QST

devoted entirely to

amateur radio

December 1934
25 cents
The 1935 model of the Collins 30FX Transmitter employs control-grid modulation ... a development which has been in the Collins Laboratories for several months. Unlike earlier systems of grid modulation, the modulation characteristic is linear, adjustments are simple, and the modulated stage operates at relatively high efficiency. The 30FX is an ideal low cost amateur transmitter.

Power ratings applied to Collins transmitters are conservative, being the measured power dissipated in an external load under average conditions. The radiophone ratings are the carrier power which is one-fourth the peak power at 100% modulation.

Technical Data

CARRIER POWER OUTPUT —
100 Watts CW — 40 Watts Phone ★

FREQUENCY RANGE —
1500 to 15000 kc.

FREQUENCY CONTROL —
Direct crystal control

FINAL AMPLIFIER TUBE —
211 Triode

NEUTRALIZATION —
Fixed at factory

BIAS SUPPLY —
Self-contained with panel control. No batteries.

DIMENSIONS —
27½" high — 19" wide — 10¾" deep

Write for information on this moderately priced transmitter and regarding a wide range of other transmitting and speech equipment.
$500 REWARD!

SYLVANIA

STARTS
DEC. 4, 1934

CONTEST!
ENDS
FEB. 4, 1935

PRIZES

1st 1-204A tube
2nd 2-860 tubes
3rd 2-852 tubes
4th 2-203A tubes each
5th 2-830B tubes each
6th 2-830 tubes each
7th 2-830 tubes each
8th 2-830 tubes each
9th 2-830 tubes each
10th 2-830 tubes each
11th 2-830 tubes each
12th 2-830 tubes each
13th 2-830 tubes each
14th 2-830 tubes each
15th 2-830 tubes each
16th 2-830 tubes each
17th 2-830 tubes each
18th 2-830 tubes each
19th 2-830 tubes each
20th 2-830 tubes each
21st 2-830 tubes each
22nd 2-830 tubes each

OBJECT—To gather the greatest possible number of QSL cards from other amateurs who are users of SYLVANIA GRAPHITE ANODE transmitting tubes.

THOSE ELIGIBLE—All licensed amateurs in the United States except Hygrade Sylvania employees. It is not necessary that you have SYLVANIA transmitting tubes in your own transmitter in order to participate for prizes.

REQUIREMENTS—The following information must be written on all QSL cards received from SYLVANIA tube users by the Gatherer in order to have them count in the contest:

1. Types of Sylvania tubes used.
2. In what stages used.
3. From whom purchased.
4. When purchased.
5. Time and date of QSO.

TIME LIMITS—Contest starts December 4th at midnight and ends February 4th at midnight. All QSLs must bear postmarks within these limits. Gatherers must send in their bundles of cards so that they will be received at our Clifton Plant on or before February 15th. Packages should be securely wrapped and carefully addressed to Hygrade Sylvania Corporation, Amateur Radio Division, Clifton, N. J.

REGISTRATION—To enter this contest all you have to do is to mail one of your own QSL cards direct to our Amateur Radio Division in Clifton, merely stating thereon “I desire to enter the QSL contest.” For further details see or write to your nearest Specializing SYLVANIA Distributor.

In case of a tie for any prize—the persons tying will each receive a prize.

HYGRADE SYLVANIA CORPORATION
ELECTRONICS DEPARTMENT
AMATEUR RADIO DIVISION

CLIFTON
NEW JERSEY

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Say You Saw It in QST — It Identifies You and Helps QST
In the above photograph Jackson Burgess is calling your attention to the marked difference in size between the new Burgess Little Six and the standard No. 6. Both have the same electrical capacity.

ANOTHER BURGESS INNOVATION
The Burgess Little Six (No. 4FH)

This new development is one which fulfills many of the needs of the radio amateur who wants portable power for filament service. Its electrical capacity is the full equivalent of the standard Number 6 cell, but its bulk is 30% less, its weight almost 40% less. Its characteristics are tabulated here:

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Burgess Little Six (No. 4FH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated Capacity</td>
<td>40 watt hours*</td>
</tr>
<tr>
<td>Rated Voltage</td>
<td>1.5 volts</td>
</tr>
<tr>
<td>Size</td>
<td>Over-all height 4.3 inches, width</td>
</tr>
<tr>
<td></td>
<td>2.5 inches, depth 2.5 inches</td>
</tr>
<tr>
<td>Weight</td>
<td>1 pound, 6 ounces</td>
</tr>
</tbody>
</table>

Like the Number 6 cell, the Burgess Little Six can be made in two styles, one for light duty (telephone type) service and one for heavy duty (filament, ignition, etc., type) service. Let us know the nature of your application — we will supply you with the proper battery.

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AMATEUR RADIO

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DECEMBER 1934

VOLUME XVIII
NUMBER 12

Kenneth B. Warner (Secretary, A.R.R.L.), Editor-in-Chief and Business Manager; Ross A. Hull, Associate Editor; James J. Lamb, Technical Editor; George Grammer, Assistant Technical Editor; Clark C. Rodmon, Managing Editor; David H. Houghton, Circulation Manager; F. Cheyney Beckley, Advertising Manager; Ursula M. Chamberlain, Assistant Advertising Manager.

Editorial and Advertising Offices
38 La Salle Road, West Hartford, Conn.

Subscription rate in United States and Possessions and Canada, $2.50 per year, postpaid; all other countries, $3.00 per year, postpaid. Single copies, 35 cents. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U. S. and for an equivalent amount in U. S. funds.


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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is non-commercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the world and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in amateur radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisite. Correspondence should be addressed to the Secretary.

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Address all general correspondence to the executive headquarters at West Hartford, Connecticut
FELLOW in here the other day asked us what was the matter with QST lately. Seemed to him we didn’t publish anything these days except about ultra-high frequencies, which were of no interest because they were no good except for local communication. He wasn’t even impressed with regular communication over a hundred miles and wanted to know of what interest is a mere hundred-mile QSO. (Seems this chap hadn’t heard the latest rumor, that all this ultra-high frequency stuff is a little private idea of ours to prepare the way to swap off the amateur’s “useful” frequencies at the next conference. Hi!)

Well now, OM’s, let’s look at the situation a moment. In the first place, there is much material in QST about other things than the very high frequencies. Only four per cent of our reading pages the past year have dealt with this subject. The more common bands are receiving their usual attention at our hands, both as to ‘phone and c.w., transmission and reception, theory and practice, elaborate gear and simple. But it is beyond dispute that at the moment the ultra-high-frequency field is the newest and most interesting one in amateur radio. We amateurs generally, and particularly A.R.R.L. as an organization, have the duty in defense of our own interests, of finding out about this part of our frequency holdings. But looming bigger in our evaluation of the subject is a fact that we all comprehend, that a radio amateur actually enjoys being confronted by a difficult problem, particularly in an unknown field, and finds his greatest stimulus when he gets caught up and perfectly absorbed in a new and pioneering investigation. That’s what being a radio amateur means. We believe that no more marvelous opportunity ever existed for the exercise of this instinct, latent in every amateur, than is afforded by the frequencies above, say, 50 megacycles.

For many years the whole radio world regarded these frequencies as quite useless for communication at any distance. Already we have uncovered enough to know that this is not entirely true. We see enough to glimpse the startling possibility that it may be the old story of 200 meters all over again. Or the more recent story of 80 meters and 40 meters. Just the other day we were reading in an old copy of QST an editorial plea that you fellows come on down from the long wavelength of 80 meters and help in the investigation of the shorter wavelength of 40 meters, where we were confident some interesting possibilities resided. We published an illustration showing many amateurs in hopeless congestion on a land labelled 80 meters, and off to one side, on a large roomy island all his own, a single pioneering 40-meter station, being none other than 1XAM, Johnny Reinartz. Honestly, fellows, if you can remember back that far, didn’t we have a hard job getting any of you interested in exploring the “shorter” waves? And wasn’t it worth while?

With tears in our eyes we’re doing the same thing today with respect to 5 meters and below. The problem is different and more difficult and it may not offer the same possibilities for splendid success. But we’ll never know until we try, and by trying we will find out. In the process we first of all improve our amateur estate. For example, can you imagine the television people getting our 5-meter band away from us now on the ground that we haven’t any interest, activity or occupancy in that region! Moreover, we’re pioneering, the amateur’s traditional proud occupation. If these waves are good and we don’t do our share in discovering that fact, we won’t have nearly as good title to them in the future as if we were their developers. That’s what we have in mind in referring to a duty to take the initiative and investigate this range which is assigned us. And so, while QST will never neglect the more customary frequencies, we are endeavoring to fulfill what we conceive to be our obligation to point the way in this new investigation. And in that work we’d like your cooperation. We wish more of you fellows would take a whirl at 5-and 2½ and 1½—and when you hear tests going on, jump in and help. In a year or two at most, we prophesy, we’re going to have a definite answer for ourselves. Either we’re going to know by our own investigations that these waves have no great and permanent interest for our kind of amateur communication or—joyous thought!—they’ll be eating out of our hands and we’ll be the lads who trained ’em. So up, Electrons, and atom!

K. B. W.
Notes on the Ultra-High-Frequency DX Work

New York—Hartford Contact Established: A Winter's Program Planned: Stations Needed on 224 Mc.

By Ross A. Hull*

This ultra-high-frequency working with directive antennas has brought us a great many more surprises than we would have thought possible in any phase of ham radio today. At the time of the first Hartford-Boston contact, almost three months ago, we knew that we would have our hands full checking the behavior of 56-mc. waves over this long indirect route. We are immensely pleased that the cooperation of the Headquarters gang made it possible to keep W1AL on the air every night since that time. No period of test work on the other bands has ever handed us as many unexpected surprises and thrills as has this one.

Our experience of the first few days revealed the probability that transmission conditions would rarely remain constant for more than a few hours at a time. In addition to a marked diurnal effect, with signal strengths dropping to a minimum toward noon, there was also an obvious correlation between transmission conditions and the weather. Signals were soon found to have the habit of climbing to extraordinary heights immediately prior to the arrival of stormy and rainy weather, falling after the storm and returning gradually as conditions again became unsettled. Now that we have almost three months of daily measurements and observations we are undertaking a comprehensive study of the data obtained.

Probably the most striking outcome so far is the discovery of what appears to be a well-defined correlation between signal strength and the relative humidity of the atmosphere. In graph form, this correlation is obvious enough to justify a preliminary guess that high relative humidity is required to permit the best communication on a long indirect route such as that between Hartford and Boston.

The study, of course, is only just begun and it is obviously futile to attempt any guesswork at this juncture. The program will continue, however, and W1AL, according to our best intentions, is to be kept on the air every night during the winter, all fitted out with recording gadgets of various kinds. We are determined, in short, to get to the bottom of this highly intriguing business.

High light of the month has been a stunning three-hour contact with W2CUZ, W2AG and W2JM to the tune of Rs and RD signals. This work was done with the bi-directive antenna at W1AL and, according to reports, the operators concerned were so thrilled over the business as to be almost speechless (a rare condition). To W2CUZ goes the credit for breaking down the barriers between the first and second districts.

Low spot of the month was a stretch of three days when, for the first time since the beginning of this program, no signals whatever were heard from the Boston area. Fortunately for the morale of AL's operators, the second district contact followed close on the heels of this dead period.

Reports of activity with directive antennas at other stations have been slow in arriving. We know of at least 20 or 30 stations either possessing directive antennas or about to install them. The number of performance reports, however, are few and far between. W1ZO, with his flea power transmitter, still seems to lead the parade—putting a better signal out of Boston than stations

* Associate Editor, QST.
using fifty times the power and favored with locations several hundred feet higher. W1FQV, at Harvard University, is just getting under way as this is written. It is already obvious, though, that his antenna is a complete success. Report has it that W2GR's directive antenna at Yonkers, New York, permitted him to break through to Princeton, New Jersey, on the first night and that W3EJJ of Bethlehem, Pennsylvania, had similar success in pushing his signal back to W2JZ and W2EAF. There is no doubt whatever that AL's work is being duplicated and perhaps surpassed in many parts of the country. We need complete details.

We are disappointed to be obliged to state that, at this writing, no extension of the previously recorded 220-mc. DX can be reported. The explanation is simple—no other stations, so far as we are aware, have come on the air. Inter-

International 28-Mc. Contest

An International 28-mc. Contest to be in progress for one year started October 1, 1934. This will be concluded at midnight, September 30, 1935. It is open to all hams. There are both A.R.R.L. and R.S.G.B. awards. In addition to an R.S.G.B. international trophy and certificates to the leading ten stations wherever they prove to be, the A.R.R.L. will make an award to the highest United States or Canadian operator-experimenter. The A.R.R.L. Award will be inscribed FOR 28-MC. ACHIEVEMENT, October 1, 1934—September 30, 1935.

The League's award will be a bronze charm, engraved as above, and with the call of the winner. A reproduction of this award is shown herewith. One point will be scored for each completed 100 miles of contact. Decision between W/VE competitors will be based on weighted credits. (1) The number of weekly reports to A.R.R.L. on 28-mc. work count 25%. (2) Description of equipment, and development work reported on same, 25%. (3) The number of points scored (monthly contacts with the same stations will be permitted to count), 50%. All W/VE entries must be received at A.R.R.L. on or before October 15, 1935. Report your results each week to A.R.R.L. to get the full credit under (1) for reports regardless of conditions. Submit scores and log to both A.R.R.L. and R.S.G.B. at the end of the contest to be eligible for all awards. A.R.R.L. can only consider reports sent to its attention before the closing date named. All reports are most welcome.

CONTEST RULES

I. The contest is open to all licensed radio amateurs.

II. The contest commenced at 0001 G.T., October 1, 1934. It will close at 2400 G.T., September 30, 1935.

III. Licensed power must not be exceeded.

IV. Contacts may be established at any hour and on any day during the contest period.

(Continued on page 104)
W1OXDA Back from the North
Schooner "Morrissey" Returns from the Arctic
By Robert Moe, WZUN*

EXPLORATION undoubtedly has benefited to a tremendous extent by the application of high-frequency radio communication.

Captain Bob Bartlett, a veteran of forty-one trips to the Arctic, including the famous Peary North Pole dashes, was among the first to realize the importance of radio in this work. His well-known schooner Morrissey has been equipped with short-wave radio ever since 1926, when she made her first trip to Arctic waters under his command. It has been my privilege to accompany Captain Bartlett in the capacity of radio operator on his last two expeditions to the north.

In 1933, operating under the call letters VOQH, the original 500-watt self-excited i.c.w. transmitter was still in use. On that trip we found that the 14-mc. band was most dependable for communication north of the Arctic Circle, both c.w. and 'phone signals coming in with remarkable strength. Reception in the other bands, however, was either unsatisfactory or impossible, no doubt because of the continuous daylight of the Arctic summer. So enthusiastic were we over the results in the 14-mc. band that it was decided that on the 1934 trip 'phone equipment would be taken along.

Therefore, back in New York again, the winter months were devoted to planning and building a medium-power 'phone transmitter to be used on the next Arctic expedition, scheduled for the early summer months of 1934. The task was accomplished, and in the spring the transmitter was installed aboard the Morrissey.

RADIO EQUIPMENT

The Morrissey, under new registration, had been assigned two licenses, one a regular ship license under the call WHFZ, and the other an experimental license, W1OXDA, the latter permitting the use of the following frequencies: 8425, 8055, 12,862.5, 17,310, 23,100 and 27,100 kilocycles. Frequencies above 16,000 kilocycles proved to be undependable so that only the lower three frequencies were used. The great interest in the equipment shown by all stations worked this summer prompts this brief description of the outfit.

The most important problem in a ship installation is the power supply. On the Morrissey the power was taken from a 120-volt bank of Exide cells, which drove a Janette rotary converter supplying 115 volts a.c. at 600 watts. This simplified matters considerably, since it permitted the use of standard power supply equipment of the type familiar to every amateur. The second important consideration was the necessity for mechanical strength adequate to withstand the engine vibration and shocks from tossing in a heavy sea. To meet this requirement heavy chestnut base-boards, finished with Valspar varnish to keep out moisture, were used, and the framework was constructed of angle aluminum. The panels are made of bakelite.

The tube line-up is shown in the r.f. diagram, Fig. 1. A shielded 47 oscillator is followed by a 46 doubler, an 841 r.f. amplifier and a 203-A final modulated amplifier in succession. Modulation is accomplished by graphite-plate 210 tubes in Class B, delivering 60 watts of audio power. A two-stage transformer coupled speech amplifier, using 87's, amplifies the output of the double button microphone, and the driver for the Class-B stage consists of two 45's in push-pull.

The oscillator is shielded to prevent feedback from the final amplifier on the shelf above. A small variable condenser couples the oscillator to the grid of the 46 doubler. Incidentally, it was necessary to use battery bias on the 46 tube to prevent creeping plate current caused by grid emission. This stage is not neutralized and is always used as a doubler; to operate it as a straight r.f. amplifier neutralization would be necessary. Condenser coupling is again used between this...
It was only after careful consideration that the 203-A tube was chosen for the final amplifier. Many possible tube arrangements were considered in the planning of the transmitter, and a 203-A tube finally was decided upon because of its sturdiness and dependability. Using the circuit shown (it was introduced and covered fully in January 1934 *QST*) the 203-A tube operates on frequencies as high as 28 mc.

The filaments of the 37's used in the speech amplifier were heated by a storage battery on the trip, even though an extra filament-transformer winding was available for them. This was necessary because the rotary converter was started up for each transmission, and the indirectly-heated tubes would have taken too long to heat up, thereby causing delay in coming back to a station. The 37 tubes were kept heated all during the station's operating periods.

A REAR VIEW OF THE W10XDA TRANSMITTER

The oscillator shield and a few of the low-power components can be glimpsed on the lower deck.

A circuit diagram of the R.F. portion of the W1XZ-W10XDA Transmitter is shown.

**FIG. 1—CIRCUIT DIAGRAM OF THE R.F. PORTION OF THE WHFZ-W10XDA TRANSMITTER**


All coils except L5 wound on Hammarlund Isolantite forms, diameter 1½ inches. Crystal oscillator works at half the output frequency. Dimensions of the antenna filter coil, L6, depend upon the type of antenna in use. A tapped coil of the type described in February 1934 *QST*, is recommended.
6250-ohm load. This was matched by operating the 203-A tube at 900 volts and 144 milliamperes.

Four power supplies were used, one for the low power r.f. stages, one for the 203-A final, one for the speech amplifier and one for the 210 modulator tubes.

The antenna on the ship was a 60-foot vertical affair, running from the deck to the top of the mainmast, and was coupled to the transmitter through a 9-foot lead and the single-line matching network shown in Fig. 1.

The receiver used was a battery operated Hammarlund Comet Pro, the same receiver as on the previous trip except that this year a crystal filter was installed. During these two years of hard service this receiver has been found to be thoroughly dependable.

Such, then, was the radio equipment carried by the Morrissey. The work that had gone into its construction proved to be thoroughly justified, the set performing daily without failure during the entire trip.

THE "MORRISSEY'S" VOYAGE

No doubt many amateurs, while appreciating the opportunity to make contact with an expedition and thus garner some new DX—and perhaps envying the members of an expedition the element of adventure involved in a trip to uninhabited lands far from civilization—wonder just why such trips are undertaken. The Bartlett expedition, which was sponsored by the Academy of Natural Sciences of Philadelphia, had for its purpose the collecting of scientific data and specimens of northern birds and mammals. On June 14, 1934, the Morrissey left its dock at West Brighton and, stopping only for additional supplies at City Island, headed north along the New England coast on the first leg of its journey.

Brigus, Newfoundland, was the first port of call, a few days being spent there to visit Captain Bartlett's mother.

Leaving Brigus, the next stop was at Turnavick, Labrador, the old Bartlett fishing station, where a few things were left for the caretaker. From there the ship went to Hopedale, Labrador, landing Junius Bird, archaeologist, and his wife, who were to spend the summer at this location excavating among old Eskimo winter houses.

From Hopedale the ship headed across Davis Straits for Godhavn, the capital of Greenland, making good time on the run. Progress north from Godhavn along the Greenland coast was greatly impeded by bad ice conditions, the ice finally becoming so bad that we were forced to anchor in a bay on Bloch Island, where we found a small Eskimo village. The enforced stopover offered an excellent opportunity for study of the habits of these interesting people.

A visit to the Peary Monument, which Captain

\[ \text{FIG. 2—THE SPEECH AMPLIFIER AND CLASS-B MODULATOR CIRCUIT DIAGRAM} \]

- $R_1$—100,000-ohm volume control (Electrad).
- $R_2$—3000 ohms.
- $R_3$—75,000 ohms.
- $R_4$—90,000 ohms.
- $R_5$—5000 ohms.
- $R_6$—750 ohms.
- $R_7$—200,000 ohms.
- $R_8$—20,000 ohms.
- $R_9$—20 ohms.
- $C_1$—0.002 mfd.
- $C_2$—0.002 mfd.
- $C_3$—2 mfd.
- $C_4$—20 mfd.
- $C_5$—25 mfd.
- $C_6$—300-ohm resistor.
- $C_7$—Double-button microphone transformer (Universal).
- $T_1$—Audio transformer (Amertran 2nd Stage Deluxe).
- $T_2$—Push-pull input transformer (Amertran 151).
- $T_3$—Class-B output transformer, 10's to 6250-ohm load (Collins 715-B).
- $T_4$—Class-B input transformer, 45's to 10 grids (Collins 715-B).
- $T_5$—Filament transformer, 7.5 and 2.5 volts.
- $RFC$—R.F. choke (Hammarlund CHX).
- $L_1$—250-henry, 15-ma. choke.
- $X$—Jacks for reading plate currents.

HAMS WHO HEARD W10XDA'S 'PHONE WILL AGREE THAT THIS MODULATOR DID A GOOD JOB

It uses a pair of graphite-plate 210's in Class B, driven by a pair of 45's. Two 37's are used in the speech amplifier.
Bartlett had erected in 1932, had been planned, but the ice was so bad that the ship could not get within twenty-five miles of the shore. Nevertheless, even at this distance the monument stood out as a prominent landmark, its metal cap reflecting the rays of the midnight sun.

Continuing north, the Morrissey worked her way into Smith Sound, stopping at Hakluyt Island to make photographs of the millions of birds there. When we reached historic old Etah we found it deserted. The ship pushed on into Kane Basin, farther north than the Morrissey had ever gone on previous trips. The east coast was blocked with unbroken ice, but the Ellesmere Land side was open and we went on up to Cape Sabine. Here the expedition turned back, as we had no work to do farther north.

Following the ice south along the Ellesmere Land shore, herds of walrus, large numbers of narwhals and several polar bear were found, and several specimens were secured for the Academy. It had also been hoped that a Peary caribou could be obtained in Ellesmere Land and the boat worked into Jones Sound for this purpose, but bad ice and open water prevented reaching land. After several attempts aided by dog sledges and boats, the project was given up and the journey south resumed. A stop at a small island at the mouth of Jones Sound resulted in some excellent photographs of Arctic bird life.

On the way south, strong winds off Baffin Land forced the ship to anchor under Cape Raper, but the winds also helped us by moving the ice off the shore and we were able to proceed southward. From there on we saw no more ice and had a fine run to the Labrador coast, stopping at Hope­dale to pick up the Birds, and going from there to Turnavick. Hawkes Harbor, a whaling station, was the next stop after Turnavick, and from there we transmitted a program which was picked up at Wayne, N. J., and rebroadcast over the Columbia network. This was the first broadcast from this vicinity, and according to Columbia engineers was one of their most successful rebroadcasts, which certainly speaks well for our 100-watt transmitter.

On the way home we stopped again for a few days in Brigus, enjoying once more the hospitality of Captain Bartlett's mother and family, and from there went directly to New York, arriving October 2d, the entire trip having taken three and one-half months.

Proper choice of frequency rather than power output would seem to be the answer to reliable communication from the far North, since with our 100 watts there was never a day when it was impossible to get in touch with the outside world. Regular schedules were kept with stations in the vicinity of New York City.

We greatly appreciate the cooperation given us by the boys of WABC at Wayne, N. J., who operate W2GQ. They kept daily schedules during the entire summer and handled practically all of the traffic to and from the Morrissey. The group included Ray Newby, W2GQ; Jack Tiffany, W3CQN; Al Hingle, W3CDO; Eddy Schreiner, W2AJF; Tom Donohue, W8HW; O. W. Read, W3EFU; Bob Mayberry and Gus Hengel. Frank Millar of W2NV also gave valuable assistance.

We also wish to express our thanks to the following stations, who also handled traffic for us: W1GBE, W2AJD, W2AOE, W2CDL, W2DC, W2EDW, W2FF, W2HFS, W3ZX, W4SI, W8CRA, W5GLY, W9BIH, W9DXJ, W9EIB, W9KF, W9PF, G2SD, G6LK, G6TT, V08Z.

A favorite question asked those who have had radio experience north of Arctic Circle is what effect the Aurora Borealis has on radio reception. To this I may answer that as far as my personal observation goes Aurora has no noticeable effect on radio. This opinion may, of course, be considered far from conclusive, as it is the result of observations made during only two summers. These findings have, however, been confirmed by the operator at the Danish Government radio station at Godhavn, Greenland, who has been making year round observations in this direction over a considerable period of time.

By the way, the cover this month shows the schooner Morrissey breaking through ice floes in the vicinity of Ellesmere Land.
NOW let's see, just what is this C.C.I.R.? We can already hear you asking, so we might as well start at the beginning.

International radio communication is governed by an international treaty called the International Telecommunications Convention. World-wide conferences are held every five years to revise the radio regulations, including frequency assignments; the conferences of Washington and Madrid were of this type, with the next one to be held in Cairo. The international treaty contains a provision setting up an international technical committee, whose duties are to meet in between the main conferences, study technical operating questions and administrative questions of which the solution depends upon technical study, and issue recommendations for standard practice by the administrations and operating agencies of the world. It is this committee which is called the C.C.I.R., from the initials of its name in French. Its first meeting was in The Hague in 1929, its second in Copenhagen in 1931, and this year it held its third meeting in Lisbon, the capital of Portugal.

The meetings of the C.C.I.R. are made up of the experts of the government administrations and private operating companies, and of a few international organizations that have been specially admitted to represent their groups. One of the latter organizations is the International Amateur Radio Union, the world-wide federation of national amateur societies which has chosen the A.R.R.L. to act as its headquarters society. Neither A.R.R.L. nor any other national amateur society would be eligible to sit in the C.C.I.R., as such national enterprises aside from private operating companies are supposedly represented by their government delegation. But in the case of amateur radio, broadcasting, aviation and a few other such services of international scope scarcely capable of being represented adequately by any one administration, special provision has been made and the ranking international societies for these services have been admitted to C.C.I.R. participation in their own names.

The C.C.I.R. does not have the power to make binding regulations, but it does issue opinions on what is technically and economically feasible and makes recommendations which, because they have been carefully studied by the major governments and companies, are so universally regarded as a working standard that they have almost the practical effect of regulations. It is therefore important for amateur radio to sit in these meetings and participate. Moreover, the C.C.I.R. meetings inevitably, even though unintentionally, lay the groundwork for the technical regulations of the major conferences and so, with Cairo in the offing, it is doubly important for us to participate. Hence it came about that the headquarters of the I.A.R.U. determined to be represented at Lisbon and invited the A.R.R.L. to take advantage of the opportunity created by the admission of the Union. The A.R.R.L. Board of Directors at its last meeting appropriated money for this purpose and authorized the writers to accept the invitation of the Union to be their spokesmen at the Lisbon meeting.

As representatives of the A.R.R.L. we had already participated in the preparatory work of the United States delegation, but we did not go to this conference as part of the American delegation. We were entirely on our own, constituting in fact the delegation of the amateurs. Thus it was that we sailed from New York in middle September and opened up amateur headquarters at the scene of the conference on September 22d, the opening day.

