraska.

LOOK: Remler panel, $6.00; new variocoupler $4.00. Eugene Traber, 9DUE, 2117 South 41 St., Omaha, Nebraska.

MAGNAVOX—A few R-3 Magnavox at sacrifice. Regular $45.00 R-3 at $30.00 while they last. All in perfect condition. RECTIGN Battery Chargers complete with tubes, $13.00. WESTERN Electric 1002-C Heads, 2200 Ohms. Regular $15.00 list at Send to John Reisinger, For Yester year's balance C.O.D. Tucker & Laxton, Inc., Charlotte, N. C.

FOR SALE: One 1500 volt 27 Amphere 3500 RPM motor-generator, Motor 60 cycle single phase 110 volt. Made by Electric Specialty Company. Am insulated large motor. Also one two stage tuner 1500 to 8500 meters and S. Cohen detector and two step amplifier. Floyd L. Vanderpoel, Litchfield, Conn. Radio 1 BEP.


MUST SELL—Grebe CR9 complete with tubes, Magnavox, $20.00; one new R-3 Magnavox $37.50; One universal transformer $15.00; one 1000 QC 2 stage, $18.00; one R.F. transformer, $15.00; one 10000 watt power transformer, $15.00; Elec. 7 way page order. For C.O.D. $100.00. Victor Vogel, Glenrock, Wyoming.

EXCHANGE $150 DX Spark Transmitter for typewriter, small lathe or cash. Other equipment all like new. All answered. H. M. Walleze, Danville, Pa.

SELL One Packard 1 KW 16,500 volt transformer $18.00; One new R-3 Magnavox $37.50; One universal transformer $15.00; one receiver complete. One honey comb high wave with change over switch, volt meters, two condensers, and in beautiful cabinet. Write for further description. sell cheap. Arthur Walser, Cheyenne, Mich.

BARGAIN—50 watt complete CW transmitter used by KXZ. DX 5000 miles. Also 500 watt 150 volt Acme plate transformer and 500 volt D.C. motor-generator set. Harry S. Weber, 1113 Walnut St., Dover, Ohio.

PHONES, TRANSFORMERS roundwound. L. Werts, 409 Saint Julian St., Pekin, Ill.

GENERATOR 500-850 volt 200 watt Robbins-Myers $45.00; 1000 volt and Generator Transformer, with Motor-Generator tubes etc. $175.00. BAR- GAIN, DX 3,500 miles. Must sell quickly. C. L. White, Stockdale, Ohio.


Edison "B" BATTERY UNITS one positive and one negative plate for 10%. 18 sets will make a 24 volt battery. Wilkinsburg Wireless Shop, 711 Penn Avenue, Wilkinsburg, Pa.

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FIRST DRAFT FOR $98.50 takes this regenerative and 2 step. Cotoeo Ant condenser, equipped with verniers. Cuts cost in half. A ready working condenser tube included, ITS A BARGAIN. Brewerst Woodburn, Hampton, Iowa.

TERMAPANELS—Drawer shell back-connection terminal panels of correct design and attractive finish. A unique idea of particular merit, providing the ULTIMATE in terminal efficiency and flexibility for all types of modern receiving apparatus. Radion panel with polished nickeled binding posts equipped with SPECIAL tinned lugs for 24 bus wire. Furnished complete with nickeled terminals and printed connection template—a sure method of FOOL-PROOFING ur connections. Type R Receiving Cabinet $11.00; A Amplifier $1.05; T Tuner $1.00; Radio Detector-Amplifier $1.35; AG Aerial-Ground $0.60. Postpaid. A. L. Woody (TERMAPANELS) Homewood, Illinois.

TBKQ's Westinghouse R.C. receiver, $100. Has Western Electric grid condenser and leak, one of three models; little used, works F.B. Worcester County Radio Assn., 766 Main St., Worcester, Mass.

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For W-D-11—DRY CELL TUBE

Holds tube firmly.

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Silver City, New Mexico
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*FOR YOUR CONVENIENCE*

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ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
WHAT IS THE REASON?

In January QST we announced five new instruments, some of which are mentioned below. Just one month later finds us rushing to keep abreast of orders. What is the reason? Business here is good. There must be a reason.

**Type 300 Amplifier Unit**

This is one of the instruments that keeps our factory hustling. A compact unit, built around our Quality Amplifying Transformer, wired ready for external connections. Can be used for table or panel mounting.