Briefly summarizing the conference: The representatives of twenty-seven administrations, thirty-one commercial companies and three international organizations (including ours) met for two weeks and a half. On the agenda were thirty-five questions, almost altogether of a technical nature, which had received prior international study by means of contributions filed by collaborating administrations and agencies, the studies then being "centralized" and published by the administration which had charge of the subject. The I.A.R.U. had previously filed some technical contributions in its own name, particularly on the question of receiver selectivity where amateur work in recent years has made an important contribution to the art. The work of the conference was divided between five main committees and an editing committee which met in daily session. In this daily work your secretary gave his attention mostly to the questions that seemed to have an administrative or regulatory angle or which were important from the "policy" point of view, while your technical editor represented the amateurs in the technical discussions where it was possible to contribute as a result of amateur technical experience. The work of the conference resulted in the formal adoption of twenty-seven recommendations for the guidance of the radio world. Six questions were declared

* Respectively Secretary-Editor of A.R.R.L. and Technical Editor of QST, joint representatives of the International Amateur Radio Union at the third meeting of the C.C.I.R.
unsolved and requiring further study, while during the conference ten new questions were originated as needing to be studied. These sixteen questions form the initial agenda for the next meeting and we entered the name of I.A.R.U. as a collaborating organization on four of these new studies.

The question of greatest amateur interest at this conference involved our 160-meter band. It related to the organization of the low-powered radiotelephone service for the small fishing trawlers of the North Sea nations. The initial proposal on this question by the German centralizing administration was strongly regulatory in nature and suggested detailed operating arrangements for the use of the frequencies from 1530 to 3500 kc., omitting all mention of the amateur band 1715–2000 kc. Although this was a European regional problem, we were speaking at this conference in the name of I.A.R.U., not A.R.R.L., and the band is as important to the European amateurs as it is to us in this country. Moreover, we felt very strongly that the C.C.I.R. possessed no right to engage itself in such a regulatory matter and that the establishment of such a precedent would be very dangerous business. Consequently I.A.R.U. determined to oppose the proposed arrangement with all its strength.

Some months before the conference and immediately following the publication of the report on this question, I.A.R.U. headquarters addressed itself to all of the member-societies in Europe, explaining the situation and requesting the societies to take up the question individually with their administrations. This was generally done and doubtless assisted materially in the outcome; certainly we found the many letters of advice which we received in Portugal from the European societies very helpful.

When this question first came up for discussion at Lisbon there was an unpremeditated but perfectly beautiful triple play, U.S.A. to I.A.R.U. to Great Britain, which knocked the props right out from under a neatly laid plan to adopt detailed regulations and frequency assignments. For our part, we pointed out the rights of amateurs under the Madrid treaty and questioned the right of the C.C.I.R. to deal with the question in the manner projected. Upon the proposal of the British delegation which was of the same general point of view, it was decided that the C.C.I.R. would treat only the technical-apparatus aspects of the problem (which concerned us amateurs not at all) while the rest of the question, as to frequency arrangements for the small-boat service, might be handled as a private regional matter between some of the administrators present, if they wished, but altogether outside of the C.C.I.R. Precisely that was done. The C.C.I.R. report (opinion) relates to installation and operating arrangements and doesn’t concern us. Representatives of eight European nations who operate such services met privately and drew up a memorandum agreement for the division of frequencies between these countries. This was

strictly within their rights, and in fact is encouraged by the Madrid regulations, but their agreement does not have C.C.I.R. endorsement. We did not let the matter go at that, even. We discussed the subject with representatives from these eight countries and filed a memorandum with them calling attention to the amateur rights and the extent to which this band was actually assigned to amateurs in many European countries, and called upon them to recognize the status quo. For the most part this was not a hostile group and it included several excellent friends of amateur radio. In fact, how far we amateurs have progressed in recent years and how valuable contact is with government representatives, is well illustrated by the fact that several of the eight representatives participating in this small informal conference actually demanded that the regional agreement take account of the rights of amateurs, refusing to associate themselves with the movement unless it did! The regional agreement that was there drafted and signed does take cognizance of the amateur rights and of the rights of individual governments to assign this band to amateurs, and directly reiterates that amateurs preserve the rights given them in the Madrid regulations. By private conversations we assured ourselves that amateurs in the North Sea nations now assigned this band will continue in its enjoyment. Thus the only topic at
Lisbon directly dealing with amateur frequencies was solved in an entirely satisfactory manner, a conclusion which quite probably would have been less favorable but for our presence and intervention.

Another question which interested us was the revision of the working rules or internal regulations of the C.C.I.R. Our interest was to preserve the right of international organizations (such as I.A.R.U.) to participate in the C.C.I.R. The new form of the regulations even increases the recognition given such international organizations and they are now definitely established as participants.

Amongst the technical problems, the one in which we took the most active interest probably was the study of receiver selectivity. Amateur work in recent years, particularly the development of the single-signal superheterodyne with variable band-width crystal filter, has been of considerable importance, and in a direction not duplicated by other services. Although the selectivity question was of great importance, there was not time to discuss it at length and the study of it was not completed. Your technical editor served on a sub-committee which drafted definitions of selectivity and sensitivity, and these were included in a recommendation that the study be continued with actual measurements of the selectivity performance of many types of receivers, making use of the so-called "two signal" method of measurement. The I.A.R.U. expects to continue collaboration on this question.

We were interested also in the study relating to the establishment of a system for standard frequency transmissions, a subject in which we have had some experience through the operation of our A.R.R.L. Standard Frequency System. We were prepared on this question to back up the proposals of the United States as against the many other proposals, but it wasn't necessary, since the proposals of the United States were at once adopted as the basis for the decision. It was interesting to note, by the way, that our A.R.R.L. system regularly achieves an accuracy higher than some of the European nations proposed as satisfactory!

Then there was a very interesting question about suppressed-side-band broadcasting. The study got nowhere, perhaps largely because of the small amount of experimental data available, and accordingly was continued on the agenda for the next meeting, but at our suggestion was expanded to include a study of suppressed-carrier transmission as well, and also a study of receivers suitable for the reception of such transmissions.

Some alarms have been sounded over the listing on the C.C.I.R. program of the study of allocation of frequencies. It is true that this was the title of one of the subjects, but it was in fact a study of performance characteristics of waves as they might influence the allocation of frequencies for specific purposes. The study was strictly technical and that portion of it which was finished concerned itself chiefly with curves for field strength at varying distances, and only in the frequencies below 1500 kc. No examination was made of the higher frequencies, where the sky-wave becomes the predominant factor. There was thus nothing whatever in the study that concerned either allocations or amateur frequencies.

It would fill several pages in QST to present a list of the subjects examined, the opinions issued, and the unresolved and new questions listed for future study. The complete proceedings of the conference will be published soon and will be available for students of the subject. As we have mentioned before, the topics embrace little of interest to the amateur as such. They dealt with such other subjects as measuring the intensity of signals and noises in the radio transmission medium, the reduction of interference in the shared bands, tolerances of harmonic intensity in the low-frequency range, radio spectrography, means permitting mobile stations to work on the frequency of land stations, synchronization of broadcasting stations, are transmitters, reduction of parasitic currents in receivers, etc. It seemed to us that many of the opinions issued by the C.C.I.R. were without particular value, being the small remainder of the subject on which agreement could be got after much argument. But it deserves to be said that in the technical contributions filed by the collaborators in advance of the
meeting, there could be gleaned a great deal of
valuable material on these subjects which would
interest the engineer and student of the art.

It had generally been understood that this was
the last C.C.I.R. meeting before the Cairo Con­ference, except that a brief meeting might be held
in Cairo on the eve of the general meeting. How­
ever, after much argument at Lisbon it was
decided to have the next meeting at Bucharest,
Rumania, and it now seems likely that that next
meeting will be held in the spring of 1937. (The
Cairo Conference is scheduled for January or
February of 1938.) The world is divided on the
general value of C.C.I.R. meetings. The contin­
ental European nations regard the C.C.I.R. as
of great value and would even like to see it a
continuing organization with a permanent secre­
tariat. Most of the English-speaking nations, on
the other hand, seem to query its general value
and are opposed to frequent meetings—which is
also the point of view of your representa­
tives. The rules provide, however, for meetings at
any time at the call of ten or more nations, so it is
likely that there will be a fourth meeting in 1937.

Although many of the topics on the Lisbon
program had technical interest to us as students
of the art, there were few subjects of actual con­
cern to the transmitting amateur. We were not
there because this conference was likely to deal
with matters affecting our rights. Rather, our
presence was an outgrowth of the several preced­
ing international conferences and pursuant to the
formal admission of the I.A.R.U. two years ago.
We went largely for the purpose of sitting down
with the governments and commercial radio com­
panies of the world and showing them that the
radio amateur also has the ability to participate
in these discussions and to make useful contribu­
tions to the work. Our aim, in the absence of ques­
tions that vitally concerned us, was to attract
favorable notice to the work of amateurs and to
widen our sphere of contacts, all to the end that
the position of the amateur may be made more
secure at the next administrative conference. Our
great task of course is the permanent preservation
of frequency assignments for amateurs and at the
next conference we want not only to retain our
existing bands but to widen some of them, par­
ticularly the 40-meter band. We know that by our
constant presence at these conferences we have
brought the nations of the world to the expecta­
tion that the transmitting amateur will be repre­
sented and spoken for, and to the realization that
the amateurs are an increasingly important group
in radio for whom adequate provision must be
made, the same as for other services. Through our
recent participation, and particularly by our
presence at the Lisbon meeting, we feel that
I.A.R.U. is now solidly fitted into place as part of
the international radio picture.

We met the Portuguese amateurs of the Lisbon
area, particularly the officials of the Rède dos
Emissores Portugueses—which is the Portuguese
section of the I.A.R.U.—and a very splendid
bunch of fellows they are! We are deeply indebted
to them for their hospitality: They took us
around to see their stations; the R.E.P. gave a
splendid dinner under the toastmastership of
their president, Dr. Alfredo Tovar de Lemos,
CT1BB, to us and to PY1DY, who was also visit­
ing in Lisbon; they honored us with membership
in their society; and a group of them were down
to the pier to see us off when our ship sailed. We
found them, as we expected, like the radio ama­
teurs of every other country, a keen and wide­
awake group, filled with love for the technique of
amateur radio and happy in the good fellowship
they found in each other. They have a splendid
amateur society, existing in favorable relations
with its government, and they enjoy the full
Madrid widths of all the amateur bands. Through
the kindness of the Portuguese administration we
saw a surprising amount of Portugal and its peo­
dle during our brief stay. We shall always cherish
a most delightful memory of that country, and
to these charming pictures of a lovely land we
add our recollection of the most hospitable re­
ception given us by the hams of the R.E.P.

W9DHH puts two crystals, one above the
other, in one holder in his Tri-tet oscillator and
finds it possible to make a quick QSY simply by
changing the tuning. They seem to oscillate just
as well as when used singly. The crystals should
not be too close in frequency, however, other­
wise the operation is likely to be erratic.

Transmitting tube distributors of RCA have
a swell map of the world available to amateurs.
These maps have the western hemisphere lo­
cated in the center so that you judge distances
easily. International prefixes are listed at the
bottom of the map. High-frequency assignments
are also shown as well as time divisions. These
maps make an attractive decoration for that part
of the shack wall you can't cover with QSL's.

Fellows who write the Technical Informa­
tion Service for help with their transmitting and
receiving troubles can help us as well simply by
dropping us a card to let us know how our sug­
gestions work out. Trouble-shooting by mail
often brings up some knotty problems, cases in
which it is impossible to do more than try to
make an intelligent guess as to the root of the
difficulty. Blank silence on the part of the re­
cipient of the advice may indicate that the guess
was well founded, but doesn't give us any basis
for helping out the next fellow who has a similar
problem. If it works, let us know. If it doesn't,
we want to know that too.
A Transportable 10-Watt Public Address System

Information that May Be Carried to Speech Amplifiers

By Clinton B. DeSoto, W1CBD*

**Did you ever sit in the back row at a hamfest or convention, or have to take standing room along the rear wall at a particularly well-attended club meeting? And then hear only an occasional word of the talks through the heavy attentuation of the crowd in front of you? How you wished then that you could hook up that Class-B modulator sitting proudly in the shack back home, tie it to a good dynamic, and really make something out of those muffled words. Well, here's the answer to the problem—a portable amplifying system that most every radio club (and a lot of individual amateurs with rental or resale ambitions) can build. It will save vocal cords and ease ear strain—and provide an interesting construction job, too.—EDITOR**

The public speaker of olden times, painfully extending the power in his voice from the normal 60 or 120 microwatts to 1 or even 2 milliwatts and finding that still inadequate, wished vainly that he might emit not microwatts but actual watts of power and reach every ear in the auditorium or arena before him with convincing, powerful sound. The modern public speaker does just that. The development during the past six or eight years of public address systems capable of hurling the voice over far greater distances than could be done unaided has completely revolutionized the presentation of entertainment and information.

These powerful amplifiers are the outgrowth of the development of radio. Radio amateurs, therefore, can feel an intrinsic interest in the public address art simply because of its association with their own activities. But quite apart from that, public address systems are of extreme utility to all amateur groups, especially in large clubs, and at hamfests and conventions.

Recognizing this need, we have endeavored to develop in the QST laboratory the sort of amplifier we believe to be most logical and desirable for this purpose. We set out with two conflicting objectives. Having concluded that an output power in the neighborhood of ten watts represented about the most desirable value, we were going to build an amplifier capable of most efficiently producing that output power with good fidelity to the input signal; at the same time, we were going to make the simplest, lightest, least expensive amplifier practicable. We feel that we have achieved both objectives to a considerable extent. The number of parts used has been kept down to the very minimum, in the interests of economy and simplicity; yet those parts which are used are of high quality, to preserve excellent performance. The construction is straight-forward and orthodox. Nevertheless, there is plenty of room for everything. The weight is higher than we originally hoped for—80 lbs. complete with cables and microphone—but even this can be carried for some distance by one person without too great effort.

**THE TUBE LINE-UP**

In its final form, the amplifier proper consists of three stages, one a voltage amplifier using a 2A6, the second a high-gain driver using a 53 with its grids and its plates paralleled, and the third a Class-B power stage capable of 10 watts output using a 53 as a dual triode. The 2A6 is a high-mu triode in conjunction with a pair of diode rectifier plates, ordinarily used in broadcast receivers as a combined second detector and first audio amplifier. In this application, we disregard the diode plates and simply use the triode portion. The 53 is a tube having two sets of high-mu triode ele-

*Assistant to the Secretary, A.R.R.L.
amplifier. (See Fig. 2.) The sensitivity, then, is sufficiently good for all applications, which would not be the case if an ordinary low-mu triode were used in the first stage; nor is it so excessive as to result in undue feedback, as it would be if a higher-gain screen-grid or pentode tube, with its attendant circuit complexity and operating trouble, had been used.

THE CIRCUIT

With an initial glance at the circuit diagram to familiarize ourselves with the general arrangement, we proceed to a step-by-step examination of the layout.

The input transformer, $T_1$, is supplied with two tapped primaries, one ($P_1$) a high-impedance affair used to couple from the plate circuit of a preceding triode (usually a 55 or 56 used as the second detector of a broadcast tuner), with a 4000-ohm tap for connecting to a high-impedance phonograph pickup. The second

...
primary \((P_2)\) has a total impedance of about 400 ohms, center-tapped. It is used for connecting in a single- or double-button carbon microphone, a low-impedance phonograph pick-up, or a 200- or 500-ohm line. The input panel, at the right rear of the chassis, has binding posts for each of these terminals, as well as one which goes direct to ground for connection to the shielding on transmission lines or microphone cables. This ground must always be used, by the way, or a loud hum pick-up will be noticed. In certain installations it may be found necessary to connect also to an external ground.

Across the secondary of the input transformer is connected a 1-meg-ohm shielded potentiometer used as a volume-level or gain control, the center terminal of which is connected through a shielded lead to the grid clip of the 2A6. The lead from the high-potential (ungrounded) side of the transformer to this gain control is also shielded, the shielding being carefully soldered to a common ground on the chassis. The ease of the gain control must also be grounded, since the panel is of bakelite and this needful precaution is not automatically provided as it would be with a metal panel; otherwise a bad hum will result. The careful isolation of the input circuit is completed by using a tube shield over the 2A6. Thorough shielding is more convenient, less expensive, and usually just as effective as the elaborate decoupling which would otherwise be necessitated to avoid feedback and static or magnetic hum pick-up.

The cathode resistor of the 2A6 is somewhat higher than would be indicated by a consideration of the published tube characteristics; the higher value, however, accomplishes two useful purposes in this particular layout; it increases the total gain slightly and, because of the resultant lower plate current, a further resistance-capacity filter can be inserted in the high voltage supply lead without introducing excessive plate-voltage drop. This plate-circuit filter reduces the residual hum to a practically inaudible value, and further minimizes feedback effects.

### THE POWER STAGE

The Class-A 53 feeds into a special Class-B input transformer. The output transformer for the Class-B 53 is a part of the speaker assembly, and is mounted inside the supporting frame of the dynamic unit.

The speaker is a new development, with improved relative loudness efficiency. In this unit a special field coil is used which provides not only the second filter choke, but draws a heavy bleeder current as well. The coil has a total resistance of 6000 ohms, which is shunted across the 300-volt supply. At 1000 ohms there is a tap, from which plate voltage for the two preliminary stages is taken, at 250 volts. The remaining 5000 ohms acts as a bleeder, contributing to the good regulation of the power supply. Thus the total field wattage is 14, which means that a considerable amount of flux is disturbed whenever a signal hits the voice coil. The speaker has an extended frequency characteristic which makes it especially adaptable to the reproduction of both speech and music.

The power supply is well isolated from the amplifier. The first filter choke is a high-inductance, low-resistance affair which, in conjunction with 8-µfd. capacity, adequately filters the supply to the final stage without affecting the regulation appreciably. It might be mentioned here that the total plate current excursions are not great. The idling plate current is in the neighborhood of 90 ma. At full output the total plate current does not exceed 120 ma. Suitable heavy-note response is therefore readily preserved, with the aid of the heavy duty power transformer, the 5Z3 rectifier tube (a type 80 would carry the current, but with more voltage drop), and the low resistance filter system.

### CONSTRUCTIONAL

The primary objective in the mechanical design has been the achievement of high quality, efficiency, and utility with a minimum of bulk and weight. The single-unit construction employed is rare in public address systems as powerful as this, orthodox practice being to provide one or two speakers in separate cases. In this system, however, it was felt to be especially desirable to have just one carrying case to hold everything for the applications for which the outfit was intended. The added possibility of feedback through this

(Continued on page 98)
Amateur Radio at the 1934 National Air Races

By Joseph H. Pitzer, W8AXV*

Once more amateur radio has been called upon to perform a public service and has come through one hundred per cent. Early in June, officials of the 1934 National Air Races began to give consideration to the problem of communication between the pylons and the judges' and timers' stands. Harry A. Tummonds, W8BAH, who had charge of amateur radio operations during the 1929 air races, assured the officials that the problem could be satisfactorily handled by amateur radio. Members of the Lakewood Radio Club and Cleveland Amateur Traffic Association offered to take over the job, and the final organization was composed chiefly of members of those clubs. Following is a list of those who participated and their assigned duties: Harry A. Tummonds, W8BAH, chief of radio communications—in charge; George Noack, assistant to chief; Ted K. Ball, in charge of personnel (grandstand); John Wahl, W8LJQ, service manager; Frank Fix, W8GUL, chief operator at grandstand; Wm. Jacob, W8BNC, assistant operator at grandstand and in charge of technical operations; Joseph Pitzer, W8AXV, chief operator Pylon No. 1; Wilson Brigham, W8BON, assistant operator Pylon No. 1; Kenneth Hybarger, W8AES, Pylon No. 2; Charles Moss, W8MAK, assistant operator Pylon No. 2; James Hill, official photographer.

Each pylon operator was given an opportunity to work one day at the grandstand, and in turn the grandstand operators manned the pylon transmitters one day. This gave each man an opportunity to become acquainted with conditions at the "other end," and also served to break the monotony of being assigned to one location for the entire meet. Three 'phone transmitters, all crystal-control, were in use every day throughout the meet. The transmitter assembled and owned by Frank Fix, W8GUL, was located at the grandstand while the transmitters, constructed by "Red" Doyle, W8BFT, and Joseph Pitzer, W8AXV, were located at Pylons No. 2 and No. 1 respectively. W8GUL's transmitter set-up was a '47 crystal oscillator, '46 buffer and a pair of 46's in the final stage. The speech equipment consisted of a 56, 46 and a pair of 46's in Class B. This transmitter operated in the 3.5-ke. band. 110-volt a.c. being available at the grandstand, W8GUL obtained power from that source. The transmitter which the writer, W8AXV, constructed consisted of a 30 crystal oscillator (1850 kc.) and 30 amplifier modulated by a 33. With 90 volts on the oscillator and 180 volts on the amplifier, no trouble was experienced by W8AXV in putting a good "sock" into the grandstand. W8BFT used a transmitter consisting of a 12 oscillator, 12 amplifier and modulated with a 42. Approximately the same voltages were applied to this transmitter as that of W8AXV. The pylon transmitters operated on 160 meters, and the grandstand transmitter on 75 meters, in order to work duplex.

The transmitting antenna at the grandstand was strung high above the press boxes. Antennas at the pylons were attached to the pylons themselves and operated as Marconi systems to ground. No end of praise must be given to John Wahl, W8LJQ, for his good work in scaling the 91-foot pylons and attaching the antenna hereto.

* 3487 W. 136 St., Cleveland, Ohio.

THE CREW OF OPERATORS AT THE RACES

The race program covered a four-day period, and the usual judges' reports of race events and like data were transmitted each day. Our real opportunity to show what we could do in an emergency presented itself on the last day of the program when the Thompson Trophy Race was run off. It was during this race that Doug Davis crashed and met his death. The crash occurred between pylons No. 1 and No. 2, and, being well within sight of pylon No. 2, W8BFT immediately flashed the tragic word to the judges' stand and kept them in touch with first-hand information, while W8AXV moved his portable to the scene of the crash and operated from that point. Local newspapermen used W8AXV to transmit their news copy to the press officials at the grandstand through W8GUL. This news in turn was relayed to the various press associations and newspapers. It is regret-

(Continued on page 108)
Amateur Radio Enjoys a Holiday

At the invitation of members of the Lakeside Radio Club of Lake Bluff, Illinois, over 1300 amateurs from 30 states, Canada, Porto Rico, Mexico and Brazil assembled to do homage to the station warming of the club station, W9PZ. Without a doubt this was the largest body of active amateurs ever congregated at one time. W5ZA and family drove continuously for 38 hours to be present. Some took day coaches from both coasts to be in attendance at a minimum of expense. Others hitch-hiked; some had to work all day Saturday, but the drive of some 300 miles did not keep them from making their presence known in the small hours of the morning following. On all sides one was impressed by the efforts made to attend the affair and from the expressions seen everyone had the time of his life.

The spirit of amateur radio certainly reached a pinnacle that day at Lake Bluff. The Lakeside Radio Club, with no commercial or political affiliation, no idea of reward, plenty of hard work, free beer and eats, set a sterling example by its playing host to all amateurs at no expense to anyone. The only request made each and every individual was that they have a good time! From all accounts this request was double-checked.

This outing as originally conceived by the dozen members of the Lakeside Radio Club was to extend a cordial invitation to each and every amateur radio operator. There were contests to be entered by all who desired. Hundreds of valuable prizes awaited those who won contests.

To be eligible for prizes one needed only to possess a ham call. No discrimination was shown any individual or group of amateurs. Prizes included seven different receivers, tubes up to and including a 35-kw. bottle (won by W4MU), all manner of chokes, transformers and condensers, resistors, etc. The YL's were remembered with silk hosiery and facial cream, a vacuum cleaner, electric iron and percolator set.

One of the first events of the day was a tennis match between four tennis professionals at the adjoining Shoreacres Country Club. Chick Evans and Jack Westland demonstrated some trick golf shots. Contests of a nature to attract the YF's and YL's in cooperation with the OM's were featured. Hamfassets and greeting the DX men present was the stellar attraction of the day. There was not even time for scheduled talks. Everyone was on his own to enjoy himself as he saw fit. There were no political discussions; the usual amateur heated arguments were conspicuous by their absence.

All young squirts? You should have seen the mob that gathered at Matty's call to look at men who had started in ham radio with spark. We recall seeing W5ZA of Roswell, N. M., W9ZN, W9AA, Mr. W. J. McGuffage of original 9AC and W9ZA among this group.

The final scheduled event of the evening was a description of the event and talk on amateur radio over the Blue network of NBC by Donald McGibney, news-commentator.
Of particular interest was the club station W9PZ. Entirely built by Wm. P. Hilliard and installed by the club members, transmitters in the shack include 1-kw. c.w. and 'phone transmitters for 20, 40 and 80 meters with a crystal-controlled set under construction for 5 and 10 meters. Included among the receivers are: S.S. receiver with 2 stages of preselection and 2 trap circuits, single or duplex crystal filter; AGSX with special preselector, trap circuit and audio built by National Co. especially for W9PZ, and a Grunow all-wave console model. At the operating position there is a relay rack which holds the S.S. receiver, a cathode ray oscilloscope and four selector switches for direction selection of the directive antenna which is 600 feet away. We hope to have a complete description of this station in an early issue. For those who didn't see the four aluminum masts 66 feet high we are reproducing a photo which partially shows the masts and tuning houses at the center and corners of the

(Continued on page 108)

A.R.R.L. Copying Bee—December 14th

JUST for some good fun, and to give hams opportunity to try their hand at copying some unusual word combinations, figure groups, and simple punctuation, a copying bee will be scheduled. There may be trick words, or even misspelled words, words sent in no particular sequence. The transmissions will be between 50 and 100 words in length. The sending will be by tape at about 20 to 25 words per minute. It will be a test to copy what you hear.

Transmissions will be made by five high-power amateur stations, all using "automatic" equipment. Stations in each time zone will transmit different text. Great care will be taken to make all messages equally difficult. Intentional errors will be inserted; different errors, different words, different word order. It will be worse than useless to try to correct or compare messages. Possibly no one will make perfect "copy." We urge everybody who knows the code at all to take part and send in whatever they get. It will be interesting to see how we all fare in the copying bee. A full report will be given in QST.

The schedule of transmissions for Friday night, December 14th, is as follows:

<table>
<thead>
<tr>
<th>Station</th>
<th>Frequency</th>
<th>E.S.T.</th>
<th>C.S.T.</th>
<th>P.S.T.</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1MK (Hartford)</td>
<td>7150 kcs.</td>
<td>9:15 p.m.</td>
<td>8:15 p.m.</td>
<td>6:15 p.m.</td>
</tr>
<tr>
<td>W1MK (Hartford)</td>
<td>3825 kcs.</td>
<td>9:15 p.m.</td>
<td>8:15 p.m.</td>
<td>6:15 p.m.</td>
</tr>
<tr>
<td>W9UZ (Chicago)</td>
<td>7183 kcs.</td>
<td>10:15 p.m.</td>
<td>9:15 p.m.</td>
<td>7:15 p.m.</td>
</tr>
<tr>
<td>W2AYN/9 (Chicago)</td>
<td>3510.5 kcs.</td>
<td>10:15 p.m.</td>
<td>9:15 p.m.</td>
<td>7:15 p.m.</td>
</tr>
<tr>
<td>W6ZF (San Francisco)</td>
<td>7030 kcs.</td>
<td>11:15 p.m.</td>
<td>10:15 p.m.</td>
<td>8:15 p.m.</td>
</tr>
<tr>
<td>W6AM (Long Beach)</td>
<td>3720 kcs.</td>
<td>11:15 p.m.</td>
<td>10:15 p.m.</td>
<td>8:15 p.m.</td>
</tr>
</tbody>
</table>

The rules for taking part in the copying bee are very simple,
(1) Any amateur operator, not having access to the tape or transmission copies at the above stations, is eligible.
(2) Only one copy shall count. Mark the one copy which you are submitting as your "best."
(3) It is not necessary to submit more than one copy . . . but please report all the above stations heard.
(4) Send in original copies. Re-copying messages invariably introduces errors and detracts from credits.
(5) Copies must be mailed within ten days of December 14th to be counted.

A silver loving cup has been selected as a trophy to be presented to the winner of the copying bee. A reproduction of this cup trophy is given herewith. In addition to the cup, a winner in each A.R.R.L. Section will be selected and a further suitable award made.

The stations will each send V's with frequent identification by call signal, for at least ten minutes before the scheduled transmission time. All amateurs are requested to note the frequencies listed and endeavor to cooperate by keeping silence on these and closely adjacent channels during the transmission of the copying bee material, which will start at the time indicated. All set? Remember, copy what you hear. Even if you get only part of a transmission, send it in so we can credit you for what you get. Best luck in the copying bee.

— F. E. H.
Increased Sensitivity With the Regenerative Detector

By Rinaldo De Cola*

In this article the author discusses a little-considered angle of reception with oscillating detectors. The information here, in conjunction with that in Robinson's "Regenerative Detectors" in February, 1933, QST, should enable the amateur using the regenerative type of receiver to obtain considerably improved performance.

FOR the proper reception of continuous-wave telegraphic signals it is necessary, in addition to the normal detection or rectification of the signal, to use some local source of oscillations of slightly different frequency from that of the received signal to obtain an audible beat. In the short-wave regenerative receiver the oscillating detector fills the rôle admirably from the standpoint of reliability and economy.

The oscillating condition of such a circuit makes for excellent selectivity and very good sensitivity.1 This arrangement of a single tube acting as both detector and oscillator has, however, certain inherent limitations which it would be desirable to overcome. Briefly, these limita-

In Fig. 1 is shown the grid voltage-grid current characteristic curve of a typical detector tube. The point where maximum efficiency as a detector

will be realized is approximately at the point of maximum curvature; that is, the point where the curve is changing its direction most rapidly. In Fig. 1 this point is indicated by A. It is generally impossible to operate at this point and still have the tube oscillate, however, because of the rise in the tube plate circuit resistance (caused by reducing the regeneration control) which assumes a value sufficient to stop oscillations. Consequently it is necessary to keep the point of detection to some value near B, where $r_p$ is of a value suitable for sustained oscillation. This variation of $r_p$ and the detection efficiency is entirely dependent upon the setting of the regeneration control.

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*527 Fairfield Ave., Bridgeport, Conn.

1Robinson, "Regenerative Detectors," QST, February, 1933.—Ed.
DETECTION EFFICIENCY AND FEEDBACK AMPLITUDE

Fig. 1 illustrates detection with the tube in a non-oscillating state. For the condition of an oscillating detector, Fig. 2 will show just how detection efficiency is dependent upon the amount of feedback or regeneration. With the tube oscillating vigorously the amount of feedback voltage to the grid is quite large, and is represented by the continuous wave $E$ of Fig. 2. In grid detection the normal grid potential is reduced when an alternating voltage is impressed upon it. Thus in Fig. 2 the voltage $E$ causes the grid to assume an operating point lower than $A$, which can be represented by point $B$. Since the curvature at $B$ is considerably less than at $A$, detection at this point will be poor.

Assume that a receiver is at hand and that detection is at point $B$ because of the oscillating condition of the circuit. If this set were tuned to a c.w. signal there would be a beat between the received signal and the receiver oscillations, which after detection would result in a voltage $E'$, representing the beat note. The voltage $E'$, causes amplified variations in the plate current of the tube at the point $C$, the current variation itself being shown at $I$. It will be noticed that the plate current decreases, as would be expected.

This decrease in plate current for a given grid voltage is a measure of detection efficiency or sensitivity. The greater the decrease for a given signal the greater the sensitivity. Consequently if the plate current curve in Fig. 2 and $C$ could be made more vertical (since the steepness determines the amplification of the tube) greater plate current variations could be obtained, resulting in greater sensitivity. Thus if the detected grid voltage $E'$ could be impressed at some point near $D$ on the $I_p$ curve, the results would be much better. This desirable condition can be obtained as shown in Fig. 3, which is identical with Fig. 2 except that the magnitude of feedback voltage $E$ has been considerably reduced.

The advantages of reducing $E$ are apparent. The operating point $B$ now lies much closer to $A$ and because of the greater curvature at this point a greater rectified voltage $E'$ is obtained. Also, since point $C$ now lies on the steepest portion of the plate-current curve the rectified voltage $E'$ on the grid gives a much greater change in plate current, resulting in greater amplification. While it is generally quite easy to operate an oscillating detector at $B$ of Fig. 2, the increased efficiency by using $B$ of Fig. 3 cannot be approached, because the receiver stops oscillating before this point can be reached.

This phenomenon is naturally most annoying in the reception of weak signals. As the regeneration control approaches the point where the tube stops oscillating the received signal steadily becomes louder, but just as it seems that the maximum point is being approached the receiver suddenly stops oscillating. During this time the operator is putting the detector tube through the various points of operation indicated in Figs. 2 and 3 but, because of the limitations of the tube as an oscillator, cannot reach $A$, the point of maximum detection. This phenomenon usually is misinterpreted, most operators thinking that it is the intensity of the local oscillations which governs the intensity of the signal, whereas in reality it is because the proper points on the detection-amplification characteristics cannot be reached without stopping oscillations. The intensity of the local oscillations plays only a minor rôle; the detector tube operating points are the factors of paramount importance.

FIG. 3--OSCILLATING DETECTOR UNDER NEARLY IDEAL CONDITIONS

The weak local oscillation causes only a slight shift in the operating point, resulting in greater rectification efficiency in the grid circuit and greater amplification of the rectified signal.

FIG. 4--TYPICAL SELECTIVITY CURVE OF A DETECTOR AT CRITICAL REGENERATION, SHOWING THE LOSS IN SIGNAL STRENGTH CAUSED BY DETUNING FOR BEAT-NOTE RECEPTION

For a beat note of constant frequency, the loss of signal strength will be greater as the frequency to which the circuit is tuned is decreased.
AUTODYNE VS. HETERODYNE RECEPTION

As has been pointed out previously,1 this system is further limited because for c.w. signals the receiver must always be tuned slightly off the frequency of the station being received. Because of the oscillating condition of the tube—which really means a condition where the losses or resistance in the grid circuit have been completely neutralized or reduced to zero—the selectivity of this circuit is very high.2 With such sharp tuning the full intensity of the signal is not impressed upon the grid, resulting in a further loss of signal strength. This point is illustrated in Fig. 4. The curve shown in this figure corresponds to the selectivity of the oscillating tube circuit, and the point T indicates a point 1000 cycles (the beat note) from the actual frequency of the station. The difference in height between point T and max. measured along the line Y, which represents voltage, will give the value of voltage lost because of the selectivity of the tuner.

Many radio amateurs who possess monitors have noticed that if the monitor is adjusted to a frequency near that of a station to which the receiver is exactly tuned (with the detector regenerating but not oscillating) much better reception is made possible. This will not work equally well in every case, since the effect depends upon the strength of the signal from the monitor. For best results this signal should be comparatively weak, as has already been shown.

The use of an external or separate oscillator, with means provided for varying the output voltage, is desirable, for not only can the full signal voltage be applied to the detector grid, but in addition the best operating point of the detector tube can actually be utilized. In all cases the detector should be of the regenerative type, although never actually oscillating.

Such a system makes an excellent all-round receiver, in spite of the necessity for using a separate oscillator. For instance, take the case of strong local signals which block the detector tube and prevent it from oscillating. The use of a separate oscillator makes this blocking impossible, since none of the signal voltage is impressed upon the oscillator, with the result that the strongest signals can be heterodyned. Also, when local stations are operating on a frequency near that of a weaker station which it is desired to receive, the local signal usually stops oscillations in the detector tube, making it impossible even to hear the weaker one unless a separate oscillator is used.

A schematic diagram of an experimental receiver of this type is shown in Fig. 5. There is nothing really new about it except the control V, which varies the oscillator voltage delivered to the detector tube. A good value for V is about 10,000 ohms. Coils L and L' are five turns each wound on a one inch form. All other circuit constants are identical to those normally used in short-wave receivers.

Polish Section Announces DX Contest

P. Z. K. Sponsor Competition — December 2d–16th

THE Polish society of the I. A. R. U. is sponsoring a DX contest between Polish amateurs and the rest of the world. Starting at 0001 G.T. on December 2d, the contest ends at 2400 G.T., December 16th. Polish competitors will send one group containing a cipher and four characters to each amateur worked and the group must be copied without error for credit. This group number must be confirmed on a QSL card to be addressed to the station worked. At the conclusion of the contest all these cards should be sent to the Polish QSL Bureau, P. Z. K., Lwow, Bielowskie 6, Poland. All cards must be there by May 31, 1935.

The points for each QSO for Polish and foreign competitors will count as follows:

1 point: All European countries (except those mentioned below).
2 points: Portugal, Ireland and Malta.
3 Azores, Canary Islands, Algeria, Tunisia, Morocco, Egypt, Tripoli, Syria, Siberia, Armenia, Turkestan, Iraq, Palestine, Transjordan, Asiatic Turkey, Sahara, Faroe Islands.
4 points: The rest of the African continent (except the Union of South Africa, Angola, (Continued on page 78)
What the League Is Doing

League Activities, Washington Notes, Board Actions—For Your Information

Election Results

In the Central, Hudson, New England, Northwestern and West Gulf Divisions of the League, balloting is now taking place to elect a division director for 1935–1936 and, in all these divisions except the West Gulf, an alternate director as well.

When the Executive Committee met to examine the nominations for this year's elections, it found that in some of the divisions there was but a single nomination for a qualified candidate. Our by-laws provide that in these cases the Executive Committee must declare the single candidate elected, without the need for balloting by the membership. Several elections of this nature are now to be reported:

In the Roanoke Division there was but one nomination for director, for Professor H. L. Caveness, W4DW, who now holds the office. Professor Caveness accordingly has been declared reelected as Roanoke Director for the 1935–1936 term. Similarly there was but one nomination in this division for alternate director, and Mr. J. Frank Key, W3ZA, of Buena Vista, Virginia, has become the alternate director for the same term.

The same circumstances prevailed in the Rocky Mountain Division nominations and Mr. Russell J. Andrews, W9AAB, the present director, has been declared reelected for the new term. There was but one nomination for alternate director from this division, which has resulted in proclaiming the election of Mr. Lewis D. Stearns, W6BTX, of Salt Lake City, as the alternate director.

In the West Gulf Division, although the membership is balloting between three candidates for director, there was but one nomination for alternate director, and Mr. David H. Calk, W5BHO, of Houston, Texas, is the alternate director for 1935–1936.

For the results of the elections by balloting, listen for the special broadcasts from W1MK commencing the night of December 20th.

Election Notice

You are hereby notified that J. C. Hagler, Jr., has resigned as A.R.R.L. Director from the Southeastern Division, his resignation to become effective upon election of a successor. You are also notified that a special election for A.R.R.L. Director is about to be held in the Southeastern Division to fill the remainder of the 1934–1935 term left vacant by this resignation. Your attention is invited to Section 1 of Article IV of the Constitution, providing for the government of A.R.R.L. affairs by a Board of Directors; Section 2 of Article IV defining their eligibility; and By-Laws 10, and 12 to 20, inclusive, providing for their nomination and election. Copy of the Constitution and By-Laws will be mailed any member upon request.

The election will take place during the period between December 15, 1934, and February 1, 1935, on ballots which will be mailed from Headquarters in the first week of that period. The ballots will list the names of all eligible candidates nominated for the position by A.R.R.L. Southeastern Division members.

Nominating petitions are hereby solicited. Ten or more A.R.R.L. members of the Southeastern Division have the right to nominate any member of the League in that division as a candidate for director therefrom. The following nominating form is suggested:

(Place and date)

Executive Committee
American Radio Relay League
West Hartford, Conn.

Gentlemen:

We, the undersigned members of the A.R.R.L. residing in the Southeastern Division, hereby nominate ............... .......... of ................ as a candidate for director from this division for the remainder of the 1934–1935 term.

(Signatures and addresses)

The signers must be League members in good standing. The nominee must be a League member in good standing and must be without commercial radio connections: he may not be commercially engaged in the manufacture, selling or renting of radio apparatus or literature. His complete name and address should be given. All such petitions must be filed at the headquarters office of the League in West Hartford, Conn., by noon of December 15, 1934. There is no limit to the number of petitions that may be filed, but no member shall append his signature to more than one petition.

This election is the constitutional opportunity for members to put the man of their choice in office as the representative of their division. They are urged to take the initiative and file nominating petitions immediately.

For the Board of Directors:

A. L. Budlong,
Acting Secretary

(Continued on page 74)
Band Switching for the Transmitter

A Five-Band Transmitter Without Plug-in Coils

By D. A. Griffin, W2AOE*

If every amateur could rub the fabled lamp of Aladdin and have the equally fabulous genie appear in a crash of static to do his bidding, how terrific the QRM would become! Without a doubt a miniature Rocky Point would appear in every aspiring Marconi’s back yard. Certainly we could expect a row of push buttons, conveniently located alongside the diversity receiver, controlling a kilowatt rig on each band. Inasmuch as the lamp has been lost for, lo, these many years, and because “R.F.C.” loans are not granted if we attempt to put up our QSL cards as collateral, QRM from such amateur stations will not be a very decisive factor in the future picture.

Unquestionably, every ham would delight in operating such an installation, but space and financial limitations preclude the possibility of such a layout to a vast majority of us. In the past our transmitters, like Topsy, have “just growed” into multi-stage affairs requiring a basketful of plug-in coils and the services of an engineer to reneutralize, trim antennas, and add or subtract buffer or doubler stages in order to shift from one band to another.

The writer for one has become heartily sick of the fractional-second service obtained in the aforementioned “dream station” is impossible, with a little practice shifts from band to band from the oscillator to the antenna tuning can be made in a fraction of a minute.

Band Switching Circuit

Referring to the circuit diagram, Fig. 1, we find a 47 oscillator, conventional in the grid circuit except for a tap switch which makes possible the selection of one of three crystals. The plate circuit is old stuff to operators of commercial transmitters, even if a bit unusual-looking to the amateur. Coil $L_1$ in combination with $C_1$ resonates in 3.5-mc. band. If the switch is thrown so that $C_1$ is connected across the coil, the circuit becomes a high-$C$ 1.7-mc. tank. When the switch is thrown to the tap short-circuiting half the coil, the circuit resonates on the 7-mc. band. If suitable crystals are provided for 1.7-mc., 3.5-mc., and 7-mc. bands, six operating frequencies are available on four bands (assuming the final stage works always as a straight amplifier) merely by turning the two switches to the proper taps and tuning $C_1$ to resonance.

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**FIG. 1—BAND-SWITCHING TRANSMITTER CIRCUIT**

The same circuit diagram could be used with other screen grid tubes, such as the 865 and 860, with suitable changes in applied voltages.

- $C_1, C_2$—150-μfd. variable, midget size.
- $C_3, C_5$—350-μfd. fixed.
- $C_1, C_2$—100-μfd. fixed.
- $C_7$—150-μfd. variable, double-spaced.
- $R_1$—20,000 ohms, 2-watt.
- $R_2$—20 ohms, centered-tapped.
- $R_3$—50,000 ohms, 20-watt.
- $R_4$—20,000 ohms, 10-watt.

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*R. Leeds, 45 Vesey Street, New York City.*
The advent of inexpensive screen-grid tubes is one of the chief reasons for the development of the transmitter. Of course, tetrodes cost more than triodes of equivalent power rating. However, there is practically no difference in the cost of a neutralized triode stage and a stage of this type using 859's because only one fixed coil form is required instead of three or four, and no neutralizing condenser is needed.

Tetrodes of this type are hi-mu affairs requiring a very small amount of excitation power, so conventional capacity coupling is used between the oscillator and the first 859 buffer-doubler. Another decided advantage is the fact that lack of bias does not cause the plate current to rise excessively. This makes the use of grid-leak bias possible throughout. The switch in the plate circuit, which normally tunes to 3.5 mc., provides condenser padding for 1.7 mc. while the two taps on the coil make it possible to tune the circuit to 7 mc. and 14 mc. as well. The padding condensers are of the flint-glass dielectric type capable of carrying large r.f. currents efficiently. The third stage is essentially the same as the second except that an additional tap on the coil makes it possible to use the last tube as a 28-mc. doubler. Inasmuch as the buffer and final stages do not require neutralization, it is easy to see that operation is possible with a wide variety of combinations. That is, both 859 stages may be used as buffers or doublers on five bands. If a single tube is used in the final stage operating as a straight amplifier, the output is 30 watts on all bands. If the stage is used as a doubler, 15 watts output can be obtained except on 28 mc. where approximately 8 watts can be secured. Of course, two tubes may be used in parallel in the final amplifier with a corresponding increase in output. While theoretical-minded amateurs may feel dubious about the losses occasioned by the short-circuited turns, it might be well first to point out that the best test of all is that it works—and works well. If apparatus of quality is employed and the switches are well made so that the "short circuits" really are short circuits, the losses run between 1% and 2% per stage, according to commercial people. These losses are not additive insofar as the output is concerned. That is, if the final stage is properly excited as a Class-C amplifier, we do not particularly care about the efficiency of the stages ahead so long as they are not overloaded. And we can cross off the small loss in the final stage in favor of the enormously increased flexibility of the unit over conventional transmitters.

TRANSMITTER LAYOUT

The photographs show the transmitter used by the writer to excite an 880 amplifier. The base is made of 20-gauge steel, 17 by 10 by 2 inches, and can be fastened to an 8½ by 19 inch panel for mounting on a standard rack. The baffle shields necessary to prevent interaction and consequent self-oscillation are 10 inches deep and 6½ inches high, having a half-inch lip at the bottom so that they may be easily fastened to the base. Closed-circuit jacks are provided in the three plate circuits so the plate current can readily be measured. The switches were a problem, in that none fitting the requirements—fairly small size and high efficiency—were commercially available.

Accordingly, they were home-made from vintage 1922 two-leaf switch blades and taps, the assembly being made on small sheets of Mycalex 3 by 8½ inches.

Six General Radio pin jacks are mounted on the side of the base for the crystal holders, the "hot" side jacks being insulated from the chassis with washers. The knob at the left of the crystal switch in the front view was originally used to vary the screen voltage on the first buffer. No advantage resulted from the use of this control in the experimental work, and it has accordingly been omitted from the diagram. The coupling condensers and grid chokes are mounted in the preceding stage in each case so that grid-plate coupling is minimized. Very short grid leads are brought through the baffle shields by means of Birnbach lead-through insulators. All of the switch leads should be short and direct and should be made with the

(Continued on page 98)
With the Affiliated Clubs

The following amateur radio clubs are the most recent additions to the A.R.R.L. "Affiliated Club" group. Both were affiliated on November 2, 1934:

The 73 Radio Club of Franklin County, Wilton, Maine.

Your affiliated brothers greet you, OMs!

With zero weather fast approaching we find club groups getting in the winter fuel supply, making necessary repairs to club shacks, checking up on transmitting and receiving gear, antenna facilities and the like in anticipation of a "rip-snorting" radio season. There's nothing like being prepared. With the season of hard weather and attendant storms in the offing it behooves all amateur societies to make sure their community is guaranteed communication in case of emergency. How is the emergency rig at your club?

Houston Amateur Radio Club

Fifteen years is a long time. The Houston (Texas) Amateur Radio Club celebrated the fifteenth anniversary of the founding of the Houston Radio Club by a special party on September 27th. The affair also marked the first anniversary of the H.A.R.C. being in its new quarters at Sam Houston Hall. About seventy-five members and visitors were present. Among these was Mr. Alfred Daniels, one of the first Houstonians to become interested in radio. Another real old timer present was Mr. Lloyd B. Quinby, who gave a talk on amateur radio, more or less a complete history of the game. Mr. Quinby proved his status as an "old timer" by displaying an A.R.R.L. membership certificate dated 1919!

Chair Warmers Club

Lives there a ham with knowledge so small that he hasn't heard of the Chair Warmers Club? We rather doubt it. Walt Colpus, W8BRS, Secretary, 23 Henderson Street, Pontiac, Michigan, writes that the C.W.C. is paged to get in touch with all shut-in, blind and physically handicapped amateurs, for whom the club was organized. Drop a line to W8BRS and you will receive a twelve page illustrated booklet telling about the Chair Warmers Club.

Bluefield Amateur Radio Club

The Bluefield (W. Va.) Amateur Radio Club is heading for 100% A.R.R.L. memberships within the club. Here is how they do it, quoted from a communication from the secretary, C. L. Andrews:

"Where it was necessary, the club lent the money to its members for the purpose of renewing their League memberships, allowing them to repay it in 'easy installments.' We also adopted the plan of assessing each member a small amount monthly so that a year from now every club member will have paid-up membership in the A.R.R.L. for the following year. These dues will be considered as a part of the regular club dues. A member who fails to keep up his payments for A.R.R.L. membership will be dropped from the club. In this manner we have insured the club again ever being without the percentage of A.R.R.L. memberships required for affiliation, and at the same time have made the keeping up of League memberships simple and 'painless.' We are revising our constitution so that the number of unlicensed members in the club will never be more than forty percent of the total membership."

Richmond Short-Wave Club

The Richmond (Va.) Short-Wave Club is holding a DX contest for members from November 15th to December 15th. Airline distances as shown on a flat map will be used and each contact will count as follows: 0-1000 miles, one point; 1000-5000, two points; 5000-10,000, three points; 10,000 and up, five points. Some type of card verification must be presented for each contact. Score for any one contact is found by multiplying the points claimed for the contact by a "band multiplier": 1.75 me., multiply by five; 3.5 me., by four; 7 me., by two; 14 me., by one; 28 me., by five; 56 me., by ten. The final score is multiplied by a "power factor" ("power" being the input to final stage): Less than 50 watts, multiply by ten; 50-100 watts, by five; 100-250 watts, by two; over 250 watts, keep original score. The contest is between "operators" not "stations." Individual scores of each operator at "more than one operator" stations must be presented. Any station worked may count once only in the contest. Other clubs may find some helpful suggestions in these rules laid down by the Richmond Short Wave Club for a DX contest.

Modesto Club Awards Wouff-Hong Trophy

The Modesto (Calif.) Amateur Radio Club has awarded its Wouff-Hong Trophy for the year ending October 1, 1934, to W6FYT, station of Mr. W. H. Jones, Ontario, California. This yearly award is made by the Modesto club to the
“best station in the Sixth District” competing in a contest covering (1) DX miles per watt, (2) Traffic handled, (3) Operating ability, and (4) Percentage of homemade apparatus. The DX record of W6FYT is an enviable one and includes the feat of Working All Continents in 48 minutes!

San Angelo Radio Club

In an attempt to increase its membership the San Angelo (Texas) Radio Club conducted a membership contest, running for thirty days. Club members over thirty days delinquent in dues could not participate. To be eligible for first prize a contestant was required to have at least five paid applications, for second prize at least three paid applications, and for third prize at least one paid application. Mimeographed application blanks were furnished all participants.

The Mike and Key Club

A system of bartering has been inaugurated for members of the Mike and Key Club of Baltimore, Maryland. Interested members notify the secretary, who keeps a list of the apparatus to be sold or exchanged. This is a good suggestion for other organizations to follow; it creates considerable interest. The first fall meeting of the Mike and Key Club was held October 2nd, at its new headquarters, the New Howard Hotel, Baltimore. Thirty-eight new members were enrolled!

Central New York Radio Club

There is a feeling of satisfaction in having a hobby that we can tell the world about with pride! And we should tell the world about amateur radio at every opportunity. Had you attended the New York State Fair this year, September 1st-8th, you would have seen a mighty fine display and above it you would have seen a large sign reading “Amateur Radio Exhibit.” This was made possible through the initiative of the Central New York Radio Club of Syracuse. Not only was it an exhibit; it contained also a complete, modern, workable 1.75-mc. amateur radiophone signing W8FXX portable. Unlike many exhibit stations W8FXX really worked them! As a bit of a novelty W8FXX was re-broadcast through W8CYT on 14 mc. ‘phone and several west coast stations were contacted as well as LA1G. 56-mc. work was not lacking and mobile contacts were maintained all over the grounds. In a building other than the one that housed W8FXX was a 7-mc. rig operating under call W8HWM BT 8. This was used in connection with the main exhibit to relay traffic and to act as an auxiliary should W8FXX break down. In addition to modern equipment the booth carried a display of equipment of 1913-1924 vintage. To show visitors what amateurs were doing a large map, with strings running from various countries to QSL cards received by local amateurs, showed the numerous countries worked. A poster proclaimed the need of amateur radio in times of disaster. Foreign QSL cards from over seventy countries in all continents adorned the wall. Much good can be accomplished by amateur radio exhibits when they are properly conducted. They afford an opportunity for the general public to get a better understanding of what “ham radio” is all about. Well done, C.N.Y.R.A.

Providence Radio Association, Inc.

Two 80-foot steel towers formerly used by a broadcasting station are one incentive that led the Providence (R.I.) Radio Association to move its quarters! What club would pass up the opportunity to use two nice masts like that? A club transmitter is under construction, parts for which have been donated by members. The club conducts code classes two nights per week. A club bulletin is being considered, and the P.R.A. is anxious to receive sample copies of other club publications. The biggest news of the month from Providence is that the P.R.A.’s annual hamfest will be held Saturday, January 19, 1935. All amateurs are invited. An all-day session is scheduled with contests, technical discussions, dinner and prizes. Reservations for individuals or club groups can be arranged by writing directly to the Providence Radio Association, Inc., 3 Valley Street, Providence, R. I. W1GNT, W1ARK, W1BIT, W1BC and W1CAB are in charge of the hamfest.

(Continued on page 94)
Staging a 56-Mc. Hidden Transmitter Hunt
An Idea for Hamfests and Clubs

By John Hogen, W3BRX

The Amateur Radio Association of New Jersey conducted a hunt for a 56-mc. hidden transmitter in early August. While none of the contestants was actually successful in finding the hidden transmitter, the event aroused sufficient enthusiasm to warrant sponsorship of another hunt on a somewhat larger scale.

Accordingly, a second affair was staged in September. The preparatory work consisted of finding a location for the h.t. (hidden transmitter) which would not be too difficult to approach with a car and yet would be fairly well hidden. Such a location was found on the estate of Mr. E. J. Edwards, on a hill 600 feet high, south of Grand View Park near Paterson, N. J. Mr. Edwards kindly offered his premises for the event.

The committee next prepared envelopes containing the following advice and instruction:

INSTRUCTIONS FOR CONTESTANTS
56-Mc. Hidden Transmitter Hunt

1. Be sure gas tank is full.
2. Check water in radiator (hills!).
3. Light lunch is advised.
4. Hidden transmitter will start transmissions at 9:15 a.m. EDST, rain or shine, and will be off the air at 12:30 p.m. EDST. A 1000-cycle tone will be emitted between transmissions.

5. Proceed to your starting point given below and find token. Contestant must present token to be eligible for prize. Your token is on telegraph or power company pole #MTC 42F located in Montville, beyond paper mill near end of macadam road.

6. A first and second prize will be offered.
7. At 1:00 p.m. EDST, please meet at D. L. & W. R. R. station at Lincoln Park, N. J., for discussion and "rasberries."

THE WINNING CREW
Charles Atwater, W2JN, is taking (or pretending to take) a bearing with the horizontal antenna.

The token referred to consisted of a card on which was written: "This is your token." This was secured to a power line pole at the contestant's starting point. Incidentally these power line poles are very conveniently numbered.

With favorable weather prevailing on the chosen morning, W3CZL, W3AKT, and W2GFZ—provided with lunch, camp chairs, etc.—made themselves comfortable at the h.t. site. At 8:30 a.m. a third member of the committee handed out the instructions to the contestants as they arrived at a point previously agreed upon, and instructed them to "get going" before opening the envelopes. This was to prevent comparing notes and thus perhaps gaining an idea of the general location of the h.t.