- **TYPE 300-A AMPLIFIER UNIT** for WD-11 Tube ......................... $7.50
- **TYPE 300-B AMPLIFIER UNIT** for Standard Tube .................... 8.00

In this unit is a

**Type 231-A Amplifying Transformer**

This is THE transformer for the WD-11 tube. We are selling thousands of these each month, many of which are used to satisfactorily replace distorting transformers of other makes. Read "Vacuum Tube Amplification" on page 15, Jan. QST, then buy an audio transformer whose design incorporates the good engineering principles mentioned in this article.

- **TYPE 231-A AMPLIFYING TRANSFORMER** .............................. $5.00

**Type 255 Rheostat**

A real moulded bakelite base rheostat used for either table of panel mounting. Regular size, 6 ohms, 1.25 amps. Can be supplied in size suitable for one power tube, 3.5 ohms, 2.5 amps.

- **TYPE 255 RHEOSTAT (Either resistance)** .............................. $1.00

**Type 282 WD-11 Tube Socket**

A socket with positive side-contact springs and moulded bakelite base. Terminals plainly marked. This is not an adaptor.

- **TYPE 282 WD-11 SOCKET** .............................................. $0.80

**Single-Circuit Users—LOOK!**

A .0005MF variable antenna condenser will give you better results than a .001 MF. (or 43 plate) condenser.

Our **TYPE 247-G or H**, low-loss Condenser is especially suited for this use. It is fitted with reduction gearing and a small knob for fine capacity adjustment. This is much more satisfactory than the usual complicated types of vernier and since the slow-motion shaft is insulated from the plates, the tuning is not disturbed by the presence of the operator’s hand.

- **TYPE 247-G 500 MMF. Mounted with g-ar** $7.25
- **TYPE 247-H 500 MMF. Unmounted with gear** 5.00

Send for NEW RADIO BULLETIN 912-Q, telling about these and other instruments. It’s FREE. Ask your dealer for our Educational Folders—"QUALITY AMPLIFICATION" and "QUALITY CONDENSERS."

**GENERAL RADIO COMPANY**

MASSACHUSETTS AVENUE AND WINDSOR STREET

CAMBRIDGE 39 MASSACHUSETTS

Do not confuse the products of the GENERAL RADIO CO. with those of other concerns using the words “General Radio.” The General Radio Co. has been manufacturing radio and scientific instruments for many years. It has no affiliation with any other company.

*Standardize on General Radio Equipment Throughout*
The Secret of its Efficiency

It is a well-known fact that losses in Radio condensers take place in the solid insulating material used in their construction. And it is equally true that a condenser increases in efficiency of signal reproduction as its losses decrease.

The Connecticut Variable Condenser not only employs the two best insulating materials known—mica and hard rubber—but the smallest possible amount of each. This, then, is the reason for its extremely low resistance—0.2 ohm—as well also the secret of its high efficiency at short wave lengths.


Descriptive bulletin 100-G upon request.

Finer adjustments
Better selectivity
Greater signal strength

Simple and dependable
Just what the symbol implies
In every comparative test by recognized testing laboratories, prominent engineers and expert amateurs, the AMRAD BASKETBALL VARIOMETER has been awarded first place—with out exception, without reservation.

Such unanimous recognition did not come about all at once. It has been a slow, continuous building-up of acknowledged superiority resulting from outside tests and the experience of users for the past 18 months—since the first AMRAD BASKETBALL was actually developed and put on the market.

Why This Universal Recognition?

As every amateur knows, the ideal variometer should be

1. Free from distributive capacity, i.e. condenser effect between the turns; and
2. Have the lowest possible dielectric loss.

In the AMRAD BASKETBALL, condenser effect, inherent in the conventional flat-layer type of winding, is practically eliminated. The turns do not closely parallel each other due to the patented "wavy-weave" form of winding and the special method of inter-connecting the four inductance sections.

Wood, moulded composition, or other dense materials permit loss of high frequency energy. But in the AMRAD BASKETBALL foreign matter is reduced to a minimum. Light, spherical forms punched from Egyptian Fibre are utilized to confine the high frequency energy to the conductors—where it belongs.

In addition to these electrical points of superiority, the AMRAD BASKETBALL enjoys important mechanical features which alone would account for its popularity in receiving set construction.

Moreover the price is exceptionally low—only $3.75 for Variometer less Knob and Dial. This is the result of recent development by us of special automatic machinery for its production.

Shaft is 1/4" dia. in turn Knob with that size hole. Fasten small piece of viewing over end for knob with larger hole.

Order AMRAD BASKETBALLS from your Dealer. Insist on the best. Described in Bulletins C sent free on request. Complete AMRAD Catalog listing over 100 items, 10 cents.