At 9:15 a.m. the transmitter was started up and, later announcements had been made, the 1000-cycle tone was put on the air with station announcements made every 15 minutes.

At 10:15 a.m., W2JN and his assistant, R. D. Compton, broke in upon peace and quiet of the h.t. site. They had used a rotating full-wave doublet to obtain bi-directional bearings and an inclined half-wave antenna to determine from (Continued on page 92)
Practice vs. Theory in Antenna Performance

A Discussion of the Effect of Metal Masts on the Field Pattern

By Edward W. Sanders, W3AKU

THE theoretical radiation patterns produced by vertical and horizontal transmitting antennas of the Hertzian type are familiar to most amateurs. The vertical type will radiate equally well in all directions in the horizontal plane; while the horizontal radiates most strongly in a direction at right angles to its axis. Fig. 1 illustrates the symmetrical pattern created by a vertical antenna; its omnidirectional characteristics are apparent. The pattern of a horizontal radiator also is shown in Fig. 1; it is evident that this type has a decided bi-directional effect, and that there is theoretically little or no radiation along the line of the axis of the antenna.

In the course of some experiments by the author with various types of antennas it was noticed that there was considerable disagreement between theory and practice in the operation of the horizontal system. While the antenna radiated strongly to the north and south, which was according to theory, there was almost as strong a radiation towards the east and west. If a recognized theory does not agree with practice the fault is in many cases traceable to the observer's overlooking some important factor in the problem; such was the case here. In order to uncover the disturbing quantities let us examine the apparatus used.

Since the transmitter itself could have no directional effect we shall skip over that part of the apparatus with just a pause to remark that it had an output of approximately fifty watts, crystal-controlled. The experiments all took place in the 14-mc. amateur band. The antenna was fed with a transmission line of negligible radiation characteristics. The flat-top was suspended by steel poles at a height of eighteen feet above a three-story building and was cut for one-half wavelength. There were no other antennas or metallic structures within a reasonable distance of the transmitting antenna. On looking over the installation it occurred to the author that the steel poles might have some distorting effect on the field pattern. No data on this could be found in various textbooks, aside from the statement that the use of steel masts was observed to cause losses in certain instances. To check the possibility of such distortion, a detector and electronic voltmeter were set up to measure the field strength and plot a pattern. By making certain changes in the antenna system the resulting change in the field pattern could be noted and the results analyzed. A description of the experiments and the results obtained therefrom follow.

THE EXPERIMENTS

The pattern shown in Fig. 2 was obtained from the antenna already described above. It can be seen that in addition to the legitimate field of the antenna there is also strong radiation in the direction of the axis. Here was the explanation for the ease with which this particular system was able to work eastern and western stations. By placing the measuring apparatus on a line which was an extension of the axis and noting the effect of horizontal and vertical receiving antennas on the field detector, it was observed that the radiation was vertically polarized. Such being the case it was assumed that there was some radiation from
the transmitting supports. It was impossible for the wave radiated from the antenna itself to change its polarization in the short distance between transmitter and field equipment. The supports used were ungrounded, but further tests with grounded masts made no startling difference in the results.

The metal poles were then replaced with wooden ones, and the field strength measurements repeated. In this test the easterly and westerly radiation dropped to a very low figure and a pattern very similar to the ideal shown in Fig. 1 was obtained. It was also observed that radiation to the north and south had increased somewhat in intensity.

Comparing the two sets of data thus secured, it was reasoned that if the metal poles could be moved out of the immediate field of the flat-top the radiation in the direction of the axis would be materially reduced. The necessary space to make this test in the same location not being available, a local transmitting antenna was pressed into service. The insulators at both ends of the flat-top were connected to the supports by ropes approximately 15 feet long. No figure was plotted for this experiment, but it was noted that the signal intensity in a portable receiver placed on an extension of the axis dropped from, in amateur parlance, R9 to R6.

As a further check on the mast effect, the pole on the western end (using the same antenna) was moved closer to the flat-top, and the pattern depicted in Fig. 3 was obtained.

Moving the pole on the eastern end in place of that on the western gave identical results, except that the "parasitic" field pointed in the opposite direction.

**CONCLUSION**

The experiments show rather conclusively that the field pattern of a horizontal transmitting antenna using metallic supports can be considerably distorted by such supports, and quite possibly also, in some locations, by broadcast receiving antennas, power lines, buildings, etc., in proximity to the antenna. A survey of local transmitting antennas disclosed the fact that 8 percent of them were suspended from metal poles of various heights, and in no case was the distance between the end of the flat-top and the pole greater than 5 feet. Doubtless the field strength would be still more distorted as the pole approaches a half wave in length. The distortions shown in the figures probably would not be so pronounced at the lower frequencies, because of the greater ratio between the length of the radiator and the height of most masts in use at present.

**Low-Power Screened Pentode Transmitting Tubes**

Just as we go to press come announcements from two manufacturers of a type of tube we've been wanting (and asking for) for quite some time—a small pentode having the same order of r.f. output as we ordinarily get from a 46, 59, etc., but with grid-plate shielding complete enough so that the tube can be used as an r.f. amplifier without neutralization. It is hardly necessary to add that the suppressor-grid connection is separate, thus making suppressor modulation possible.

Both RCA Radiotron and Raytheon Production Corp. are making the tubes. The development work apparently has been done independently, since the tubes brought out by the two organizations, although practically identical in output ratings, are of different construction and have different baying arrangements. The Raytheon tubes will be known as the RK-23 and RK-25, the difference in the two numbers being solely in the heater ratings. The 23 has a 2.5-volt, 2.0-ampere heater, while the 25 heater is rated at 6.3 volts, 0.8 amp. Other ratings follow:

- D.c. plate voltage 400 volts
- D.c. screen voltage 200 volts
- D.c. plate current 60 ma.
- D.c. screen current 35 ma.
- Plate dissipation 10 watts
- Nominal r.f. output 10 watts

The direct interelectrode capacitances are

- $C_{gp} = 0.038 \ \mu\text{fd.}
- C_{gs} = 10.0 \ \mu\text{fd.}
- C_{ps} = 10.0 \ \mu\text{fd.}

The grid-plate capacity, incidentally, is lower than that of any other transmitting screen-grid tetrodes now available.

The RK-23 and RK-25 will have 6-prong ceramic bases, with the plate connection brought out to a cap on top of the tube. The additional (Continued on page 78)
Highlights of the Convention Season

Midwest Division (Kansas City) Convention

STARTING promptly at 8 a.m. and winding up after the banquet the following evening, the Kansas City Convention proved of great interest to all. The first morning was taken up with examinations, hamfesting, exhibits and visits to local amateur supply houses.

At 2 p.m. on August 4th, with the temperature at 110°, the assemblage were officially welcomed by Col. Ruby D. Garrett of the Chamber of Commerce, who made all feel they were welcome in Kansas City. "Barney" Stanley, W9EJH, president of the Heart of America Radio Club, then took charge and introduced John Reinartz, W1QP. A talk was given by Mr. Kadell of the Raytheon Production Corp. on the RK-20 and RK-19.

"Grandpa" Kerr, W9GP, was then introduced to the gang. Phone and c.w. round tables followed with their discussions of modulation and traffic. After everyone had had his say, the lighting bureau of the Kansas City Power and Light Co. was visited. This led to a trip to KMBC on the edge of town, with Mr. Church providing the transportation. When everyone returned to the hotel the banquet on the first night was held with Everett Dillard, W9BKO, as toastmaster. Entertainment was provided by the KMBC staff. Elmo Melton, Guy Wilson and Barney Stanley gave short addresses. John Reinartz told about a bath he took in the ocean near the Arctic Circle. Commdr. Holton, representing the Naval Reserve, was introduced by Al Dodge, W9CFL. Keat Crockett, W9KG, represented the A.A.R.S. Radio Inspector MacDowell had a word for the gang, and Director Kerr invited us to the Convention at Lincoln. John Amis invited all to the Topeka Convention. John Reinartz wound up the evening with a demonstration of his home-made oscilloscope.

On Sunday morning Arthur Collins, W9CXX, opened the day’s sessions with much dope on antenna tuning systems. The Army and Navy had their discussions and were followed with a paper sent by the E. F. Johnson Co. of Waseca, Minn., read by Jay Wilcox, W9CUN. Herb Hollister, W9DRD, talked on zero temperature coefficient crystals. Mr. Wheeler of the University of Kansas talked on the peculiarities of high-frequency transmission. John Reinartz followed with a talk on the variation of angle of radiation of an antenna from the operating table. Before the main banquet contests were held and the big prize drawing was transferred to the banquet hall. Herb Hollister as master of ceremonies introduced those at the speakers table and won the hearts of all by saying there were to be no speeches! SCM Cannady of Missouri could not be present to receive the Activity Cup. The climax came when W9JPA and W9GUB walked away with a Hammarlund Pro apiece.

—F. D. L.

Dakota Hamfest Big Success

PIERRE, South Dakota, was the scene of the annual hamfest. The Pierre Radio Club sponsored the hamfest and Scott Davison, W9OED was chairman. The program started at 9 a.m. on October 13th, and every minute was filled with some activity until the final banquet on the following evening.

Trips were made to KGFX for the OM’s and the city and C.C.C. camps proved attractive to the YL’s and YF’s. An explanation and tour of the Dakota Central Telephone Company and their carrier system was headed by W9LBU. A code speed contest was won by W9OXC with W9SGI, W9IQZ and W9NM following in order.

The following day there was a demonstration of two-way 5-meter communication between ground and 'plane. Visits to ham shacks also proved popular. The banquet in the evening brought the program to a close.

—S. E. D., W9OED

Northwestern Division Convention

THE Northwest Division Convention held in Seattle at the Gowman Hotel, August 18th and 19th, was one that will long be remembered by those who were able to attend.

The evening preceding the convention the Amateur Radio Club of Seattle held an informal meeting where John Reinartz displayed and talked on pictures taken during his trip with Admiral Byrd to the Great Circle. A number of convention delegates that came early were in attendance.

The official convention opening started off with a welcome talk by a representative from the Mayor’s office, followed by interesting addresses from A. A. Hebert, officers of the Thirteenth Naval Reserve, and the United States Signal Corps. Following this meeting a car caravan carried the delegates to Seattle’s new Natatorium where swimming and diving contests took place with an enjoyable time for everyone.

The technical program featured interesting talks on "Radio Aids to Aviation," "National Park Service Portable Equipment," "Radio Problems in Alaska," "Impedance Antennas,"
and an exceptional talk and demonstration by John Reinartz. So interested were a number that he was detained for a considerable period following the adjournment of the meeting. The dance following was very colorful with wonderful music and professional entertainment.

On Sunday, August 19th, the usual traffic meeting and general meeting got under way where many important subjects were discussed. This meeting was followed by a special television show and demonstration which was the first of its kind ever shown in Seattle, and created considerable interest. Through the courtesy of the commander of the Naval Communication Reserve a cruise on the U.S.N.R. Eagle Boat 57 to visit the big radio station at Keyport was one of the major features of the convention. During this cruise a five-meter 'phone test was conducted with an airplane circling overhead and with 5-meter equipment at Boeing Field. All stations carried on successful communication which proved to be of much interest to everyone. The delegates that made this trip had the pleasure of going through the Government Canal Locks on both the out and in voyage. Coffee and doughnuts were served.

A number of brief talks were made with Mr. Ralph J. Gibbons as toastmaster at the banquet. Stanley Belevacu was lauded for his splendid work as S.C.M., and Larry Sobring of Everett, Washington, was voted the most outstanding amateur in the Northwestern Division. It was through a small majority vote that Wenatchee was served.

Many interesting phases of amateur radio were discussed and demonstrated on the first evening. Contests were held much of the following day with trips made to points of interest. Worthwhile radio equipment had been donated by many manufacturers as prizes.

Mr. George Freeman, president of the Louisiana State Fair, was the guest of honor. He assured us that room would be had for a complete amateur station to be in operation during the Fair, October 20–28th inclusive.

New Orleans next year, fellows!

—W. J. W., W9DWW

The Central Division Convention

THE 1934 Central Division Convention was held at Columbus, Ohio, under the auspices of the Columbus Amateur Radio Association on September 7th, 8th, and 9th. J. M. Bays, W8BZY, who assumed the chairmanship of all meetings, had his hands full keeping to schedule. Starting off with John Reinartz, W1QP, the lectures proved most interesting, with other talks by Fred Schnell, W9UZ, and Al Kahn of the Electro-Voice Manufacturing Company. Harvey Brauer of the Power and Light Company took one through the trials and tribulations of locating "radio troubles," and Mr. Dwyer of Chicago explained the making of condensers.

(Continued on page 86)
Quartz Crystal Fundamentals

The Piezo-Electric Effect, Crystal Cuts, and Applications

By J. M. Wolfskill*

The use of quartz crystals has become so essential to the peak operation of present-day amateur transmitters and receivers that it seems to us that the time is ripe for collecting the widely-scattered information on crystals and presenting it in a form which will be helpful to amateurs. This article—which sets forth, as its title states, the fundamentals of piezo-electric crystal action—is the first of a series which will cover various phases of the subject. In the second article another author will describe practical methods of cutting and grinding crystals.

T

HE properties of quartz crystals which make them useful in many electrical circuits are due largely to the piezo-electric effect. If a piece of crystalline quartz is strained mechanically, it sets up an electric field in its neighborhood, inducing charges or electric potentials on conductors in that field. Hence the derivation of the term "piezo-electric," from the Greek expression "piezein," which means "to press." Conversely, when a crystal is placed in an electric field, a mechanical deformation takes place.

Quartz, however, is not the only crystalline material to exhibit these phenomena, nor is it the most "active." Rochelle salt crystals have a much more pronounced piezo-electric activity. Common cane sugar also has marked electrical properties. Other desirable properties of quartz, such as low internal friction, chemical stability, and hardness, in addition to its piezo-electric effect, make it the most used material. Tourmaline has marked piezo-electric properties and is used to some extent for oscillator control in the higher frequency range, the highest frequency obtainable being twice that of quartz. Because of its scarcity and consequent high price, however, its use is not nearly so extensive as that of quartz.

The chemical properties of quartz are such as to make it ideal for permanency. Its hardness prevents wear and scratching in holding or clamping devices, with consequent change of the response frequency. Oxidation cannot take place, since it is already silicon dioxide (SiO₂). Hydrofluoric acid is about the only chemical substance that will affect it to any extent; this fact is made use of, as will be discussed later, to detect twinning in crystals. The occurrence of clear quartz crystals among rocks that are disintegrating with age is a guarantee of the permanence of this material.

The use of mechanical vibrating systems in frequency generation is not new. The classical example is, of course, the clock pendulum; the clock is a frequency generator whether it delivers electrical impulses or not. Tuning forks, driven by vacuum tubes, often have been used as frequency standards. With these mechanical vibrators some means must be provided for coupling between the mechanical and electrical vibrating systems. This is usually accomplished magnetically, but for frequencies above the audible range hysteresis and eddy current losses tend to defeat the very purpose of the mechanical system. It was not until Professor Cady of Wesleyan University pointed out that the piezo-electric effect in crystals could be used to furnish this coupling mechanism that mechanical vibrators were used at the higher frequencies. A quartz plate is truly a mechanical vibrator, and the same modes of vibration occur in it as in other mechanical systems.

MODES OF VIBRATION

Vibration may occur in four different modes: longitudinal, transverse, flexural, and torsional.

These are defined in the following paragraphs.

Longitudinal: This mode applies to rods or to more extended masses in which the motion of the vibrating particles is parallel to the direction of propagation of the wave, that is, normal to the wave front.

Transverse: The vibrating particles move in a direction parallel to the wave front, and normal to

* Sheridan, Pa. Formerly with Bell Telephone Laboratories.


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the direction of propagation. This type of vibration occurs in vibrating strings, membranes, and thin plates. In crystals these vibrations may occur when the direction of the electric field is such that the field produces a shearing stress about some axis.

Flexural: These occur in elongated plates or bars, and are frequently called “transverse” or “lateral.” To distinguish them, however, they are associated with a bending of the specimen in a certain plane.

Torsional: In this mode a relative angular displacement about the axis of the figure takes place; as in a cylinder or prism between adjacent cross sections.

The two principal modes employed are longitudinal and transverse; a crystal may vibrate in any of the above mentioned modes, however. The elimination of the unwanted modes and the selection of a particular mode of vibration has required considerable study. A crystal plate constitutes an extremely complex vibrating system, having a large number of degrees of freedom. The general relation between stress and strain, which in an ordinary isotropic medium involves only two constants, in quartz requires six. The choice of a particular constant or constants that enter into a given mode of vibration depends upon the orientation of the quartz plate with respect to the original crystal axes, and the particular type of vibration employed. To secure uniformity and to make a particular mode the principal mode of vibration, it was necessary to set up criteria for cutting the plates with respect to their principal axes, the object being to make them vibrate in a definite mode having determinable characteristics.

AXES AND METHODS OF CUTTING

The method of cutting a crystal depends upon the purpose for which it is to be used. In describing a particular cut, reference must be made to the three principal axes of the crystal; the electrical, mechanical, and optical. The optic axis is the axis of symmetry of the hexagonal quartz prism, so called because of the unique optical effects obtained in this direction. The electrical is parallel to opposite faces of the prism and perpendicular to the optic axis. The mechanical axis is also perpendicular to the optic axis, but is perpendicular instead of parallel to opposite faces of the prism. These axes and methods of cutting are shown in Figs. 1 and 2.

Quartz crystal vibrators can be constructed for any frequency from a few kilocycles to ten megacycles, but the ordinary useful commercial limits are from forty kilocycles to seven megacycles. Crystals for the broadcast and high-frequency range are principally obtainable from slabs cut parallel to one of the six natural faces of the crystal. Resonators of the desired shape, either round or square as is most convenient for cutting and mounting, are then cut from these slabs; see Fig. 1.

For this method of cutting the most important dimension, from the standpoint of frequency, is the thickness along the mechanical axis, as the principal response depends on this dimension. The frequency may be determined by dividing the constant 1,960,000 by the thickness in millimeters:

\[ F = \frac{1.96 \times 10^6}{M \text{ in mm.}} \]

\[ M = \text{thickness of mechanical axis} \]

\[ F = \text{frequency in cycles}. \]

Conversely the thickness of a crystal to resonate at a specified frequency may be computed from the above. The other dimensions determine mainly the amount of energy the crystal can safely handle. This constant applies to crystals mounted between pairs of parallel plate conductors, often, though not necessarily, in contact with the crystal. The principal mode of vibration is transverse.

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2 Love's "Mathematical Theory of Elasticity," Ch. 6.
Crystals for operating at the relatively lower frequencies are cut so that the long dimension is parallel to the mechanical axis, that is, perpendicular to the electrical and optic axes (X cut). The electric field is applied by electrodes which are in the plane of the mechanical and optic axes as indicated in Fig. 2. In order to obtain one major response frequency and eliminate parasitic frequencies, it is necessary to make the dimension along the mechanical axis twice or greater than twice the dimension along the optic axis. A crystal cut in this manner represents a bar or rod, employing longitudinal vibration, the response frequency of which is determined by dividing the constant 2,860,000 by the length (mechanical axis) in millimeters.\(^6\)

\[ F = \frac{2.86 \times 10^6}{M \text{ in mm.}} \]

Where M is equal to or greater than twice the optic axis. This constant is for a crystal held between parallel plates. Recent practice has been to eliminate the series capacity caused by the parallel plates by using closely adhering electrodes, such as platinum sputtered on the crystal surfaces. In this case another constant applies:

\[ F = \frac{2.72 \times 10^6}{M \text{ in mm.}} \]

**EQUIVALENT NETWORK**

Equations and constants have been derived by which the values of the equivalent electrical network of the crystal may be obtained from its dimensions; conversely, if a crystal is to replace a given network of electrical elements the dimensions of the crystal required may be determined. These equations will be given later. The equivalent electrical network and the reactance-frequency characteristic of a quartz crystal are shown in Figs. 3 and 4 respectively. The equivalent network is for a crystal with plates in intimate contact with the quartz, as with platinum-sputtered surfaces. For electrodes with an air gap between the plates and the crystal, an additional capacity must be added in series with the network shown.

With the methods just described it is difficult to obtain really low frequencies, since a rod giving a frequency of 1000 cycles is impracticable because it is impossible to obtain large enough crystals to make such a cut. A crystal frequency of 25,000 cycles is about as low as can be produced by the above methods.\(^6\)

\(^6\) Two modes of vibration, one for a low frequency and the other for a high frequency, may be employed with either X- or Y-cut plates. Although the Y-cut plates are more “active” and oscillate more readily at the high frequencies, the fact that Y-cut plates usually show two frequencies at low kilocycles apart, and have a tendency to “jump” from one frequency to the other in oscillator circuits, has caused most amateurs to prefer the somewhat less active but more stable X cut. The formula given above applies equally well for the high frequency of X-cut plates if the thickness of the plate is substituted for the length along the mechanical axis.—Edward.

Methods of obtaining much lower frequencies have been devised in which flexural or bending vibration is employed. This is done by having the electrodes cover the entire length of the crystal, but only half of the width (cut as in Fig. 2).

**FIG. 3—EQUIVALENT CIRCUIT OF THE QUARTZ CRYSTAL IN TERMS OF ELECTRICAL CONSTANTS**

This circuit assumes intimate contact between the plates and the crystal such as would be obtained by sputtered platinum or silvered surfaces. For crystals mounted in an air-gap holder an additional small capacity should be placed in series with the circuit shown.

One side of the crystal is shortened and lengthened alternately, resulting in flexural vibration in the plane of the mechanical and optic axes. Another method is to cut the crystal in the shape of a tuning fork, and employ flexural vibration by applying the electrodes to half of the width of the fork. Frequencies as low as 1000 cycles per second have been obtained by this method. Application of crystals to the audible frequency range has not been very satisfactory up to the present, however, and will not be given further consideration here.

**EQUATIONS FOR COMPUTING ELEMENT VALUES**

Considering now only the two most used methods of cutting, namely the perpendicular or X-cut and the parallel or Y-cut; let us examine first the process by which the plate is set in vibration. When a potential is applied to the electrodes, the crystal plate, by reason of its piezoelectric effect, expands in the direction of the mechanical axis and contracts along the direction of the electrical axis. Along the third or optic axis there is no motion. When the potential is removed, the crystal contracts and develops a voltage of opposite sign on the electrodes. For a steady potential the magnitude of this effect is small—of the order of 6 \(\times 10^{-7}\) centimeters for a potential of 3000 volts. But when an alternating potential having a frequency corresponding to one of the mechanical vibration frequencies of the plate is applied, the phenomenon of resonance builds up the amplitude of vibration to a level at which the forces are quite large—sometimes great enough to shatter the crystal.

The elements \(L, R, \) and \(C\) (Fig. 3) represent the electrical equivalent of the mechanical vibrating system. \(C_1\) is the capacity of the plate itself—of a condenser with the quartz plate as the dielectric. \((K \text{ for quartz} = 4.55.)\) The inductance, which corresponds to the mass, may be of the order of \(\frac{1}{2}\) henry to several hundred, depending on the size and frequency. \(C\) is the capacity required to resonate with this inductance at the given frequency; and \(R\) is the resistance of the
inductance $L$. The ratio of the inductive reactance to resistance is very high, representing a circuit with low damping—much lower than can be obtained by electrical elements. Outside the region of resonance, the crystal acts as a simple capacity. The values of these quantities in terms of their dimensions, for the parallel-cut high frequency crystals, are given in henrys and farads by the equations:

$$L = \frac{118 M^3}{M O}$$
$$C = 2.89 \times 10^{-14} \frac{M O}{E}$$
$$C_1 = 4.05 \times 10^{-13} \frac{M O}{E}$$

where $M$, $O$, and $E$ are the dimensions in centimeters along the mechanical, optic and electric axes respectively. $R$ must generally be determined experimentally, since it varies with different holders.

In the case of $X$ or perpendicular cut crystals used for the low frequencies the equations become:

$$L = \frac{118 M E}{0}$$
$$C = 2.89 \times 10^{-14} \frac{M O}{E}$$
$$C_1 = 4.05 \times 10^{-13} \frac{M O}{E}$$

$$F = \frac{2.72 \times 10^5}{M} = \frac{1}{2\pi\sqrt{L C}}$$

It will be noted that in both these cases the ratio of $C_1$ to $C$ is in the order of 140 to 1. This is an inherent quality of the quartz and cannot easily be lowered, but may be raised any time by applying a condenser in shunt with the crystal. This ratio and the equations given above apply to crystals with closely adhering electrodes, such as sputtered platinum.

Equations for determining the dimensions of a crystal in terms of its equivalent electrical elements may be obtained by solving the above as simultaneous equations.

**TEMPERATURE EFFECTS**

A change in temperature affects a quartz crystal in the same way that it affects any mechanical object; that is, there is a temporary change in the dimensions. Because the three principal axes have different coefficients the temperature effect in a quartz crystal is very complex. For the parallel or $Y$-cut plates the temperature coefficient varies with the shape and size of the crystal, having a wide range of values whose limits are approximately plus 100 cycles in a million per degree centigrade and minus 20 cycles/million/degree, with all possible intermediate values, including zero. This peculiar phenomenon indicates that a crystal might be so cut as to have a negligible temperature coefficient. Fig. 5 shows a crystal cup in the shape of a "life saver" which has a zero temperature coefficient over a small temperature range. The ring is cut in the plane of the optic and electric axes, with the difference between the radii equal to the thickness.

For the perpendicular or $X$-cut plates the temperature coefficient varies but little with the size of the crystal; this coefficient lies between minus 15 to minus 25 cycles in a million per degree Centigrade. The small variation is due to different qualities of quartz and the accuracy in cutting, particularly with regard to following the axes within close limits.

**USES OF QUARTZ CRYSTALS**

The chief application of quartz resonators up to the present has been for the measurement and control of frequency. Efficient distribution of frequency channels among various radio services and the strict adherence to specified frequencies would be practically impossible without this stable, efficient vibrating system.

(Continued on page 48)
"ONCE upon a time" is the way the fairy tales that delighted our childhood began. We use the phrase at the very outset, however, to prevent a trend of thought that might possibly brand us as "copy cats."

A few years ago it was possible to purchase, by the inch or foot, a very substantial winding of "low-loss" coil from which the user could cut as many turns as he needed for a specific purpose. Very little of this material is seen these days, and the particular type referred to probably would not suffice in the position of plate tank coil in a moderate or high-power rig. Nevertheless, it was this self-same type of coil that we wished to duplicate, except for size and spacing. One of our old-time friends, W8IH, supplied the idea for the present method of winding when we saw him stiffen a coil on which the turns wanted to flop together instead of staying nicely spaced.

THE WOODEN MANDREL SHOWN ABOVE IS CONVENIENT IF MANY COILS ARE TO BE WOUND

A copper tubing coil just as it comes off the winding form is shown at the left; the coil at the right has been "trimmed" and mounted.

About that time we needed a few coils and had only one piece of bakelite tubing for a form. Since necessity is said to be the mother of invention, we proceeded to experiment and develop a means of providing a substantial low-loss coil that would stand ordinary usage and have neat appearance without the losses incurred through the use of bakelite or formica forms or their various substitutes. The explanation of the procedure is far more complicated than the job itself, and we can assure you that if you wade through these instructions the task of winding coils will prove simple by comparison.

COIL SIZES AND WINDING FORMS

In a discussion on winding coils it is appropriate enough to say something about coil dimensions. In some cases, for instance, it is desirable that the coil have a rather extensive external field so it can be easily coupled in inductively-coupled circuits. This calls for a fairly large diameter in coils having considerable inductance, such as would be used on the lower frequencies. A suitable 160-meter power amplifier plate coil designed to tune with a 100-µfd. condenser, for example, would be 4 inches in diameter and have about 40 turns of No. 12 wire.

Coils intended for capacity-coupled or link-coupled circuits, on the other hand, will usually have lower losses if the external field is minimized as much as possible. In such cases a small diameter is preferable. All of which brings us to the conclusion that 2-, 2 1/2- and 3-inch diameter coils probably will suit most purposes.

The author’s coils are wound on forms which are removed after the coil is finished, the turns being supported "on air" by strips of celluloid. The winding form may be of ordinary bakelite tubing or wood, the latter being more satisfactory if a great many coils are to be made. One form will suffice for all coils of that particular diameter.

The wooden mandrels should be turned out of maple or other hard wood. A square piece slightly larger than the desired diameter is used. Before it is turned to size, it should be sawed diagonally into two wedge-shaped pieces. Clamp these together and turn them down to size on the lathe. This procedure eliminates the necessity for a shim to make up for the saw cut if the piece is turned first and then cut diagonally afterwards. Round-head wood screws through the thin ends of the pieces hold them together. A length of 8 inches is satisfactory since it is rarely necessary to wind coils that long. If tubing is used, 8 inches is likewise a good length.

Variety stores carry in their household wares departments two sizes of wooden rolling pins that are "the berries," both for size and cost. These can be cut diagonally in a mitre box.

The materials needed, in addition to the forms, consist of a sheet of celluloid side curtain repair material (from any auto accessory store), some waxed paper, a tube of Duco Household Cement, and of course the wire or copper tubing for the coil.
WINDING THE COILS

First cut four strips of celluloid, ½-inch wide and 2 inches longer than the finished coil is to be. Wrap two layers of waxed paper on the form, and then one layer of ordinary tablet paper or newspaper over the waxed paper, holding all in place with a tight rubber band at each end. Now slide the celluloid strips under the rubber bands and space them at equal points around the form so that there are four longitudinal “braces.”

Run a 6/32 bolt through the form (a ½-inch No. 5 round-head wood screw in the wooden mandrel) at points equal to the intended length of the coil. The 6/32 should be held in place with a nut. Next, secure one end of the wire to one of the bolts or screws and wind on about half the total number of turns close wound, then space out the balance to reach the other bolt or screw at the opposite end. Cut off the wire and secure this end by means of another nut (or by turning down the screw into the wooden form).

Spacing is the next job. This is done by winding a length of chalk line or heavy twine between the turns, starting at the close-wound end. Forcing the twine or cord between the close-wound turns pushes them apart and will close up the wider spacing at the opposite end. Ordinary chalk line will give about 8 turns per inch with No. 12 enameled copper wire, and it naturally follows that if fewer turns per inch are wanted heavier twine or cord must be used. If this method of spacing the turns produces some slack in the last few turns—and it invariably does—take the coil in one hand and hold a fair tension on the winding, then with the other hand turn the form so that the coil acts as a screw working through a thread. This will take out some more slack and a new turn taken around the terminal bolt will hold it tight. When the wire is wound as tightly as possible the spacing cord can be unwound without having the turns of wire slip back together.

The next step is to apply a line of cement from one end of the coil to the other directly over the strip. Another layer of cement can be put on immediately and the same toothpick or match used as a trowel to smooth the cement off and cover the first application. Care should be taken not to apply so much cement that it runs off the strip onto the paper. After all four strips have been treated in this manner, the procedure is the same as that for forming the coil itself, and including ¾-inch copper tubing can be used, though it were braced with the old-fashioned longitudinal clamps.

The ends of the strips are easily trimmed off with a knife or scissors. The methods of mounting, several of which are suggested in the photographs, are left to the constructor’s preferences.

For 1- or 1½-inch diameters a full-sized piece of celluloid can be used as suggested on page 10 of March QST, but the waxed paper idea still holds good when it comes to removing the winding form. Everything from No. 14 enameled wire up to and including ¾-inch copper tubing can be used, on diameters up to 6 inches, with this method. The builder can feel certain of obtaining a rigid coil with a minimum of “looser” matter, as well as a commercial-looking job that will do justice to the appearance of the rig.

Strays

Please!

Every magazine publisher finds the change-of-address problem a difficult one. By necessity wrappers are prepared well in advance of actual date of mailing of each issue. Prompt advice of your new address, giving your old one at the same time, will be appreciated. Thank you!
Antenna Pruning for Efficiency

In connection with recent notes in the Experimenters' Section on end-fed antennas, James A. O'Neil, W6GIS, has some good suggestions on the business of getting the proper antenna length. His letter is quoted below:

"I read with interest the articles by W1TX and W6QF on the end-fed antenna because several of us in San Francisco are using it to our satisfaction. But why the necessity for making field tests for the correct length, since it means additional apparatus and outdoor measurements? The method we use is to cut the antenna over-long and presents no problem because a strong tug restores the needed inches."

"The foregoing, of course, only applies to transmitters which are not self-excited. Adjustment of such may be achieved without much more trouble. The receiver, monitor, frequency meter, or what have you, should be set to the portion of the band where operation is desired and the transmitter tuned to zero beat with the antenna disconnected. Tapping on the over-long antenna will drive the transmitter off the selected frequency and necessitate retuning of the transmitter and checking device for zero beat. Cut and again cut till the transmitter frequency remains constant unloaded or loaded."

"In either case the antenna resonant frequency perfectly corresponds to that of the transmitter and the radiating system acts as a resistor load. A good match can be expected over the whole band, usually better than the average hit and miss installation."

"Clipping onto the plate coil for coupling is the ultimate in simplicity, particularly if a split-stator is used for harmonic suppression, but unfortunately is not lawful. The next best thing is the antenna filter described by Collins, which also discriminates against harmonics, and furthermore gives a perfect match on any part of any band if frequency shift is desirable. Currents up to 200 ma. at any voltage up to 400, can be obtained. Voltages are readily adjustable through heavy duty potentiometers.

Then clip to the final tank circuit, which of course is tuned to resonance, selecting a point where plate current is near the desired amount. It then becomes necessary to retune the final to lesser capacity for minimum plate current.

"Disconnecting the antenna, six inches or a foot is cut off, the final retuned to resonance, and the antenna put back on. The change in capacity for the low point in plate current will be less. This process is repeated several times until a length of wire is obtained which requires no retuning of the plate circuit; resonance has then been obtained. It is quite an accurate indication of exact length because as the antenna resonant frequency is approached the pruning must be done in inches. Should too much be removed, the plate tank again requires retuning, the capacity now being increased. With ordinary No. 12 copper this presents no problem because a strong tug restores the needed inches."

"The foregoing, of course, only applies to transmitters which are not self-excited. Adjustment of such may be achieved without much more trouble. The receiver, monitor, frequency meter, or what have you, should be set to the portion of the band where operation is desired and the transmitter tuned to zero beat with the antenna disconnected. Tapping on the over-long antenna will drive the transmitter off the selected frequency and necessitate retuning of the transmitter and checking device for zero beat. Cut and again cut till the transmitter frequency remains constant unloaded or loaded."

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"Surely some one will say: why cut to the inch, when copper will stretch a foot or more under strain and any difference can be compensated for in the coupler? The first answer is copper-weld cut to the frequency most in use, or else a periodic trimming of the wire. Secondly the antenna filter is fine and dandy for moving hither and yon, but, for the main frequency, it is my personal opinion that the antenna should be a straight stretch of wire without a loading device. Particularly so when low power is used and every watt is wanted where it belongs."

"The preceding remarks apply mainly to the end-fed antenna since it enters directly into the shack. It is advisable to place the set as close as possible to the entrance for obvious reasons, which brings up the question of loss of height and absorption. Theoretically, they both tend to lower radiation efficiency. But actual results—and after all that is what the majority strive for, whether
by orthodox means or not—proved the end-fed superior to a Zepp and single-wire feed system in the same direction at a greater height. Better transfer of energy from the transmitter to the antenna proper helps account for it, and in addition, the usual end-fed has one end considerably lower than the other with resultant directivity off the low end which is absent in the horizontal type.

"To sum up—"

1. The end-fed is the essence of simplicity, requiring no feeder arrangement.

2. The correct length is easily obtained using only the plate meter.

3. There is no need to worry whether the power entering the feeder or feeders is being transferred efficiently.

"As a specific instance, an ordinary Zepp caused a 203-A to color slightly at 200 watts input while an end-fed allowed the same tube to be run cold at 350 watts.

"In conclusion, no matter what type of antenna or feed is used the results obtained from careful adjustment are well worth the trouble, since, as K. B. Warner pointed out, the antenna is the weak link in the set-up."

Universal Power Supply for Experimental Work

When doing experimental work, it seems inevitable that one never has at hand the facilities one needs. Particularly is this true in the case of power supply equipment, especially when working with receivers, audio amplifiers, and the like. In an attempt to cleave through this difficulty with one stroke I built a universal power supply which provides me with any voltage up to 400 on eight different terminals, with a maximum current drain of 250 ma. The maximum current drain was arrived at by subtracting the bleeder current (15 ma.) from the total capabilities of the unit, 250 ma.

Four husky potentiometers provide as many variable voltages; their interconnections provide the same number of semi-fixed voltages. Variable voltages are thus available for every circuit element. To illustrate: by connecting terminal 1 (Fig. 1) to grid, 2 or 4 to cathode, variable grid bias of the "fixed" variety is obtainable. Plate, screen, and cathode grids can then be connected to any suitable one of the higher-voltage taps, also readily variable. Units requiring different plate or cathode voltages are easily accommodated. In fact, there is no requirement short of a 400-volt total potential difference that can't be met. Every terminal is heavily by-passed, both for filtering and to eliminate inter-coupling.

A 6-prong socket is provided for filament and variable plate voltages to facilitate use of a separate beat frequency oscillator and signal generator unit in connection with experimental work. A separate 16-µfd. condenser provides added filtering for this unit. The current reserve is ample to accommodate an ordinary receiver on test as well.

Construction is simplified by use of the General Radio punched panel, and chassis and end plate assembly. No dust cover is used because it would impair heat radiation—at times there is as much as 100 watts to be radiated.

Using the constants given, the hum is negligible, being less than one-half volt at the high-voltage terminal, with an even lower percentage on the lower terminals.

—Clinton B. De Soto, W1CBD

Making Inductance Clips

It is hard to do a neat job of making small clips to go on tubing, etc., with a pair of pliers. This kink may help.

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FIG. 1—CIRCUIT DIAGRAM OF THE UNIVERSAL POWER SUPPLY

T1—400-v. 250-ma. plate transformer (Thordarson T-5303 or equivalent).
T2—Combination filament transformer to meet circuit needs; in this case, 5 to 3 a, 2.5 to 10 a, and 2.5 to 3.5 a
Ch—15-henry 250-ma. chokes.
C1—16-µfd. 500-v. electrolytic condenser.
C2—3-section 4-µfd. 250-v. electrolytic condenser.
R1—4500-ohm 150-watt potentiometer (Ohmite 0547 or equivalent).
R2, R3—10,000-ohm 150-watt potentiometer (Ohmite 0549 or equivalent).
R4—2250-ohm 150-watt potentiometer (Ohmite 0545 or equivalent).

FIG. 2—SPRING CLIPS FOR TRANSMITTING INDUCTANCES CAN BE FORMED READILY WITH THE HELP OF A PAIR OF WOOD BLOCKS AND A VISE

A strip of phosphor bronze or other suitable material of the proper width is bent in the middle...
to form the two sides of the clip. A nail or rod of approximately the same diameter as the tubing on which the clip is to work is then inserted between the blades at the point where the bends should occur. The whole is then put in the vise between two small blocks of very hard wood, the nail carefully set at right angles to the length of the material, and the vise screwed home. Fast and neat—and the two halves come opposite each other! The outer lips are then bent back slightly with pliers. A small through bolt may be put about mid-way the length of the clip if necessary.

—K. B. Warner, W1EH

Power Supply Delay Switch

Many amateurs who do not have expensive equipment find two switches necessary for getting the rectifiers and the transmitter on the air. A slight alteration to a d.p.s.t. knife switch, as shown in Fig. 3, affords a simple and convenient way of providing a few seconds time delay for the filament power is certain to go on before the primary circuit of the plate transformer is closed

mercury tube filaments to heat, yet only one switch is required.

The filaments of the rectifier and transmitter tubes are controlled by the side making contact first, while the primary of the plate transformer is closed by the second contact. This combines all of the advantages of two separate switches, yet is simpler to operate.

—L. D. Miles, W2GGB

Bias Power Packs and Blocked-Grid Keying

In connection with “Biasing the Power Amplifier,” page 33, March 1934 QST, a few changes will transform this circuit into a very good arrangement for blocked-grid keying. The key is placed in series with the ground side of the voltage divider at position (X) as shown in Fig. 4, and the only current keyed is the bleeder current, which is small. This makes it very simple to eliminate key clicks; in fact, this is the only circuit of about a dozen tried here that eliminated thumps completely, even without a thump filter across the key.

The pack must deliver enough voltage effectively to block the grid when the key is up. The voltage necessary will be dependant upon the type tube being used. A 400-volt pack here effectively blocks the grid of a 203-A tube with 1150 volts on the plate. With the key up the full eliminator voltage is applied to the grid plus the automatic bias through the upper part of the divider (Rs). The values of R₁ and R₂ should be as advocated in the above-mentioned article. Rs is a 2-watt carbon resistor of 100,000 ohms, used to put a small load on the pack even though the key is open.

—Robert E. Foltz, W9GBT

“Shockless” Meter Jacks

Some of the “brethren,” who want to live as long as possible, may be interested in the following:

When using a single plate meter and single grid meter to service two or more stages in a transmitter, it is usual to connect the frames of one set of jacks to positive of plate supply and the frames of the other set to negative, which makes the front of the panel a very bad place for hands. The writer uses the four-spring, double-circuit type jack wired as shown in Fig. 5.

The frame of this jack is “cold” except when the plug is inserted.

—Neil E. Henry, W3BRY

December, 1934 45
Amateur Radio

W9AUH, Louisville, Ky.

In any sporting activity there's always one team or man you've got to beat if you want to get to the top of the heap. In Communications Department contest activities that man is G. W. Mossbarger, W9AUH, who has acquired for himself the title of "ORS Party QSO King" because he's won so many of the QSO parties that it's become a habit. In the twelve parties held up to this writing W9AUH has been the high scorer of eight of them—and that's something of a record.

It's his ambition to work every A.R.R.L. section in one of the parties, and at the rate he's going it looks to be only a matter of time—in the April QSO party he worked 139 O.R.S. in 48 of the 69 sections. That's knocking them off at quite a rate, considering that only ORS count in the results and that the contest period covers only a little over a day!

"Moss" also is a heavy competitor in the Sweepstakes, having been the highest scorer for the country in the 1933 contest, gathering 62,622 points while working 63 sections, and was the Kentucky leader in the 1932 contest with 35,000 points, coming out second in the national standings that year.

Because the station is an extremely active one we imagine a great many amateurs, particularly those operating in the 3.5-mc. c.w. band, must look upon W9AUH as a familiar call. The set that makes the signal possible is shown in the accompanying photographs. The power input to the final stage of the transmitter is nearly the maximum allowed amateur stations, being 900 watts under normal conditions.

The circuit diagram shows the tube line-up of the transmitter. The oscillator is a 47, used in the regular pentode circuit with parallel plate feed. The crystals—W9AUH has eleven of them, all told—are kept in a home-made temperature control box using a bimetallic thermostat, with

W9AUH'S ONE-KILOWATT FINAL STAGE IS A SEPARATE UNIT

This side view shows the 571 tube in operation. This unit is link-coupled to the output stage of the transmitter shown in the other photograph. Antenna condensers and ammeters are on a panel mounted from the wall above the amplifier frame.

10-watt bulbs for heaters, and the temperature holds to within a degree Fahrenheit. The second stage, using a Type 10, is a neutralized buffer, capacity coupled to the oscillator. Following it is an 841, neutralized, which may be used either as straight amplifier or doubler. The key is inserted in the grid circuit of this stage. The fourth stage
is an 860; capacity-coupled to the 841. The oscillator and two low-power stages are all shielded.

The 860 is coupled by a link line to the final amplifier tube, a 571 (equivalent to the 831), a tube which will handle a kilowatt with ease. The fixed bias voltages indicated by the circuit diagram are supplied by "B" batteries, a combination of battery and leak bias being used in most cases. Each stage has its own meters—filament voltmeter, plate milliammeter and grid milliammeter. Four power supplies are used: the low-voltage supply for the crystal oscillator has an 83 rectifier and brute force filter; the 750-volt supply for the 841 uses a pair of 81 rectifiers and a two-stage choke-input filter, with a bleeder having a 500-volt tap for the 10 buffer. The 3000-volt supply for the 860 uses 866's, and the 3500-volt supply for the 571 a pair of 866-A's working into a two-section choke-input filter. The last power supply is equipped with an auto transformer connected in with the primary of the power transformer so that the output voltage can be regulated.

W9AUH's antenna is a Zepp consisting of a 133-foot length of quarter-inch copper tubing, supported at the ends by 60-foot telephone poles.

One might expect a traffic handler to have his operating table conveniently arranged, and so it turns out to be at W9AUH. A shelf, supported high enough above the table top to allow ample room for keys and control switches, holds the Hammarlund Crystal Pro receiver, loud speaker, General Radio frequency-meter-monitor, and the telephone. Although the receiver does not take up table space, its controls are within easy reach through the use of this arrangement. A typewriter also is handy.

W9AUH has been heard in fifteen foreign countries on 3.5 mc., and Hawaii has been worked several times on the same band with RS reports. Plenty of work is carried on in the other bands, too; during the last international DX contest, Japan was snagged for the coveted WAC certificate. Besides (Continued on page 88)
I. A. R. U. NEWS

Devoted to the Interests and activities of the
INTERNATIONAL AMATEUR RADIO UNION

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Vice-President: C. H. Stewart
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Headquarters Society: The American Radio Relay League, West Hartford, Conn.

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Associazione Radiotecnica Italiana
Canadian Section, A. R. L.
Ceskoslouvenskii Amatér Vyslalci
Deutscher Amateur Send-und-Empfangs
Dienst
Experimentierende Dänische Radioamateur
Irish Radio Transmitters Society
Japanaise Amateur Radio League
Liga Colombiana de Radio Aficionados

Liga Mexicana de Radio Experimentadores
Nederlandsche Vereeniging voor Internationale Radioamateurisme
Norddeutsches-Östliches Vereinigung Voor Internationale Radioamateurisme
New Zealand Association of Radio Transmitters
Norsk Radio Helse Liga
Polish Zweik Bandfellowcy
Radio Society of Great Britain

Rede dos Emissores Portugueses
Resea du Emteuteurs Français
South African Radio Relay League
Radioamatoorliitto ry.
Sveriges Radioamatorer
Union of Radio Experimenters
Wireless Institute of Australia

Conducted by Clinton B. DeSoto

Union:

A new member-society appears in the list at the head of this department this month. We offer our congratulations to the Japanese Amateur Radio League upon its accession to membership in the I.A.R.U. and express our gratification at the added strength lent the Union by the presence of a strong Asiatic member upon its membership rolls.

The celerity with which this Union of ours is growing in strength and prestige is a thing of joy to all. Think of it—twenty-five member-societies, in as many of the most important countries of the world, acting in concert for the representation and protection of perhaps 60,000 licensed amateur operators. Nearly a third of the number of nations represented at international treaty conferences—covering a good proportion of the civilized world—by many times the largest body of radio transmitters, even if representing only a small proportion of the monetary investment in the art—yes, indeed, this Union of ours is rapidly growing to a place of power in the radio circles of the earth. Contrasted with 1927, or even 1932, its power to-day is manifold. Evidence of that is contained in the excellent reception of the work done by the I.A.R.U. delegation at the Estoril (Portugal) conference by the representatives of more than thirty nations, companies, and international bodies there assembled.

Our task now is to build that strength to even greater proportions—to increase our membership to include all important bodies of amateurs everywhere—to improve conditions in each of the member-nations—to better organize and concentrate our activities. Specifically, the responsibility for this work devolves upon the headquarters of the Union and the headquarters of the respective member-societies. It is basically dependent, however, upon the support of the individual amateur—on the faithfulness with which he observes frequency band limits and good operating practice, on the efficacy of the research work and public service which he does to justify his occupancy of his portion of the radio spectrum.

In other words, not only the continued progress of amateur radio, but the very existence of amateur radio, depends on the manner in which the individual amateur discharges his responsibilities as a citizen of the great world of radio. If that responsibility is adequately discharged, then the Union can work unimpeded toward the preservation, glorification and expansion of our art.

Regulations:

Important improvements in the amateur regulatory structure of two nations have recently been effected.

In Great Britain, the R.S.G.B., working principally through its president, Arthur Watts, G6UN, has secured a reduction in the guard or buffer bands set aside along the boundaries of the various amateur bands. These tolerances have now been reduced to a 5-ke. band at the end of all bands except the high-frequency end of the 3.5-mc. (3730 kc.) band. Members of the R.S.G.B. are being advised to set their nominal frequencies 0.1% inside the new bands in order to prevent their transmissions appearing outside the bands as a result of crystal or transmitter variations, it is reported by J. Clarricoats, Secretary of the R.S.G.B. Another important concession provides for the carrying out of television tests between 28- and 30-mc. The 29- to 30-mc.
band will then, it is expected, be used for the sound channel.

In South Africa, the Postmaster General, following upon conference and recommendations by a committee of the S.A.R.R.L., with G. Ross Kent, ZT6R, responsible for much of the work, has issued a broad new interpretation of amateur matters. For the first time, amateurs are recognized as such, the "experimental" status having been abandoned. The creation of an amateur status internationally will be recalled as one of the major triumphs of the amateur delegates at the Madrid treaty conference. A separate classification of "private and experimental" stations has been created allowing only for operation in the 56- and 28-mc. bands. Radiotelephony is now to be permitted on all bands; transmission of music under limitations is permitted; and a number of licensing and general regulations are liberalized and clarified. The resulting set of regulations should be a great asset to South African amateur radio.

General:

E. J. Dunkley, VU2LZ, now WAC, is searching for a VE QSO for WBE . . . . . He operates on 7 and 14 mc. between 1200 and 1600, and 0030 and 0130, G.T. . . . . SX3A, Athens, Greece, was worked on 14,120 kc. Oct. 13th at 1:53 p.m. by Frank Gow, WIAF . . . . The tone was 500 cycle, the QRA, Directions des Services Radiotelegraphiques, Delamarine, Athens, Greece . . . . The E.D.R. awarded W1DHE a certificate in connection with his excellent work during the "First Danish-International Competition" . . . . OZ7KG won the first prize . . . . The R.S.G.B.'s 9th annual convention broke all records for enthusiasm and attendance, writes J. Claricoats, G6CL . . . . Over 200 were there, including more than 20 British Empire and foreign amateurs, among them ON4UU, ON4AU, ON4HM, ON4PA, PA0ASD, PA0OGG, PA0OUB, PA0OBF, VQ4CRH, VU2FFP, ZB1JH, ZL1FQ, VP7NB, and SU1MM . . . . For W-South American communication these days the band is definitely 14 mc., 7 mc. showing little result . . . . Clyde C. Anderson, W6FFP, wants a TBTOC certificate . . . . How many of those now members of this club, or hopeful of becoming members, would be willing to co-operatively share the cost of certificates? . . . . The amount would probably be a dollar or so each, if enough wanted them . . . . . . R.S.G.B. has annulled Rule 6 of the 28-mc. contest rules, requiring a minimum report of QSA3 before points can be scored . . . . The first amateur message handled between Japan and the United States was sent from J1AA via U6RW April 8, 1925 . . . . Does it seem hard to believe after hearing some of these loud VK's that they are limited to 25 watts input? . . . . Well, don't begin doubting your ears; a little kookaburra bird told us with a meaning snicker that a good many Aussies are inclined to smirk knowingly when the power limit is mentioned.

Special: In April, 1934, the Union de Radioamateurs Espanols (Continued on page 88)
G2BYH, Alan S. Macen, 30 Ellon Rd., Bishopston, Bristol 7, England
(14-mc. 'phone)

G2BYH, Alan S. Macen, 30 Ellon Rd., Bishopston, Bristol 7, England
(14-mc. 'phone)

James B. Robbins, 11 Church St., Westboro, Mass.
(14-mc. 'phone)

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James B. Robbins, 11 Church St., Westboro, Mass.
(14-mc. 'phone)
COURTESY and good operating ability are often found together. Both 'phone and telegraph operators find this so. We have met few operators so discourteous as to show utter lack of attention during a "rag chew." All operators of course want to be considered thoughtful and courteous. Some operators manage to surround themselves with noise and distractions, either in the form of "family QRN" or a noisy broadcast receiver for "background." The ability of an operator to copy is based partly on the ability to concentrate and the power to focus complete attention on the job in hand. In planning a radio check, the choice of the operating position to permit the relative exclusions of the operator with freedom from interruptions and noise, ought to be given consideration. This helps us to be both courteous and efficient in our radio operation.

Operating ability is developed only through practice. The station DX, the number of QSOs, the value of an amateur to himself and to his community in cases of local or any kind of emergency depends a great deal on highly developed operating ability. The power to copy what we hear accurately is important in all communication. Speaking of skill and operating ability, the "S.S." was the most recent opportunity to put this to one kind of a test. Another type of opportunity is afforded in THE COPYING BEE, announced on page 28 of this issue. It will be held on Friday evening of December 14th. Everyone we have discussed the idea with likes the scheme. As well as giving us a chance to check our copying ability this should result in considerable fun. The early plans for transmission from a single station were expanded when early announcements showed enthusiasm for the idea, which was suggested by W1EH. Thanks are due the stations helping to make this activity a success by their transmissions. Send us your log on the Bee, and report which stations you could hear too, please. Good luck on December 14.

Briefs

Over 400 chapters of the American Red Cross have arranged to render their annual roll call reports to their zone Red Cross Headquarters over the Army Amateur Radio System during the week of December 1st-8th.

Correction

Sweeps Participants will please note an error in the announcement of the new "power equalizing factor." Under (b), page 18, November QST, the rule should read: Over 25, and up to 75 watts — multiply score by 2.

On the first day of M.I.T.'s Freshman camp, which was attended by 300 freshmen, W1ENF got lonesome and whistled CQ to see if he could find another ham in camp. He raised a W9, a W8, a W6, a W3, two W2's, and two W1's! The rest of the camp period was devoted to a miniature hamfest. The moral for hams is, "Learn to whistle"!

W9FYC offers: Some high-power stations reduce power when working locally. This is sometimes difficult to accomplish without elaborate switching arrangements. As a means to accomplish the same effect, W9FYC suggests disconnecting the antenna when working local stations; he has been able to maintain communication over as great distances as 175 to 390 miles with his antenna off.

QRR

October 21st found one of the worst windstorms in the history of the Northwest raging in that territory. Wind velocity went as high as 70 miles per hour in Seattle, Wash. Many trees fell, glass windows were broken, telephone lines were down. VE5JE, Vancouver, B. C., with a rush message for the Coast Guard at Bellingham, Wash., sent a QRR. The message regarded the safety of two men clinging to piling in heavy seas at Boundary Bay near the border. W7MD and W7DGN both delivered the message to the Coast Guard. The papers stated later that the two men had been rescued. W7CXS, Bandon, Ore., delivered a message to the Lighthouse Service at Portland saying that many windows in the Tillamook Rock Lighthouse had been broken by the wind.

W3FG, Baltimore, Md., has worked all W and VE districts on 1.75-mc. 'phone with 60 watts input to a '10 amplifier.

DX Briefs

On the afternoon of October 11th, W6GRX, Los Angeles, was QSO ON4CSL, Belgian Congo, on 14 mc. This is believed to be the first W6/Congo QSO. The use of beam antennae at W6GRX assisted the QSO; reception of ON4CSL was increased from R2 to R5 with the beam.

W1DBU, New London, Conn., was QSO FC4CJJ at 3:15 p.m. E.S.T., October 22nd, and reports that FC4CJJ is located in the Belgian Congo. QSL's should be sent via Renaeu Belge.

On May 11th, W2WT, Stapleton, N. Y., was QSO VK3MR on 7 mc. at 6:50 p.m. E.D.S.T. On June 1st at 5:18 p.m. E.S.T., W1EZ was QSO VK5ML on 7 mc. On January 31st on 7 mc., W2CJM worked VK3KX and VK5FG at 3:50 p.m. and 4:45 p.m. E.S.T., respectively. W3AOJ, on February 9th at 3:40 p.m. E.S.T., was QSO VK3KX.

And then there's the one about the embryo ham who asked why hams have to "bake" their crystals! He saw an advertisement for crystal "ovens."  

W3HG, Baltimore, Md., has worked all W and VE districts on 1.75-mc. 'phone with 60 watts input to a '10 amplifier.

Service, Plus!

While on a business trip to Roanoke, Va., W3ASK of Shenandoah, Va., was entertained during an idle evening by W3CNY. Due to some information received from W3CNY, it became desirable for W3ASK to communicate with W3DO of Wilmington, Del. Efforts to raise W3DO from W3CNY during the early evening were unsuccessful. However, W3B7TM of Roanoke, whose station was visited during the evening by W3CNY and W3ASK, knew that W3ASK was anxious to QSO W3DIQ, and, hearing him on
about 12:30 a.m., managed to hook up with him. Contact being established he informed W3DQ of W3ASK's desire, called W3ASK out of a sound sleep by means of the telephone in his hotel room, and W3ASK, without getting out of bed, carried on a successful fifteen-minute telephone-radio QSO with W3DQ, with W3BHM acting as monitoring station, and manipulating the telephone and transmitter at the intermediate point. This was all on 3.9-mc. 'phone.

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**VE3WW—London Amateur Radio Club**

The London (Ont.) Amateur Radio Club operated VE3WW on 1.75-mc. 'phone at an amateur radio booth in the Confederation building of Western Fair, London, September 10th-15th. VE3WW was crystal-controlled on 1790 kcs. Quite a bunch of messages were originated. Operators were VE3PA, VE3YR, VE3GSA, VE3AAO, VE3AAN, VE3WWW and Jack Paice. The exhibit was a complete success.

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**A.R.R.L. Trunk Lines**

The first of the reorganized A.R.R.L. Trunk Lines to be completed and working 100% throughout is the Illinois to Texas route. "K." This line consists of: W9EJY, Glen Ellyn, Illinois—W1LH, Alton, Illinois—W1FPG, Topeka, Kansas—W6CEZ, Ponca City, Oklahoma—W5MN, San Antonio, Texas. Lines "A," "B," "C" and "H" are also practically complete throughout. All the other lines are expected to be in running order by the end of November.

The following stations have been chosen to handle the A.R.R.L. Trunk Lines; the order of listing in the case of each line shows the route taken:

- **Line "A":** W2DQW W8GUF W8FTW W9COK W90XP 3805 kcs. W9DQS W7ASQ W7LJ
- **Line "B":** W3APY W9GSO W8CDA W4AFM W9MZD 3795 kcs. W9DLO W9EOH W9CQO W9GYX W6FEL
- **Line "C":** W1CRP W1EQX W1AMO W2CHX W6EEZ 3665 kcs. W3BWT W3BYA W4DWM W4ASR
- **Line "D":** W4DS W5CQW W5BAR W5BI 3625 kcs.
- **Line "E":** W3CIZ W8EEL W4PL W8BWJ W8BYD 3785 kcs. W9KVE W7RMF W7YA W7EAA
- **Line "F":** W8FEM W7CZY W7XY W7DTQ W7UJ 3827.5 kcs. W6KGO W6EFP
- **Line "G":** W8JA W8DXW W8TJT W8DVC W9OEZ 3615 kcs. W7AVP W7DUE
- **Line "H":** W9EOL W8PF T W9DEA W9DXN W9DN 3605 kcs. W9BMA W8IEL W8EBD W3JE
- **Line "I":** W9ER W8KDH W9AG W4ICM
- **Line "J":** W9IYA W9BAZ W4APU W4CRI
- **Line "K":** W9KEJY W9LH W8PLG W6CEZ W5MN 3925 kcs.
- **Line "L":** W2EKM W6CIO W9VRK W9HCK W9FAM 3865 kcs. W9EPA W9PV W6DRG
- **Line "M":** W3CWL W8NBD W9KWA W8CHS W8STM 3853 kcs. W8AEQ W9PBDE

In order to maintain a place in the A.R.R.L. Trunk Line System all stations listed, and any others that may later become trunk line stations, must hold appointments as Official Relay Stations, must be crystal-controlled, must maintain trunk schedules at least five days per week, and must have Alternates to handle schedules should anything prevent them from keeping them. More complete details on the lines will appear in January QST.

Last season's "Star" line is again in working order and has picked up its excellent work where it left off last year. This line specializes in trans-Pacific traffic. The route is same as last year: W1FIO-W9EG-W9E5A-W8BMC-W8DQW.

An all-ORS transcon route, which operates "net style" in the early morning hours, is the "Owl Special" and comprises these stations: W6LIE-W6GYX-W5BDX-W4PL.

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**56-Mc. Schedule for Cleveland, Ohio**

Every Wednesday, Saturday and Sunday are "56-mc. days" in Cleveland, Ohio. 56-mc. stations in that vicinity concentrate their operation on these days. The following are among the active 56-mc. gang in Cleveland: W8AXY AARS 10G DDK HC BAH JVN COX LUY MOH C1N BFA.

---

**A 56-Mc. Tribute**

WIFEM, popular member of the Massachusetts 56-mc. gang, was killed in a motorcycle accident on Sunday, October 21st. At the instigation of W1FSK, word was passed around on Monday and Tuesday nights that there would be a 56-mc. silent period on Wednesday night in memory of WIFEM. At 7:30 p.m., Wednesday, W1KIH, New England Division Director, sent QST's at about minute intervals until 8:00 p.m. At exactly 8:00 p.m. he signed—and the band was completely silent for an hour! A constant watch was kept on the band and not a single voice was heard for fifteen minutes—a most impressive tribute to WIFEM, and an almost unbelievable example of cooperation. At exactly 8:15 W1KIH put his carrier on and said, "This is WIFEM." thanked the gang for their silence, and said, "Let's carry on"—in two minutes the band was a roaring mass of signals from end to end!!

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The Meters of the Morning

A 1.75-mc. 'phone club has been in operation in Florida since April 30, 1934. It is called the "Meters of the Morning." The purpose for which the group organized was traffic schedules and storm emergency relief work. At the present time cross-band drills are held with 3.9-mc. 'phones and excellent contact is maintained between the two bands. The officers at time of organizing were: W4DCE, Frequency
Meters; W4CPG, Oscillator; W4CTS, Buffer; W4CQJ, Final Amplifier; and W4CQZ, Modulator, who enters the
minutes of the meeting. Procedure of meetings is usually:
reading of the minutes of the last meeting, some kind of
technical discussion and then a general round table talk.
The Meters of the Morning maintain a weather net which is
of great service in time of emergency. The club also has
an official publication, W4BCZ Editor, known as "The Alley-
Gator."

The Haywire Net

A group of 3.5-mc, 'phone operators have organized under
the title "The Haywire Net," and have dedicated their
efforts to the establishment of a high standard of operating
ethics and better operating conditions for all 3.5-mc, 'phones.
This network operates normally from 12:30 to 1:30 p.m.
E.S.T. Special procedure for the operation of the "net" has
been recently formulated. Among the members at present
are W4BFR, W3NR, W3CKD, W2BO and W3AXR. All
3.5-mc, 'phone operators meeting the qualifications and hav­
ing a sincere interest in the aims of the group are invited to
join in.

Right in the heat of the O.R.S. Party (Sunday night,
October 21st), W6AKW called W5CEZ, informed him
there had been a disaster on the west coast, and asked him if
he could get on an A.A.R.S. frequency and ask the gang to
stand by for emergency traffic. W5CEZ got on 3475.5 kcs.,
rushed WLMF, WLUA, WLUC and WLM the first crack
out of the box, and the dope was circulated.

Carroll Staggell, ON4CSL, hails from Chattanooga, Tenn.
He is doing missionary work in Belgian Congo for one of the
Chattanooga churches. For some time he had been very
anxious to contact a Chattanooga ham for the handling of
traffic to and from his relatives and friends. On October
13th, W4AM, Chattanooga, succeeded in contacting
ON4CSL and handled several messages. Two additional
schedules, on the 16th and 18th, went off without a hitch.
On the afternoon of the 18th W4AM invited several of
ON4CSL's relatives to sit in during the QSO; many messages
were relayed back and forth over the thousands of miles that
separate the two stations. It is hoped that a permanent
schedule may be arranged.

Do you have any trouble spotting various frequencies
throughout the high-frequency spectrum? A list of "Mark­
er" Stations useful for checking receiver and frequency meter
calibrations will be found on page 84, June, 1934 QST. This
list will be found very helpful in many frequency determina­
tion problems.

The Harlem Radio Club, N.Y.C., is supervising three
radio courses given as part of the activities of the 135th
Street Branch Y.M.C.A. The classes are held every Saturday
from 7 to 10 p.m. These courses are free and open to all:
Amateur Radio Operation (7-8 p.m.), Radio Servicing
(8-9 p.m.), Radio Code Practice (9-10 p.m.). The instructors
are W2BCB, W2GTO and W2CSQ.

W9FO is picking names for a crew at the ideal ham sta­
tion. Here are the results so far (all actual names of hams):
RECEIVER—W7BDL, Call; W6BSF, Dial; W81Y, Hook; W4TG, Shields; W8LNI, Tape. TRANSMITTER—
W1FXB, C. W. Rock; W2HEY, C. W. Sharp; VK5VY, Harry; W3GMY, Hartley; W8HYW, Phillips Colpitts;
W9WTU, Poulsen; W1AAS, Power; W8DZU, Popoff (over­load relay); WAWB, Lightholder (for the 1-kw. tube); W6DKO, Shorthose (watercooling 1-kw. tube). QRM DEPT.
—W3EEH, Ketcham. SUPPLY DEPT.—W8CCR, Cheese; W8AAL, Cook; W8MDE, Rug; W6CEQ, Cashier; W8DG7T, Mikeell. OPERATORS—W6EF, Allday; W8BUZ, Fast; W8EXD, Pullop; W7AMO, Marconi; VK2EM, Mapa; W5CRQ, Moroe; V5K5S, Sparks; W7CWI, Sparks; W7RL, Sparks; W801, Sparks; W1FOP, Morse.
ANTENNA CREW—WIGZM, Stockpole; W8BTU, Walkup; W9OJI, Willingham. DX CARDS—W1APM-
W1BHE, Mailbot.

The Use of "ORS" After a Call

One hears more and more use of "ORS" after calls these
days. The "ORS" added after a "sine" is the mark of a
reliable operator. It helps other amateurs to know an
experienced man is on the air, and ready to help in relaying
traffic or making deliveries if they will but give him a call.
"ORS" are known widely for their good signals, fine operating,
courtesy, and general efficiency and readiness for any
communicating job. "ORS" sent after a sign-off is hamsy and
filled with fraternal spirit, in addition to its practical
use in establishing "identity." It aids general traffic move­
tment, too. If you have traffic, try to give it to a station that
signs "ORS." A postal will bring any League member
information on becoming an Official Relay Station ap­
pointed.

"CQ TFC" is the general call used in the GENERAL TRAFFIC PERIOD—6:30-8:00 p.m. (local time). Use this period to move your traffic through reliable stations. Operators who sign
"ORS," "TLS," "RM" or "SCM" after their call are sure to be "reliables." The very use of "CQ TFC" by any operator indicates an interest in
reliable traffic work. Cooperate with the stations using the TRAFFIC HOUR!

W1MAK

Addressed transmissions to amateurs are sent simul­
taneously on two frequencies, by automatic, from the
headquarters station, W1MAK, on the following schedule:

<table>
<thead>
<tr>
<th>Days</th>
<th>Times E.S.T.</th>
<th>Speeds</th>
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<tbody>
<tr>
<td></td>
<td>(in p.m)</td>
<td>Frequency</td>
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<tr>
<td>Sunday</td>
<td>9:30 p.m.</td>
<td>13</td>
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<td>Sunday</td>
<td>Midnight</td>
<td>22</td>
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<td>Monday</td>
<td>8:30 p.m.</td>
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<td>Monday</td>
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<td>Tuesday</td>
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<td>Tuesday</td>
<td>10:30 p.m.</td>
<td>13</td>
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<tr>
<td>Thursday</td>
<td>Midnight</td>
<td>22</td>
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<tr>
<td>Friday</td>
<td>8:30 p.m.</td>
<td>13</td>
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<tr>
<td>Friday</td>
<td>10:30 p.m.</td>
<td>13</td>
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</tbody>
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Schedules at present are with W1ERQ, W1GOG, W7DBQ, W2ELK, W3BWT, W3CXL, W6AM, W6PG, W8DSS, W8GUF, W9AUL, W9MZD, W9FO, CM8VB, NT1AA. The additional time is divided between 7- and 3.5-mc. bands for "general" contact with any ham who may call. Operators try to "chew the rug" with just as many hams as time permits, as well as QSP whenever possible. QRG service is also available.

A new transmitter to be located at the A.R.R.L. Head­
quarters offices, 38 La Salle Road, West Hartford, Conn.,
and designed primarily for 1.75-, 3.9- and 14-mc. radiophone
should be on the air when this issue is off the press.

Headquarters operators and their personal "signs":
Harold A. Bubb, "HAL," Chief Operator W1MAK; F. E.

W6WO, Los Angeles, reports hearing HJAW, a South
American Expedition at Cartagena, Colombia, HJAW was just outside the low-frequency end of the 14-mc. band when heard with an r.a.c. note.
The following contribution by Miss Opal Sisk, W9CMV, wins C.D. article contest prize for this month. Your articles on any phase of amateur communication activity are likewise solicited and may win you a bound Handbook, six logs, or equivalent credit applied toward other A.R.R.L. supplies. Let us have your article, and mark it "for the C.D. Contest," please.

—E. H.

**Testimonial—By a YL**

**What Radio Has Done For Me**

**By Miss Opal Sisk, W9CMV**

I was once a very quiet person, perhaps some might have called me dull—life went on for me in a very humdrum fashion. I was never popular socially in school, as I devoted all my time to my studies—so I had no time for other activities (that's what happens to a person trying to keep up a "rep" as an "A" student). Boys seemed to be afraid of me on account of my grades, and, although expressing admiration, they remained aloof. I was one of those girls that everyone likes or respects, but no one pays any attention to in a crowd. Of course I always had a small following of devotees, but as far as being termed "popular" I was HUH! After I graduated from high school and was given the option of anything out of the ordinary ever happened—it all became a matter of routine—sleep, eat, and work—day in and day out—and time hung heavy on my hands. I was becoming "dissipated," down moral, contented—I lacked "pep" and initiative—life in general was getting lachrymose!

Then one day an event occurred that changed my whole outlook on life—with the same results as some of the old-time fairy tales we've all read—I was introduced to amateur radio! Through a personal friend, a radio enthusiast who constantly rode his hobby, I was prepared, and I became eager to enter the portals of that fascinating world all its own—that realm of high adventure, where all manner of rank, caste or creed are east aside, and operators are bound together the world over by the strongest of bonds—Amateur Spirit! Gradually the "light" seeped in, and after passing the exam without getting "stage fright" among so many OMs, I had the thrill of once in a lifetime—my first QSO! The little "bugs" bit, and bit hard! The "unusual" always fascinated me, and at first I showed signs of acquiring "radio mania." Meals became only a bothersome interruption, while sleep was only a bad habit I was sorry I had formed. After a few QSO's, I was impressed by the fact that a YL operated ability to win trophies! The Cup Trophy is one of the most interesting items of a person's life—without radio, life seemingly routine, without radio, a whole new world opened up before me—it became one of the most fascinating interests of my life. radio—life is worth living.

And so what has all this meant to me? Just this—I now—life would be a monotonous routine of existence—again—it seems as casual as the very food I eat! So this is my testimonial of what radio has done for me—or to me—and the only regret I have is that I did not know of it years ago—and that I have only one life to lead as a YL!

**Code Practice on 1.75 Mc.**

November QST, page 43, carried information on stations whose operators have volunteered their services in sending code practice on 1.75 mc. In addition to those listed in that issue, the following have also agreed to send code lessons: W6IXZ, San Francisco, Calif., on 1845 kcs. transmits on Mondays and Thursdays from 7:00 to 8:00 p.m. P.S.T. W6JQG, Corning, Calif., will give code practice Sundays from 1:30 to 3:30 p.m. P.S.T. on 1010 kcs. W8CYF, Baldwin, Mich., has started code lessons on 1.75 mc. each Wednesday at 7:30 p.m. and each Sunday at 9:00 a.m. This schedule will continue until July 1, 1935. W4BQT, Quitman, Ga., using 1935 kcs. will transmit code practice daily except Sunday from 6:00 to 7:00 p.m. E.S.T. W3GIX, East Windsor, Conn., plans to cooperate in this endeavor. Any other amateur operating on 1.75 mc. who is desirous of assisting in the code practice program is invited to drop a line to A.R.R.L. Communications Department listing schedule for announcement in QST.

The W9AUH O.R.S. Trophy is a big silver cup, donated by Griffin W. Mossbarger, of Louisville, Ky., to be awarded permanently to the O.R.S. winning it three different times (whether consecutive or not). The Cup is one of the handsomest achievement awards we have seen and it takes the years previous seem to have dropped into non-existence—! live in a new world entirely. All interests are based directly on radio—all my friends are hams—life is worth living—"there's romance on the air," as an Ohio ham said. Also adventure, mystery, humor, knowledge, the satisfaction of accomplishing something worthwhile, the thrill of playing with strange forces.

Each contact may lead to a new friendship—something worthwhile, a new influence in a person's life! Without radio, life would be a monotonous routine of existence again—it seems as casual as the very food I eat! So this is my testimonial of what radio has done for me—or to me—and the only regret I have is that I did not know of it years ago—and that I have only one life to lead as a YL!
Results of the Dakota Division QSO Party

The first annual Dakota Division QSO Party held Sept. 28th-30th was a huge success. 136 stations took part in this gala affair, and their "CQ-Dak" could be heard at all times during the contest. The R.F. Ammeter given as grand prize was won by W9PDL with a score of 1172 points. The winners in each section who receive a Radio Amateur's Handbook as prize are as follows:

Section          Call    QSOs  Score
N. Dak.        W9LJC  36    338
S. Dak.        W9FOQ  24    508
No. Minn.      W9PTU  42    924
So. Minn.      W9MOW  18    420

A summary of the scores above 400:

<table>
<thead>
<tr>
<th>Call</th>
<th>QSOs</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9PDL</td>
<td>48</td>
<td>1172</td>
</tr>
<tr>
<td>W9PTU</td>
<td>42</td>
<td>508</td>
</tr>
<tr>
<td>W9LJC</td>
<td>36</td>
<td>508</td>
</tr>
<tr>
<td>W9FOQ</td>
<td>24</td>
<td>508</td>
</tr>
<tr>
<td>W9MOW</td>
<td>18</td>
<td>420</td>
</tr>
<tr>
<td>W9TJW</td>
<td>185</td>
<td>204</td>
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<tr>
<td>W9MBF</td>
<td>56</td>
<td>204</td>
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<tr>
<td>W9LBK</td>
<td>32</td>
<td>204</td>
</tr>
<tr>
<td>W9KBC</td>
<td>27</td>
<td>204</td>
</tr>
<tr>
<td>W9MOW</td>
<td>27</td>
<td>420</td>
</tr>
</tbody>
</table>

O.B.S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October QST (page 49): W1ACV, W2BSE, W2FNT, W3Dex, W3DZO, W7JTW, W9LXC, W9LVL, W9YA, W8EKB.

W9MJE, Chicago, will send code practice on 56-mc phone for the benefit of local short-wave listeners. His schedule starts November 20th and will continue regularly until further notice.

According to W2AYN, the departure of the club president for Chicago with his car has put the Flatbush Transmitting Club on its feet and Brooklyn Rapid Transit stock is paying dividends at last.

The Hannibal (Mo.) Amateur Radio Club assisted representatives of the F.C.C. in obtaining information which led to the conviction of Charles Power, who for several years had been operating an unlicensed broadcasting station at Marcon, Mo. Amateur radio clubs can often be of material assistance in tracking down illegal operation, and their efforts to that end are most commendable.

W3CTD mentions many messages coming through his station containing only a telephone number and name of city for address. This makes mail delivery very complicated; and mail delivery is necessary when the delivering station does not have 'phone facilities. This brings to mind the importance of complete addresses on all radio-grams. Never accept a message for origination at your station unless it contains a full address, which will assure delivery. A "complete" address may be said to consist of (1) full name of addressee, (2) street and number, (3) city and state.

FOR BROADCASTING STATION OPERATORS:-

Plans are under way for a non-commercial "Broadcast Operators Bulletin." All radio operators at broadcasting stations are invited to send the following information to R. N. Eubank, W3AAJ (Chief op. at WRVA), 2917 Montrose Ave., Richmond, Virginia: Name, Address, Class License, Amateur Call.

Double Your DX — Get More QSOs — Be Courteous

Both c.w. telegraph and voice operated stations will make operation on 14-mc, and all other bands except by both kinds of stations more effective IF there are under way for a non-commercial "Broadcast Operators Bulletin." All radio operators at broadcasting stations are invited to send the following information to R. N. Eubank, W3AAJ (Chief op. at WRVA), 2917 Montrose Ave., Richmond, Virginia: Name, Address, Class License, Amateur Call.

BRASS POUNDERS’ LEAGUE

(Sept. 16th-Oct., 15th)

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Ret.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2EKM</td>
<td>110</td>
<td>40</td>
<td>150</td>
<td>1902</td>
</tr>
<tr>
<td>W9HMC</td>
<td>16</td>
<td>23</td>
<td>43</td>
<td>1345</td>
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<tr>
<td>W9HSC</td>
<td>45</td>
<td>12</td>
<td>57</td>
<td>1334</td>
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<tr>
<td>W9HSH</td>
<td>15</td>
<td>11</td>
<td>26</td>
<td>1236</td>
</tr>
<tr>
<td>W9HCF</td>
<td>23</td>
<td>13</td>
<td>36</td>
<td>1202</td>
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<tr>
<td>W9HPS</td>
<td>25</td>
<td>20</td>
<td>45</td>
<td>1191</td>
</tr>
<tr>
<td>W9HBT</td>
<td>31</td>
<td>17</td>
<td>48</td>
<td>1184</td>
</tr>
<tr>
<td>W9KCE</td>
<td>127</td>
<td>67</td>
<td>194</td>
<td>880</td>
</tr>
<tr>
<td>W9LCL</td>
<td>98</td>
<td>84</td>
<td>182</td>
<td>815</td>
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<tr>
<td>W9L sculptures</td>
<td>219</td>
<td>103</td>
<td>322</td>
<td>752</td>
</tr>
<tr>
<td>W9LCT</td>
<td>40</td>
<td>44</td>
<td>84</td>
<td>752</td>
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<tr>
<td>W9LCP</td>
<td>144</td>
<td>65</td>
<td>209</td>
<td>722</td>
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<tr>
<td>W9LCS</td>
<td>87</td>
<td>46</td>
<td>133</td>
<td>655</td>
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<tr>
<td>W9LJU</td>
<td>145</td>
<td>32</td>
<td>177</td>
<td>492</td>
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<tr>
<td>W9LZY</td>
<td>85</td>
<td>127</td>
<td>212</td>
<td>568</td>
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<tr>
<td>W9LZP</td>
<td>71</td>
<td>20</td>
<td>91</td>
<td>546</td>
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<td>W9MGE</td>
<td>49</td>
<td>92</td>
<td>141</td>
<td>589</td>
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<tr>
<td>W9SGW</td>
<td>68</td>
<td>88</td>
<td>156</td>
<td>514</td>
</tr>
<tr>
<td>W9STM</td>
<td>111</td>
<td>91</td>
<td>202</td>
<td>516</td>
</tr>
<tr>
<td>W9SMN</td>
<td>27</td>
<td>54</td>
<td>81</td>
<td>505</td>
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</tbody>
</table>

MORE-THAN-ONE-OPERATOR STATIONS

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Ret.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9EKM</td>
<td>661</td>
<td>805</td>
<td>1466</td>
<td>2021</td>
</tr>
<tr>
<td>W9HMT</td>
<td>567</td>
<td>535</td>
<td>1102</td>
<td>1882</td>
</tr>
<tr>
<td>W9LCT</td>
<td>323</td>
<td>306</td>
<td>629</td>
<td>755</td>
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<tr>
<td>W9LCL</td>
<td>93</td>
<td>373</td>
<td>466</td>
<td>716</td>
</tr>
</tbody>
</table>

These stations "make" the B.P.L. with totals of 500 or over. Many "rates" extra credit for one hundred or more daily QSO’s. The following one-operator stations make 14150 kc. for delivering 100 or more QSO’s. The number of deliveries is as follows: Deliveries count.

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Ret.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9LCL</td>
<td>84</td>
<td>84</td>
<td>168</td>
<td>514</td>
</tr>
<tr>
<td>W9LZM</td>
<td>219</td>
<td>219</td>
<td>438</td>
<td>752</td>
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<tr>
<td>W9LCT</td>
<td>65</td>
<td>65</td>
<td>130</td>
<td>752</td>
</tr>
<tr>
<td>W9LCL</td>
<td>46</td>
<td>46</td>
<td>92</td>
<td>492</td>
</tr>
<tr>
<td>W9LZP</td>
<td>127</td>
<td>127</td>
<td>254</td>
<td>568</td>
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<td>W9LZM</td>
<td>20</td>
<td>20</td>
<td>40</td>
<td>240</td>
</tr>
<tr>
<td>W9SMN</td>
<td>44</td>
<td>44</td>
<td>88</td>
<td>505</td>
</tr>
</tbody>
</table>

A.A.S. STATIONS

<table>
<thead>
<tr>
<th>Call</th>
<th>Orig.</th>
<th>Del.</th>
<th>Ret.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>W9LCL</td>
<td>57</td>
<td>57</td>
<td>114</td>
<td>336</td>
</tr>
<tr>
<td>W9LZM</td>
<td>162</td>
<td>162</td>
<td>324</td>
<td>508</td>
</tr>
</tbody>
</table>

A total of 500 or more, or just 100 or more deliveries will put you in line for a place in the B.P.L.

John B. Rideg, Jr., W2EKM

1910-1934

It is with deep regret that we record the passing on November 9th of John "Buddy" Rideg, Jr., W2EKM, A.R.R.L., Section Communications Manager, Northern New Jersey. A former Navy man, "Bud," as he was known on the air, was active in the N.C.R. and A.A.R.S. He was an invertebrate brasspounder, being Chief Operator at W2JC and W2HNM, stations of the Bloomfield Radio Club and West Essex Radio Club respectively, as well as making many QSO records for his own station. From September 1933 to September 1934 W2EKM had 4325 QSO’s and worked 998 stations in one month! "Bud," was one of the best known operators on the air and his snappy fist will be missed by his many friends.
ELECTION NOTICES
To all A.R.R.L. Members residing in the Sections listed below: (The list given the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of his term of office.) This notice supersedes previous notice.

In cases where no valid nominating petitions have been received from A.R.R.L. members residing in the different Sections in response to our previous notices, the closing dates for receipt of nominating petitions are hereby set as those given herewith. In the absence of nominating petitions from members of a Section, the incumbents continue to hold his official position and carry on the work of the Section subject, of course, to the right of proper nominating petitions and the holding of an election by ballot or as may be necessary. Petitions must be in Hartford on or before noon on December 14, 1934.

Due to the death of the Northern New Jersey SCM and resignation of the SCM of North Carolina, Quebec, and Labrador-South Carolina-Cuba-Isle of Pines-Porto Rico-Virgin Islands Sections nominating petitions are hereby solicited for the offices of Section Communications Manager in these Sections and the closing date for receipt of nominations at A.R.R.L. Headquarters is hereinafter specified as noon, December 14, 1934.

Section Closing Date Present SCM Present Term of Office

<table>
<thead>
<tr>
<th>Section</th>
<th>Closing Date</th>
<th>Present SCM</th>
<th>Present Term of Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nevada</td>
<td>Dec. 14, 1934</td>
<td>K. L. Harris</td>
<td>Aug. 15, 1934</td>
</tr>
<tr>
<td>Saskatchewan*</td>
<td>Dec. 14, 1934</td>
<td>W. F. Stjernwall</td>
<td>June 15, 1934</td>
</tr>
<tr>
<td>Alaska</td>
<td>Dec. 14, 1934</td>
<td>Richard J. Fox</td>
<td>Feb. 19, 1934</td>
</tr>
<tr>
<td>N. Carolina</td>
<td>Dec. 14, 1934</td>
<td>O. H. Wright, Jr.</td>
<td>(resigned)</td>
</tr>
<tr>
<td>Quebec</td>
<td>Dec. 14, 1934</td>
<td>J. A. Robertson</td>
<td>(resigned)</td>
</tr>
<tr>
<td>Northern New Jersey</td>
<td>Dec. 14, 1934</td>
<td>John B. Rider, Jr.</td>
<td>(deceased)</td>
</tr>
<tr>
<td>Georgia-S. C.-Carolina</td>
<td>Dec. 14, 1934</td>
<td>George A. Love</td>
<td>Isle of Pines- (resigned)</td>
</tr>
<tr>
<td>P. R. V. S.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Washington</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New York City</td>
<td>Apr. 1, 1935</td>
<td>Edward L.</td>
<td>Apr. 18, 1935</td>
</tr>
<tr>
<td>Conn</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* In Canadian Sections nominating petitions for Section Managers must be addressed to Canadian General Manager, Alex Field, 163 Logan Ave., St. Louis, Quebec. To be valid such petitions must be filed with him on or before the closing dates named.

1. You are hereby notified that an election for an A.R.R.L. Section Communications Manager for the next two-year term of office is about to be held in each of these Sections in accordance with the provisions of By-Laws 5, 6, 7, and 8.

2. The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions as set down for each of the different Sections. The ballots mailed from Headquarters will list the names of all eligible candidates nominated by the A.R.R.L. members residing in the Sections concerned. Ballots will be mailed to members as of the closing dates specified above, for receipt of nominating petitions.

3. Nominating petitions from the Sections named are hereby solicited. Five or more A.R.R.L. members residing in any Section have the privilege of nominating any member of the League as candidate for Section Manager. The following form for nomination is recommended:

We, the undersigned members of the A.R.R.L. residing in the Section of the ... hereby nominate ... for the office of Section Communications Manager for this Section for the next two-year term of office.

(Place and date)

4. Members are urged to take initiative immediately, filing petitions for the officials for each Section listed above. This is your opportunity to have the man of your choice to carry on the work of the organization in your Section.

ELECTION RESULTS
Valid nominating petitions nominating a single candidate as Section Manager were received in a number of Sections. By order of the President of the League under Article 11 Section 3 of the Constitution and By-Laws, electing the following officials, the term of office given on the day named.

Tennessee--Merrill D. Parker, Jr., W4BBT Oct. 14, 1934
Kentucky--O. J. Spalton, W8FLQ Oct. 15, 1934
San Joaquin--Clay C. Anderson, W6PV Nov. 14, 1934

In the Virginia Section of the Roanoke Division, Mr. Neil E. Hix, W4BAK, and Mr. Charles M. Wall, Jr., W4VUA, were nominated, Mr. Hix received 57 votes and Mr. Wall received 26 votes. Mr. Hix's term of office began Oct. 9, 1934.

STATION ACTIVITIES
EASTERN PENNSYLVANIA—SCM, Jack Wagenoller, W3G5—By order of P. O. Dept., please address all mail to S.C.M. to Llanerch, UPPER DARBY, Penna. Please send suggestions for Section Section 3E5 has been appointed Route Manager. SD1G wants schedules with O.C.C. camps in central Penna. SD1G has 21 new cards per week. 2ABZ was on N.C.R. cruise. SLRl worked all VE directions in contest. SASW has had 50-watt. SARK's transmitter is "red hot." SAOQ is QRL Army traffic. RWT reports Shamokin Radio Club on air under call SMRH. SF1LA is D.N.C.S. Army Net. 3CL is resuming schedules. 3BOL reports regular call at C.C.C. Camp in Reading now. 3EOY worked all U.S. districts in one month on air. 3AEG blew two power supplies in one month. 3SOJ put up 40-foot mast on roof. 3EDC is in line for O.R.S. 3ALX works West Coast every morning on 3.5 mc. 3COJ and 3OK report via radiogram. 3PET's new rig uses 850 final. 3SGA says DX excellent.

Traffic—W3ABZ 7 EZ 39S ADM 190 AK5 317 AQN 170 BYS 101 CL 184 ADE 10 271 BFW 11 AG 54 CJT 9 ECD 124 ALX 105 CQ8 8 EPJ 5 OK 342 GZS 35. W3DIG 59 EOJ 69 LRI 31 ASW 11 WTX 83 FIA 290.

MARYLAND-DELAWARE-DISTRICT OF COLUMBIA—SCM, Edgar E. Hudson, W3BAK—W3XCL-WLM, Sol. Ed Day, accompanied by Pvt. Bradford Criswell, 3BPT, in a campaign trip to Roanoke Convention. WBT has eleven schedules. EOJ made fine showing in O.R.S. Party! EOG now works schedules on 7 mc. CIZ is new O.R.S. There are eight hams in DML's high school, EDS attended Roanoke Convention. 3DQG of Laurel, Del., has a job as teacher of radio in local high school. EOG is active in A.A.R.L. DTO took portable up in Mts. CQ8 is QRL N.C.R. WZ is back after being off two years. EHWO/2 is rebuilding, W2GQY, portable, is awaiting W3 call. BHE is building new c/e rig. CDQ attended Roanoke Convention. 3DQG of Laurel, Del., has a job as teacher of radio in local high school.

Traffic: W3CCXL 359 (WLM 2312) BWT 533 EUO 450 EOG $9 ASO 61 CIZ 57 DML 42 GWE 40 DUK 20 ETV 20 BAK 11 ECD 650 DHO 5 ATQ 5 CQ8-EIH—WZ 2 EFW/OZ 1. W2COY 1.

SOUTHERN NEW JERSEY—SCM, Gedney Rigor, W3GI—AQC has moved to N. C. DNU is getting O.R.S. ticket. Z1 handles over 50 schedules per week. APV is handling Trunk Line schedules. NP is new Route Manager. Senior New Jersey portion of Section. EDP has Jr. oppr. No. 2 now. AEC is looking for local aids this winter. CTVI turned in largest traffic total in So. N. J. in many months. EITV, w2GQY, K2EITW, W3G2V, W2QZ, K2LQ, W3C, W3GIN, W3G5T, W3AGU, W2HOME, W3G5R, W3G5C gets out well with low-power phone. 2XZ had large score in RNMite contest. QL, S.C.M., went on sea trip. Many thanks for re-election, and will see that all reports are in on time. The S.J.R.A. had invitation to Naval
Militia and heard Admiral Robinson, first Chief of Radio in the U.S., speak and tell of the first radio on our naval vessels. The new club in Atlantic City, known as the Island Radio Club, has opened with a bang. All stations within radius of 25 miles of Camden send in applications for entry in station contest in St. Jersey held by S.J.R.A. A Silver Loving Cup will be awarded for the winner in February. A card will enter your station. AV's signals were heard in Gulf R by QL. BDH is operator aboard the Grace Line streamer Saratoga, plugging the Western New York and Cuba, Chila.

Traffic: W9AGC 1 DNU 3 ZI 124 APV 264 NF 53 EDP 8 AEB 12 CWL 549 ETL 16 (WLNE 121) BIR 2 AZY 3 VE 19 ZX 4 DST 9 AVJ 13.

WESTERN NEW YORK—SCM, Don Farwell, WDESP—The Mohawk Valley Brass Founders have new club rooms at 236 Genesee St., Utica. JAK and DSU are on 50 mc. DT and LGS visited Schenectady. MNR is building new high-power rig. LUI is buying new super. EXT's antenna broke. HWR is on with new rig. QJO sends complete description of his station. JTT, R.M., is high traffic man. ATJ has new transceiver with 19 tubes. DRS, R.M., attended Toronto Convention as did JW, EMX. QJG has nice schedules. MQY is new Sodus call. KBS is working on new rig. EUY reports VJ's and ZL's are coming thru on 3.5 mc. in early morning. GWY is putting in new operating desk and equipping with phone to phone, GPO station QRA. FYF keeps schedules on Monday only. GZM has been operating at OHSA. LGR, MAD, LYZ attended Schenectady hamfest. EWP attends all Navy drums. EQQ is going to the big work. HBW is looking up on WCW. AAR has gone on 3.9- and 14-mc. 'phone. ERU is changing to link-coupling. VJ reports T.C.R.C., having a portable contest. LDA blew his '10. The following report: LON, DBX, ABX, AFM, DHU, JJJ. The Southern Tier Transmitting Association held an enjoyable ham-fest at Wagner Hotel in Penn Yan on Oct, 29th. Speakers included Radio Instructor M. W. Grineil from Buffalo, Dr. Burton T. Simpson from Buffalo and the S.C.M. Ln., held known as "Eight Lousy Notes," was one of the high lights of the entertaining. FOY is building RKO-20 Tri-let job for the S.C.M.

Traffic: W9STT 668 DSB 273 JTP 119 AQG 90 KBS 37 EUP 32 G0Y 21 FYF 17 GZM 16 BWY 14 LG-EWP 12 BQJ 9 KMC-FMX 8 AAR-FTB 6 ERU 5 VJ 3 JTT 8.

WESTERN PENNSYLVANIA—SCM, C. H. Grossart, PA—W9GK has tried hard to break QNO record. KWA has been appointed Route Manager. CUG worked all districts in last RM party. HGG and JZZ enjoyed VE/W contest. GBC resigned as R.M. due to lack of finances. Reports by radio. KOB has two rigs, one on 7, one on 3.5 mc. GSH is in nice shape as new CRJ goes well. RLK has HKG, DIG reports LTQ active on 1.75 mc., ESR busy with P.A. work and BOZ building highpower rig. IOZ says NNE with ops IOI, KEX, LSH and IOH had an all-night QSO party. He reports for IOI and JZT. GYD sends first report. CMP is erecting directive array for 50 mc. GJQ gives us dope on Hallo,-een party held by SHB&M. HMJ had a visit from KRG. FKU is in nice total for starter. HBQ is rapidly becoming the winner. C.U.F. is working hard on new highpower rig. LIs, MMO, is perking at the boys to get new 'phone men buying new super. EXT's new super. LPY is on new rig. EUY reports VJ's and ZL's are coming thru on 3.5 mc. in early morning. GWY is putting in new operating desk and equipping with phone to phone, GPO station QRA. FYF keeps schedules on Monday only. GZM has been operating at OHSA. LGR, MAD, LYZ attended Schenectady hamfest. EWP attends all Navy drums. EQQ is going to the big work. HBW is looking up on WCW. AAR has gone on 3.9- and 14-mc. 'phone. ERU is changing to link-coupling. VJ reports T.C.R.C., having a portable contest. LDA blew his '10. The following report: LON, DBX, ABX, AFM, DHU, JJJ. The Southern Tier Transmitting Association held an enjoyable ham-fest at Wagner Hotel in Penn Yan on Oct, 29th. Speakers included Radio Instructor M. W. Grineil from Buffalo, Dr. Burton T. Simpson from Buffalo and the S.C.M. Ln., held known as "Eight Lousy Notes," was one of the high lights of the entertainment. FOY is building RKO-20 Tri-let job for the S.C.M.

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Traffic: W8GFQ 3 DET 5 EQQ 4 ARK 8 MQV 4 JRIK 105 (W8LH 26) CRG 5 LSH 21 HUO 14 YB 12 HU 7 HPQ 22 HU 2 AXH 7 TE 7 TPL 5.

Kentucky—SCM, G. W. Mosheraker. W8AUIH—PXX wants another Ky. hamfest, We expect OX on soon. GGB got traffic in W/VE contest. ECCO is on with 300-watt 'phone. CDA is going strong on A.R.R.L. Trunk Line "I." W9VHG has 'phone. RDG has new 1-kw. rig. MNQ, former lMK and W3K got traffic in W/VE contest. ECCO is on with 300-watt 'phone. CDA is going strong on A.R.R.L. Trunk Line "I." W9VHG has 'phone. RDG has new 1-kw. rig. MNQ, former lMK and W3K got traffic in W/VE contest.

Traffic: W8GFQ 3 DET 5 EQQ 4 ARK 8 MQV 4 JRIK 105 (W8LH 26) CRG 5 LSH 21 HUO 14 YB 12 HU 7 HPQ 22 HU 2 AXH 7 TE 7 TPL 5.


CENTRAL DIVISION

ILLINOIS—SCM, F. J. Hinds, WOAP-WR—R.M.s: 1, LERU, 9ILH, 6KJY, IBIU put up new R.C.A. antenna with new mast. HUM has U, of Ill, to draw traffic from. New appointments by HUM. VQK reports, e. g. RIM has new RME-9D receiver. New super at MRQ. BKQ is erecting new O.P.S. link coupling throughout. MCC is rebuilding entire station. CKC is on A.R.R.L. Trunk Line "A." DQH is DXing. New c.nct. at RDU. RYB rebuilt to Class B. FZ put on one of the biggest hamfests ever. ERY says FFQ won the "HRO" at PZ hamfest. HUX has been made O.R.S. for local chapter of American Red Cross—Signal Corps. MLH is low power A.R.S. New bug at OLA. WC handled half-hour conversation with UZ at 4ABY—family QSO of UZ's. CUI was heard in England and Germany. The Mohawk Valley Brass Founders have new club rooms at 236 Genesee St., Utica. JAK and DSU are on 50 mc. DT and LGS visited Schenectady. MNR is building new high-power rig. LUI is buying new super. EXT's antenna broke. HWR is on with new rig. QJO sends complete description of his station. JTT, R.M., is high traffic man. ATJ has new transceiver with 19 tubes. DRS, R.M., attended Toronto Convention as did JW, EMX. QJG has nice schedules. MQY is new Sodus call. KBS is working on new rig. EUY reports VJ's and ZL's are coming thru on 3.5 mc. in early morning. GWY is putting in new operating desk and equipping with phone to phone, GPO station QRA. FYF keeps schedules on Monday only. GZM has been operating at OHSA. LGR, MAD, LYZ attended Schenectady hamfest. EWP attends all Navy drums. EQQ is going to the big work. HBW is looking up on WCW. AAR has gone on 3.9- and 14-mc. 'phone. ERU is changing to link-coupling. VJ reports T.C.R.C., having a portable contest. LDA blew his '10. The following report: LON, DBX, ABX, AFM, DHU, JJJ. The Southern Tier Transmitting Association held an enjoyable ham-fest at Wagner Hotel in Penn Yan on Oct, 29th. Speakers included Radio Instructor M. W. Grineil from Buffalo, Dr. Burton T. Simpson from Buffalo and the S.C.M. Ln., held known as "Eight Lousy Notes," was one of the high lights of the entertainment. FOY is building RKO-20 Tri-let job for the S.C.M.


Traffic: W8GFQ 3 DET 5 EQQ 4 ARK 8 MQV 4 JRIK 105 (W8LH 26) CRG 5 LSH 21 HUO 14 YB 12 HU 7 HPQ 22 HU 2 AXH 7 TE 7 TPL 5.


Traffic. HK could not control that itching in his fingers, and is back on again. MI CID GAN EIGHTS: Congrats 8838 kc., 5 to 5:30, Tues. and Friday, and 12 Noon.

IDB hooked his first ZL, reports JKO. IDB works on ISB have rig going again-HXT.

"Ole Political are all sorry to hear of the death of R.M. EGI's mother.

GUC is Corps Area N.C.S. Alt. and QT is State N.C.S. DVC, with plenty of schedules, leads the gang. DWB is QRL Akron Univ. reports for Y.M.C.A. Wireless Club of Ashtabula. GGF is at Bethany College. FGA is out after W.A.C. DIII is busy building DDQ. LJR is 14 me. HDP wants O.R.S. ETM, AON, and GIT attended 09Z hamfest. KQJ has been painting all summer. STP is now Milw. ham. FCS and other hams at U. Ext. Div. are invited to send in monthly reports. R5A is building wiggisticks. PPG wants to get 01QTZ and QRZ our full support. He's doing a real job.

Traffic: W9ATO 115 HSK 100 SBD 75 OXP 71 ORS 37 PGU 18 SIN-LJK 10 RK4 4 HDP 6.

DAKOTA DIVISION

NORTH DAKOTA—SCM, Fred J. Wells, W9JVP—EHJ's new rig works like a charm. OEL keeps seven schedules daily. PAI has new job at KFTR. JVP is putting 545 in final. LBI made nice score in VE/W contest. PDC's new QRA: Thompson Falls, Mont. FVV's new QRA: Port Arthur College. SHL is trying 175 mc. saw has c.e. rig. 1RA, PGO and GER are ops. at WURC. 17FP is on 3.5 mc. phone. New Bismarck hams: STP, STL, KZL is new Milw. good old western standby, SDK is an up-and-coming traffic man. OXP is Wisconsin station on A.R.R.L. Trunk Line "A." ORS is c.e. on 3777 kc. SIN is planning bigger rig. LFX is on that "5" 16 mc. HDX wanted in, LST, ETM, etc., and GIT attended 09Z hamfest. KQJ has been painting all summer. STP is new Milw. ham. FCS and other hams at U. Ext. Div. are invited to send in monthly reports. R5A is building wiggisticks. PPG wants to get 01QTZ and QRZ our full support. He's doing a real job.

hearn FB DX, EKU and KVI are QRL Univ. SJX is new ham on 1.75-mc. phone. The Red Wing fellows hold a private hamfest. Albert Lea has a new radio club meeting in the town.

Traffic: WBBK 227 DEI 104 BN 60 DH-RBT 20 DVH 8 RKG 7 ZT 6 DXT-BNN 2.

DELTA DIVISION

ARKANSAS—SCM, H. E. Veille, W4ABI—HMI—WLUA lost tube in finals. ABI completely rebuilt. ARC and DAO reports. ACO, FRB has been appointed O.P.S. DTT was appointed O.R.S. CGZ-DVG is on 14 mc., 100 watts input to a pair of 10's. DSW has new Super DTT is located at Pine Bluff. CHU worked KS and VEL. DTT has new SW3. DTT took Class A exam. EIP worked LU on 14 mc. EAR is on 3600 kcs. FX remodeling house. ARQ enlisted in C.C.C. CPV is trying antenna coupling unit. DFR has been sick in bed. CVO is working on local light plants. DBZ has new monitor. DNX is located in Hot Springs. EBSG is new DuQuem ham. Are you in the traffic-handling contest now going on in this state? It will run for five months. If you have not been reporting to the S.C.M. each month you should do so, as you may win one of the prizes offered. We are going to put Arkansas and the Delta Division on top. We challenge any state in the Delta Traffic-Handling Contest.


LOUISIANA—SCM, W. J. Wilkinson, Jr., W5DWW—DLD keeps daily schedules. HR is 'phone traffic man. BID uses 'phone and c.w. on 3.5 mc., 3.9 mc., 7 mc., and 20 mc. Everyone is working. ACO reports his visitation in N.O. AER transmits official broadcasts. ELF is new N.O. station. EKL worked a VE. DQJ is active in Algiers, La. CTR's change of address: Box 214, State College. Reporting to the S.C.M. each month you should do so, as you may win one of the prizes offered. We are going to put Arkansas and the Delta Division on top. We challenge any state in the Delta Traffic-Handling Contest.

Traffic: W5DEJ 89 EKV 18.

TENNESSEE—SCM, Merrill B. Parker, Jr., W4BBT—New har on 1.75-mc. 'phone. The Red Wing fellows held first impromptu traffic-handling contest now going on in this state? It will run for five months. If you have not been reporting to the S.C.M. each month you should do so, as you may win one of the prizes offered. We are going to put Arkansas and the Delta Division on top. We challenge any state in the Delta Traffic-Handling Contest.

Traffic: W2LU 217 EGF 208 FGC 131 UL-ATM 26 ES0-QNI 69 BFD 15 FKL 12 CC 9 GPB 4 GRY 3 DSH 52.

NEW YORK CITY AND LONG ISLAND—SCM, Ed. L. Baumach, W2AZV—New O.P.S.: 2HBQ at Bay Side L.I., from the first district. ex-ICNA. CSM is at new QRA in Little Neck, L. I. DXO entered Northern Nassau Wireless Assoc. flea power contest with 21 watts input on a 91A. HQJ is new at Rostyn. BCW took the top step. Good luck. OM, FJD is drafting new plans for antenna skycraper. ETA's rig gets out DBB. DBE is now a traffic- handling contest now going on in this state? It will run for five months. If you have not been reporting to the S.C.M. each month you should do so, as you may win one of the prizes offered. We are going to put Arkansas and the Delta Division on top. We challenge any state in the Delta Traffic-Handling Contest.

Traffic: W5DEJ 89 EKV 18.

TENNESSEE—SCM, Merrill B. Parker, Jr., W4BBT—The new S.C.M. wishes to thank all who responded to his call for assistance in publicizing contests and news of his election with messages and letters. PL leads the Section in traffic. A YV carries several good schedules. ANI is with us again. BXZ is working W4PL 209 AFM 49 (WLRH 183) RO 84 AVY 68 ACU 50 BBT 48 ATW 4 BM 2.

HUSON DIVISION

EASTERN NEW YORK—SCM, Robert F. Haight, W2LU—LU has 830 final with 133-fl. Zepp. EGF seen ball DX at 10 mc. PQRQ formed S.A.B.R. hamfest. ATM is troubled with key clicks. ES0 and HJN were heard in Germany on 3.5 mc. GNI reports three hams: HNU, HMT, HMX, all c.w. KW is on 14 mc. with 90A. FKL reports HRD new ham. EJG reports in the game. GYU won condenser at S.A.R.A. hamfest. DRI is on 3.5 mc. new O.B.S. on 3660 and 7160 kcs. FXQ is QRL Teachers College. US at S.A.R.A. hamfests won Mutter G.L. QST for 60

Traffic: W2LU 217 EGF 208 FGC 131 UL-ATM 26 ES0-QNI 69 BFD 15 FKL 12 CC 9 GPB 4 GRY 3 DSH 52.
rig. GNO uses indoor antenna. GSF uses flex power, one 71A. GEI is trying suppressor grid modulation. DFO reports ESJ, the Harlem Radio Club, is conducting a rudimentary AGC controlled head. LEV lists 7 to 10 p.m.; all essentials of radio are being covered. AZX works DX with 59 Tri-tet and 841 amp. over.

Traffic: W2EKK 346 CHK 1241 148 103 102 101

reports have not been sent in for the last three months, for B.P.L. LWG MZD is Alt. D.N.C.S. in A.A.R.S. BMA is working on PWX4.

It moves again. It is reported LJO is selling out.

Traffic: B,ill air with Tri-tet. RQE operated USA at World's Fair.

I • KD 4. 4 FRC 35 OAQ 30 RIZ 19 KTJ-IQI 15 CMV 7

107 EYY 103 CDM 101 BYM-NI 69 EFE 62 KFQ 60 RIZ is O.R.S. license. J{MM completes first Iowa Traffic Net. All friends new skywire. HUY is a duck hunter. OZW is leading west.

Traffic: BMA 109 108 107 106 105 104 103 102 101

Russell County O.R.S. are requested to forward their list to R.M. HMM.

Traffic: W9ACL 133 LEZ 113 LCX 92 ABE 88 EIV 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

New England Division

Connecticut—SCM, Frederick Ellis, Jr., WlCTI—Conn. QSO Contest went over with a bang. UE made highest score. Prizes were won by ASJ on c.w. and EHF on phone. Country Traffic Net is under way. AMG leads in traffic, with MK a close second. FIO is up to neck on sure-fire west coast trunk and made B.P.L. in two days. "Gil" and UE kept CJD on the air about 27 hours during O.R.S. Party. UE is mostly DXing. IFE is in the game again. All making a special showing of some kind are mentioned. All reports are appreciated, no matter how small they are. Send the information in at your leisure.

Traffic: W1AMG 474 MK 466 FIO 342 CJID 291 UE 181 CVL 88 (WLG 53) D00 88 WHE 63 BDJ 62 C2 55 RMM 42 GMX 29 GXX 22 HIP 13 APW 12 HZX-HEL 10 HSU 2 DLX-BNB-IDI 6

KANSAS—SCM, O. J. Leiz, W9FLG—9KG and 91OMl ROE's 9EE5 P.A.M. The 8th Annual Kansas Convention at Topeka, under auspices of K.V.R.C., was a great success. WAQ has new 8300, PRO says, "Am I desired!" (reported day after convention). RIZ is O.R.S. applicant as well.

Traffic: W9JAC 133 LCX 123 ABE 88 EIV 79 78 77 76 75 74 73 72 71 70 69 68 67 66 65 64 63 62 61 60 59 58 57 56 55 54 53 52 51 50 49 48 47 46 45 44 43 42 41 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

Traffic: W9QBT 981 (WLU 181) WFW 685 KPA 297

NEBRASKA—SCM, Samuel C. Wallace, W9EYG—JPT—NEBRASKA'S SOM, 0. R. Cannady, W9EYG-JPT...
EASTERN MASSACHUSETTS—SCM, Joseph A. Sullivan, W1A5I—ASI attended Cape and Melrose hamfest. ABG has largest unit in N.C.R. Section. KH is busy visiting clubs. VW wants expedition schedules. GCL is on 3.5 mc. CH is busy with S.E.A.R.C. Section’s Class A 1 KW. ‘phone SW is Phillips Andover Radio Club. IER is adding RK20’s. HKY is busy with Army Net. BFS is going on 28 mc. with 50-watt ‘phone and i.c.w. RE has 59 Tri-tet feeding RKES. FFO received 2nd class commercial. IW uses c.e. IDA works DX on 14 mc. IC is going to Eastern Radio School. ELL is going o.c. on 3505 kc. Following are results of club elections: Eastern Mass. A.R.A.: Pres. KH, Vice-Pres. GL, Treas. DK, Secy. PSE, Publicity ALY, Directors DPP, FIK, NA, South Shore A.R.C.: Pres. AY, Secy. GYZ, Vice-Pres. Mullen WIAS-A SI-AS attended Cape and Melrose hamfest. South Shore A.R.C.: Pres. AKY, Secy. GYZ, Vice-Pres. RK20’s. HKY is busy with Army Net. BSF is going to 21 FRO 71 GCL 10 CEL 158 BR 21 SW 7 !EK 4 HKY Mass. A.R.A.: Pres. KH, Vice-Pres. GL, ‘freas. DK, treas. please get in touch with the S.C.M. Secy. 1''SK, Publicity ALY, Directors DPP, FIK, NA. First report. BVP has new position in Lowell. Sorry to keep daily A.A.R.S. schedules. COI worked VK5SU on 13 BSF 112.

Noble, WlBVR/WLG—EOB makes B.P.L. for first ‘phone. SW is Phillips Andover Radio Club. IEK is adding KB20’s. HKY is busy with Army Net. BSF is going to 21 FRO 71 GCL 10 CEL 158 BR 21 SW 7!EK 4 HKY Mass. A.R.A.: Pres. KH, Vice-Pres. GL, ‘freas. DK, treas. please get in touch with the S.C.M. Secy. 1''SK, Publicity ALY, Directors DPP, FIK, NA. First report. BVP has new position in Lowell. Sorry to keep daily A.A.R.S. schedules. COI worked VK5SU on 13 BSF 112.
PACIFIC DIVISION

NEVADA—SCM, Keston L. Ramsey, W6RAD—BPO W.A.C.'d 45 countries. GYX is on A.R.R.L. Trunk Line "B." AJP is rebuilding. HGJ has new c.e. rig. KJZ has new 300-watt Collins transmitter. ECQ has new 300-watt rig. AAX works Army and Navy drills. BYH has new transmitter. EEF has new Sargent receiver. KEB is attending U. of Nev. HGL's sister has license.

Traffic: W6BFO 120 GYX 73 AJP 35 HGL-UO 26 GQZ

LOS ANGELES—SCM, Howell C. Brown, W6BPU—Let's snap out of it, fellows, and get back where we belong. I am counting on you, and will be here to do new from now on. AM has new 107-foot tower. Following make R.P.L.: FTI, EZ, (our YL O.R.S.), NF, CFN, AZU, CVF, HZT, CVF, big blow big tet. GKM is going to rebuild. KBY has daily schedule with RAILR. DWP has trouble with rig. ERT made 85-mile record on 56 mc. JVU is QRL law school. HFD made VS6AH "W.A.C." on 7-mc. JNE is putting in c.e. AJF moved to North Hollywood. CUH has new station now without QD partner. Reports received from: ANN, BLS, RWE, CV, DZI, GK (Ex-9AFR), RMS (married and leaves section, Luck), IDZ, LLY, IRA, IFW (works T12RC), KJE, WG, New hams: GLU, LKP. Welcome.


SANTA CLARA VALLEY—SCM, Charles J. Camp, W6BMW—XY, Stanford Univ. Club, is back on; they have now micrometer frequency meter. BCF is getting under way. FBW sends an excellent report. JFD has a QSO with RB on 56 mc. KUZ has been trying grid modulation. JUD is on again. KJZ is trying to QSO So. African. BWE, BMK intends putting in 'phone rig. NX is old-timer, getting a 'phone together.

Traffic: W6BPW 72 BM 60. JNDU—SCM, P. W. Dann, W6ZX—Come on, fellows, send in your reports by the 16th so that S.C.M. can have something to work on. RJ is still QRL as aide to Capt. Woolverton. ITF centered his activities around rebuilding. RP is QRL, U.S.N.R. unit; includes AIK, AJIJ, ATT, FQG, INZ, CTX, CF, VS and ZJ. We understand Chief Geritz, CTX, is an Ensign in EAJA. EJA says new club at Richmond coming along fine. AIK has been working the South Africans. DHS works China and Guam constantly. FS is on QRL school. BCF is getting under way. RMS and A.A.R.S. The S.C.M. helped VS put up 265-foot Zepp.


SAN FRANCISCO—SCM, Byron Goodman, W6CAL—2G, A.A.R.S. N.C.S. B.P.L.'s again. RH, new R.N., is going great guns. KJ reports for U.S.N.R. station N. LB is new O.R.S. on A.R.R.L. Trunk Line "B." SG has nightly schedule with K6DV, HJF now helms to A.A.R.S. HSA has new Class A ticket. JNI is QRL U.S.N.R. work. JDG's final '40 wouldn't take 750 watts. WF is QRL, U.S.N.R. HBY is now O.R.S. and proxy of A.R.A. NEM is printing for 88 contest. AWA and RQG are knocking over only DX. KBY wants O.P.'s. KQJ seeks O.R.S. KKB has '03A final. JZJ has new Sargent 9-33. AZK is QRL Univ. of Calif. JUW has new o.e. rig. JQJ says, "Neither any power, not much DX. My crystals this summer. JMR worked CM, X, and VK. GIS is busy with construction work. JWM is back from C.C.C. camp. ERS reports from Tacoma. HFP knocks over PK and 2U with new 300-watt rig. QAR is on schedule.


SACRAMENTO VALLEY—SCM, George L. Woodington, W6DV-E—the Sacramento Valley Radio Club has a new lease on life with GQZ as new president. A big fire burned out all GAC's competitors in the grocery store. Two new O.R.S.'s: DVL and 22N. JDG flow has a comet pro. Those attending A.A.R.S. hamfest in Sacramento: 2G, RJ, E5W, KGO, HYF, HLJ, GZJ, EQG, GGM, EXH, E6K, CGJ, and DVD. DVD has been assigned to A.R.R.L. Trunk Line "F." GQZ, GZJ and IZE are playing with microwaves.


ARIZONA—SCM, Ernest Mendosa, W6BQ—CLU cancelled. Reports schedules because of models to new QRA. JHF is QRL at U. of A. KOL wants O.R.S. GW4 (W9QC army portable) has new motorcycle at Parker. IQ8 is alternate state N.C.S. for A.A.R.S. FQZ is rebuilding to RX-20 crystal osc., 801 final, 1000-w. input. IQ8's DX antenna blew down. BFA has a '10 on 5 mc. and P.P.'s '10s on 7 mc. RLP works G and F on 14 mc. JYQ is getting ready for '52 installation. DPS is back from Los Angeles. LAB is now at Tucson. DSC is new Phoenix man. DOW moved to San Jose, Calif. KHS wants crystal on his rig. HCX is now A.A.R.S. JHV bagged one of the first deer. FEK is on 1.75-mc. 'phone. KGJ is working at Ajo temporarily. BCD is police operator at KGJ. GJU has excellent report on 14-mc. 'phone. BYD has new pair of "sky hooks." DKP is from World's Fair. DSQ builds duplex garage, while not on 14-mc. 'phone! 1ZU is on with an '11. KRU has 56-mc. rig. KK is c.e. JFO is polishing rig for winter. GHC has new micrometer frequency meter. JFO is completing last stage. ICI is new Globe ham. DRE,.DKF, DJH are active on 56 mc. SKNY and SKDJ, from Ohio, settle in Phoenix. GPK, portable, visited S.C.M. at Parker. New officers of Phoenix Club: KQG, pres.; DKF, vice-pres.; RHI, secy.; IIF, treas.; DJH, "bouncer." Second Arizona hamfest to be in late February or early March.

Traffic: W6ALU 262 (WLJB 886) JHF 125 KOL 65 QC 47 HIF-FQZ 20 IYQ 6 BFA 29.

PHILIPPINES—SCM, N. E. Thompson, KA—XA—IWR, Harry Wright, left for the states October 29th. Captain A. B. Pitts, W6EQG, is now IAP. Chief Radio­man Des Goodman will operate KA1ST. Olongapo.


SAN DIEGO—SCM, Harry A. Amblar, W6EOP—BMC reports the Trunk Line working fine. BHF works 'phone and c.e. FQU was appointed Radio Liaison Officer emergency committee, Veterans of Foreign Wars of the U. S. A. EPK will hold down San Diego end of A.R.R.L. Trunk Line "F." AJC was made Chief in U.S.N.R. NW called on U.S.N.R. BHF from East coast. HEX was in the VE/W Contest. AXN is still QRL. The R.M. job for the Valley, as QA will not be with us for some time. IBK is rebuilding with 830 final. KBD reports GMU on 66 mc. CNK was visited by IEMV and JFK. LD is rebuilding receiving end. K1J was appointed Assistant Director, A.R.R.L., for San Diego Section. BLZ bought new SW3. JEZ is now on 3.9-mc. 'phone. FK7 reports new club at Escondido. The San Diego Radio Club had a station at Electric Show and took over 700 messages.


SAN JOAQUIN VALLEY—SCM, Bill Ramsey, W6E—Second Arizona "bouncer." WD6DN—BCR sold his 'phone rig. The Stockton Radio Club had a DX contest all its own. EXH is doing fine A.A.R.S. work. KGO is now O.R.S. FQU reports Modesto Radio Club experimenting with 86 mc. GQZ, our YL op, puts out some FB chicken feeds for the hams. SB has four tons in final. This will be our last report for the remainder of this section. I thank all who cooperated with me during my term and ask all of you to support the next S.C.M. as much as possible. So long, gang, and goodbyes.

Traffic: W6EXH 107 FQU 57 AGY 49 DZN 47 KGO 37.
I want every ham in this Section to know that I appreciate the whole-hearted support I have had during my Strike. The new club station, BV A, is on the air in Greensboro. CJP is QRL law school. ALK, FT, and VW are rebuilding. The new club station in Charlotte is nearly ready. BKS and BVJ are doing FB DX work. AAU, BBK, and BVV are rebuilding shack and rig. CYK is rebuilding. The new club station in Charlotte is waiting for radios. OUI has lot of pep. IPH will soon be in circulation again. HQV sold 1.75-mc. 'phone. GHY had 6 tin-watter go bad. DDF gets out "C." ELB and BV is on 'phone mostly, BVZ has 1"B 3.9-mc. 'phone mostly, and BV has 3.9-mc. 'phone. BV and AAU did splendid traffic relay work while the N.C. Cavalry was on duty at Concord during the week. The new club station, BVA, is on the air in Greensboro.

IROQUOIS DIVISION

C.C.R.A., 6COA, 5EBJ, 4CIO, 3AF, 3BFW, 2BDD, and 1LTD are installing O.R.S., 6FYR, 7DIE: O.P.S., 7ARK; Asst. opr., 6COA. The greatest convention in Division was held at Roanoke, with rain both days, too. Active: ODF, LYV, FHX. The San Isabel Amateur Radio Association elects new officers: NLD Pres., PMF Secy. and Treas. SAU is a new club in Denver. AAB has been on the sick list.

NEW ENGLAND DIVISION

West Virginia-----BCM, C. S. Hoffmann, Jr., WSHD 1,Washington, D. C., looks forward to your full cooperation will be my last report. Officers: HWT, Pres.; 1"VCJ, V. Pres.; DAM, Secy. and Treas.

ROANOKE DIVISION

 affirm has not had the time to put to amateur radio during the summer. EEN is on 3790 kcs. APT visited ANT. EPW is on air with schedules VP5AS weekly. New O.P.S.: 3FM. New club station in Greensboro: W3G9. JKB is adding P.P. '10s. EAP was on 56 mc during the month and for that reason

Trafic: W3BTO 186 BRT 50 DW 34 VB 28 BKK 13 DJ D 14 CJB 10 MR-BHR 9 BYA 8 ZCH-XCO 5 EXP1 3 RBF 2.

VIRGINIA----SCM, R. N. Eubank, W3AAJ-EGD has ENR as Asst. opr. AAJ is testing new type antenna. FE won 3rd prize in Roanoke Div. Contest. CFV schedules 427 with every chance. EVN is building Cross CW 25. APF won Cathode Ray at convention. BFV has new c.e. freq. meter, BZE liked VE contest. BIG is new P.A.M. EPK and CYM are on 3.5 mc. BSF likes DX. APT schedules 1554A and 1611B. CJL handled sick message and answer to Winnipeg. EHII is now O.R.S. BRU is our new S.C.M. ECQ operates at BRY. APT schedules BJJ daily. CA did grand job as convention manager. EUL was visited by BRY, DSF. EGD has new receiver and rack transmitter. ELJ was heard in Germany on 3.5 mc. BSY operated portable at Shelby. ELA is on 3332 and 7064 kcs. ALP is on 3814 at Appomattox. DBL station at fair, operated by members. FEJ has Hill 60-mc. full beam ant. on daily schedules. AUG has rig on at Reserve Armory. DQB schedules CHE. EBK is adding P.P. '10s. EAP was on 56 mc during the summer. EEN is on 3790 kcs. APT visited ANT. EPF won crystal and holder in Roanoke Div. Contest. SEX, RHH, RNF, and EDM were active Saturday night. Active: ODF, LYV, FHX. The San Isabel Amateur Radio Association elects new officers: NLD Pres., PMF Secy. and Treas. SAU is a new club in Denver. AAB has been on the sick list.

Trafic: W3FW 24 ELO 2 9BD 9 7TD 9 6LSJ 9 BW 54 MCL 9 51 (WLHG 64) MCR 7 FQB 24 MOP 9 2.

WEST VIRGINIA-----SCM, C. S. Hoffmann, Jr., W8EDD

New ham club, Radio Communications Assn., was formed in Wheeling. Officers: HWT, Pres.; FVU, V. Pres., Harry W. Mauil, Secy.-Treas. ELO is QRL U.S.N.R. ANU attends Bethany College, near Wheeling. BTVV is operating at Ohio State. The Army beat the Navy in Gode Contest. ESA has a new 3-tube recciver given away by Mountaineer Amateur Radio Assn.; FQB and JKN won crystals. KSJ has 1st class BC opra. license. HD is back on air with schedules. FVU has baby girl. OK puts out 1.75-mc. 'phone.

Trafic: W3FW 24 ELO 2 9BD 9 7TD 9 6LSJ 9 BW 54 MCL 9 51 (WLHG 64) MCR 7 FQB 24 MOP 9 2.

MOUNTAIN DIVISION


Colorado-----SCM, T. R. Becker, W9WTO--An FB will be waiting for you in Denver. AAJ and OM's went to convention. YF's spent time relaxing at the Army beat the Navy in Gode Contest. ESA has a new 3-tube recciver given away by Mountaineer Amateur Radio Assn.; FQB and JKN won crystals. KSJ has 1st class BC opra. license. HD is back on air with schedules. FVU has baby girl. OK puts out 1.75-mc. 'phone. SP has a new Meandro Silver all-wave. The new club in Denver is putting out a paper. 8ND is C.C.R.A. Club station. SJF is new Denver ham. GNK is on regularly again, EGD worked VK5RR. BYF has new antenna system. JKB is looking to Emory-Henry College. EGD has been on the sick list.


Utah-----BYMOMING--SCM, Arly W. Clark, W8QGC--IDM--Announcements: Trunk Line, GQQ--"B," 6DGR--"I;" O.R.S., 6FYR, 7DB; O.P.S., 7ARK; Asst. S.C.M. for Wyoming, 7COI. Wyoming amateurs, please NOTE: Wyoming will function under the direction of T. J. Rigby, 7COI, Box 698, Midwest, Yolo, He will be
SOUTHEASTERN DIVISION

ALABAMA—SCM, L. D. Elwell, W4KD—The Mobile Convention went off with a bang. DS has the “Dixie-Dew Drop” Net going fine. ADI and portable SLD are in the Muscle Shoals district. AYJ reports 28 mc. gone dead. CIU helped talk up convention. BOU was heard on for O.R.S. party. APU reports from Atlanta. CVW tried 7 mc., but went back to 3.5 mc. for traffic. R8, ZS, AUP, BZG, BGO reported during A.A.R.S. ‘Phone Net. BMM is to be P.A.M. for Alabama. The SCM visited Bahama.

Traffic: W4DS 89 BOU 44 APU 20 AJY 19 CVG 22 CIU 4 ADI 1 R8 24 AUP 6 BGO 19 BZG 8 KP 5.

EASTERN FLORIDA—SCM, Philip A. McMasters, W4BZC—ASK applied for O.R.S. to keep his place on Trunk X. TMN. ‘Phone in hand. CQZ resigned as Secy. -Treas. of St. Pete Club; he is moving to Lake City. All interested in joining Chapter 2 of “Meters of the Morning.” write P.A.M. CQZ at Lake City; limited to 1.75-mc. ‘phone. QT portable is active in St. Pete. COV worked GSNF, ON4BBN &nd CIIU 4 ADI 1 RS 24 AUP 6 BGO 19 BZG 6 KP 5.

Traffic: W4BZC 7 ASR 18 CQZ 3 CWR 5 COV 18 CSJ 4 BNR 19 AEK 17 CQJ 9 BNI 7.

WESTERN FLORIDA—SCM, Eddie Collins, W4MS—has new Phantom in relay. Congrats to KB on Class ‘A” license. AQZ has been QRL college. BNN had several ham contacts.

Traffic: W4WQZ 89 BOU 44 APU 20 AJY 19 CVG 22 CIU 4 ADI 1 R8 24 AUP 6 BGO 19 BZG 8 KP 5.

Traffic: W4DZS 89 BOU 44 APU 20 AJY 19 CVG 22 CIU 4 ADI 1 R8 24 AUP 6 BGO 19 BZG 8 KP 5.

NORTHERN TEXAS—SCM, Glen E. Talbott, W5AU—Hl wants to hear from traffic stations.


OKLAHOMA—SCM, Carter L. Simpson, W5CEZ—CBZ wants to put on a 240A to work Trunk K schedules. BQZ is doing well. work as A.A.R.S. DEB. AMT is new L.N.C.S. in A.A.R.S. BKK plays in college band. BAR, Okl’s new BM is, is running Oklahoma position on Trunk D. AJF is QRL college. EFP-CVA did interesting 85-mc. work at N. C. camp. BDX has private transcon line from N.Y.C. to Frisco and back to Washington, D. C., operating between 1:00 a.m. and 4:45 a.m. daily. DTC cream station and WX reports keep DTC busy. DBU pinches hit for BEK on WX reports. DDW has two c.c. rings, one for 7 and one for 3.5 mc. ASQ is working hard on N.C.R. unit. BWN blew power transformer. BJ6 qualifies for A.A.R.S. EMH is replacing c.e. on 6 mc. with c.c. rings. CBZ reports. AWZ spends 90% time on ‘phone. LR is club station of Venturers. Key Clickers. AIR operates at Police Station. AJA is new Watusha ham. EHS is going to school in Norman. CRS is rebudding between shifts at A.G.S. A.A.R.S. trunk line “K” and “D” now run through OKLAHOMA. Your traffic to 5AZ or 5CEZ to get it on either one or both of these fast lines.


SOUTHERN TEXAS—SCM, Bradfield A. Beard, W5WZD—MN carries 15 traffic schedules! BFA reports San Angelo Club has new club house. BEF works 7, 8, 10, 13 and 3.5 mc. WW has traffic line for 1st Cavalry Horse Show. MS has new R.C.A. antenna system. DMK is installing 93A final in phone. SW worked VK8UIA with single ‘45. DJ6 says rhythm system helps make QSO’s longer. PF is attending U. of Tex. AFV entered VK contest. BDI may get ‘VX’s with his ‘10’s. CLZ has ‘10 final. CTP moved to E.C. Mo. EKJ is experimenting with 55 mc. BHO is on ‘phone. EFS has type 19 tube on 1.7 mc. "D," with new O.Q. ERE has DXing with ‘45a. ON is on 3.9-mc. ‘phone. Following have sure fire traffic schedules: MN, BFA, BEF, BJ, DWN, AJY, MS. The H.A.R.C. is every evening during U.C.A. ADZ DX’s on 14 and 7 mc. Please get

December, 1934

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your monthly reports in by the 15th. Applications for O.P.S. and good O.R.S. wanted. Active: AJY, ABOG, CVWA, EXW. Special phone: SP, DCP, EEP.

Traffic: WOEW 718 (WLJ 695) MN 505 BFA 213 BEF 74 BJ 49 DWN 45 AJY 32 CVQ 39 MS 18 ADX 10 DXP 10 CVW 7 BY 5 F 4 DJT 3 AFV-EFZ 2 CLZ 1 BWM 3.

Newcomers: EXW, DZ. Lay, WDDZ-DUI: DUI is QRL Airways. 4CA-SUC has located at Pecos for the winter. ZM has four licensed operators. DLG is looking for schedules. CCJ is putting the gang through A.A.R.L. drills. AJY has set his recorder. New appointments: AOM, TR, WLE. G.O.RS.

Traffic: W6ZM 152 DLG 56 CGY 56 (WLIJE 36) DUI 51 AAX 20 AOP 23 EAO 14 DZY 9.

CANADA

MARITIME DIVISION

MARITIME—SCM, A. M. Crowell, VEIDQ—Nova Scotia: FT is new O.R.S. O.L is c.e. on 3730 kc. EP is now Pres. H.A.R.C. HB sports new bug. HG has SQD 26 counties on 14 mc. Congrats to AW and EK, now beneficia. DQ has been tuning up on 3.6 mc. FB is taking a swat at 14-mc. DX. GR's Class B 1.75-mc. phone gets out well. HJ and RK are new men on 3.5 mc. EX entered VE/W contest. EP is only Halifax 'phone on 3.6 mc. YL will in future sign from EK. AG is to annex a dynamotor. DC and BP recently visited Halifax gang. Newfoundland: VOSW is on 7 mc. regularly. VOSY has lower input. For Grits, FHO is putting in some QSOs. QW's waits input to part. '31's photo and dope in T & R Bulletin. VOSHK is rebuilding. VOSY has pair '52's P.P., 300 w. input. VOSY made 2511 points in VE/W contest.


ONTARIO DIVISION


BRITISH COLUMBIA—SCM, R. E. Town, VE5AC—HQ leads traffic reporters. The Kootenay boys report via EJ, who has idea of going 1.75-mc. 'phone. JI is putting in some 3.5 mc. DX. VO8HK is rebuilding. VO8K has pair '52's P.P., 1.75-mc. 'phone. VO8H has 15-watt power. VO8K hopes for call 5NB. UA has nice note on 3.5 mc. GI works east coast regularly on 7 mc. IN has 110-foot tower. KY is new on 7 me. CO and TZ are new 7-mc. stations. EK has Tri-tet 668 messages were received from visitors and disposed of through efforts of EE, DR, HK, BU, GO, HT, IE, IB, and DU and had enjoyable time at A.A.R.L. Convention in Toronto. AP is filming sharks of the gang; GO is new O.R.S. BU, DR and HX schedule Toronto. DJ and IO now have c.c. EK had contacts. VO8G has nice traffic list. HG needs this for W.A.C. BG burns out "at last" one of the first '36's sold. Nice letters from HH, DG, EC, IG, IN, CG. Be sure and listen to our OBS-2HK every Tuesday evening at 10:15 p.m.

Traffic: VE2HK 130 BU 107 GO 24 DR 381 DG 114 BG 13 GA 4 EE 252 HE 7 DJ 21 CO 76 CU 280 CG 3 IG 45 EC 7.

VANALTA DIVISION

ALBERTA—SCM, J. Smalley, Jr., VE4GD—JK was heard in G on 14-mc. 'phone. EO lost sleep in W/VE contest. OG is in line for O.R.S. LG changed to c.e. QK moved into Calgary. KG is putting his shackles into high gear. LX moved into town for winter. The area DX contest is to be staged from November 1st to December 31st. All hams desirous of entering must notify Tom Watson, 4NH, before November 15th. W7ABT was a visitor in Calgary and Saskatoon Monday.


Traffic: VE5IC 3 GI 27 IN 1 KY 11 DP 45 FM 19 MD 13 HR 47 EU 26 AM 52 SF 8 KB 6 EP 9 HQ 151 JK 24 LZ 10 AL 31 JA 9 GT 20 AC 55.

PRAIRIE DIVISION

MANITOBA—SCM, Reg. Strong, VE4GO—AG has schedule west and south. MV keeps emergency schedule for American Consul. KU handled traffic from Montreal Show. GC takes traffic from Vancouver and Canadian National Exhibitions. KX has new rig. DJ and BG work DX. AE, LL, GL and DU get FB results on 14-mc. 'phone. IU, IA, QA, QY, LE, HM, MY and JS are on 7 mc. TO and TZ are new 7-mc. stations. EK has Tri-tet for that district. 4NB comes to work DX. AE, LL, GL and QZ doing fine. New Saskatoon hams: TN, UH, UD, UC, UI, TI, PE and TN are building new receivers. LB is to annex a new O.R.S. OR, LS visited DW, MG and TH and pair RK20's. UA has M.O.P.A. TJ has quite a phone. It acquired two 50-watters. DU received W.A.C. changes. MN flits to Beaufield. RZ purloins OW. BN worked some FB DX. MH is making extensive contacts.


SASKATCHEWAN—SCM, Wilfred Skaife, VE4EL—CM is well ahead in traffic. GR a good second, and FW, ND and QZ doing fine. New Saskatoon hams: TN, UD, UD, UC, UI, TI, PE and TN are building new receivers. RI has 1.75-mc. 'phone. PW was visited by SE, SQ and KB, QS and RD are building c.e. rigs. JB M.O.P.A. LI works 1.75-mc. 'phone and 3.5-mc. c.w. FW is going in for O.R.S. SY gets out well. KX has new rig. KF handles Victoria end of cb.ess game with Vancouver, scheduling FM daily. HB sports new Sargeant receiver. EF is appointed R.M. JK is QRL servicing. LS has station at store during Radio Week. CP resumed schedule with VE5K.

Traffic: VE3QG 45 MV 93 41 BJ 48.

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Traffic: VE3QG 45 MV 93 41 BJ 48.


Causal Zone: K5AF/W2AL continues to uphold the A.A.R.S. Traffic for Sept.—Oct. month, 201.


Traffic: VE3QG 45 MV 93 41 BJ 48.

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Traffic: VE3QG 45 MV 93 41 BJ 48.
The Publishers of QST assume no responsibility for statements made herein by correspondents.

**Hi,gh Power QRM**

26 Ridgewood Ter., Maplewood, N. J.

Editor, QST:

... After all, when you sit right down and think about it, is there such an awful lot of QRM on our bands? I have a 40-meter rig, '10 final and '10 oscillator with about 55 watts to the amplifier, perched right up among the high-power xtal boys on 7011 kc., and a Super Wasp receiver. I'll be darned if I can find all this terrific QRM that everyone's blowing about. Sure, sometimes I've had a QSO busted up by a high-powered fellow who blocked my detector out, but that's all in the game. We can't have Utopia. And, too, if some of these poor guys that are doing the yelling would learn to copy through QRM, it would be better. You don't have to copy every letter to get what the other fellow's telling you, you know.

—Robert Bramley, W2FLP

**Editor's Note.**—To many dozens of controversial correspondents on high-power limitation, whether or no: lack of space prevents publication of more letters on this subject. To those who have unauthorizedly and unjustifiably stated that QST is sponsoring a movement for power reduction: attention is called to the line just beneath the heading of this department. QST engages in no campaigns except when ordered by A.R.R.L.'s Board of Directors. To amateurs in general: QST sponsors no movements, yet it maintains this open forum for all; herein the views of the many and any are subject to expression, the only requirement for publication, subject to space limitations, being general interest to the amateur fraternity.

**R-S-T**

734 Lewis St., Burlington, Wis.

Editor, QST:

RST49X! Logical, brief, and to the point. The biggest improvement in amateur operating practice for quite some time, and W2BSR is to be complimented on the new standard system of reporting signals.

Many times in the past I have been disgusted with the long lingo of "QSA 3 R 5 NDC with slight key thumps," and now we have a system that answers a very definite need, and one which I trust every amateur will adopt immediately. I am for it 100%.

—M. F. Whitton, W9BXZ

Box 185, Decker, Ind.

Editor, QST:

... This seems to come far nearer to filling the need of a comprehensive reporting system. Everyone knows the confusion existing thru the use of QSA and R. Very few amateurs knew the difference between the two but with the new R-S-T it is easy to be seen. However, the T system could be changed somewhat, and I would suggest T9 to mean "Purest d.c. xtal." It seems as if there has been too much stress on the a.c. ripple. Most signals of to-day are d.c.-p.d.c. or xtal, so why not make three or four of the T's for the a.c. and the rest for the d.c.-p.d.c. and xtal?...

—Edwin L. Robb, W9DGC

P. O. Box 143, Pt. Pleasant, N. J.

Editor, QST:

Congratulations on the article by W2BSR on his new system of reporting. I hope that it goes over RST559X! Hi! Ham radio needed something like this some time ago. . . .

—W. T. Sutphen, W2GPI

2030 Quenby Road, Houston, Texas

Editor, QST:

... I tried the new R-S-T system on a couple of fellows, and they thought I was insane. Hi! Still using it, though. . . .

—Bradfield A. Beard, W5ADZ

Box 411, Minden, La.

Editor, QST:

W6CMQ wanted to know if QST was trying to get all the hams streamlined by using R-S-T instead of the old method.

Tell W2BSR that I sure like the R-S-T system 100%, and am using it at all times.

—William T. Fritz, W6BZR

**Power Input**

3217 De Witt, Mattoon, Ill.

Editor, QST:

Perhaps the most illogical of all amateur regulations is the one limiting input to the final ampli-

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fler to one kilowatt, it has been carried over unchanged from the age of self-excited oscillators and at present serves to put at a disadvantage those amateurs who desire to use, as a final amplifier, a linear unit, a grid-modulated amplifier or a suppressor-grid modulated radio. The following are reasonable estimates of efficiency: (1) High-level modulated stage—70%; (2) Linear amplifier—33%; (3) Grid-bias modulated stage—22%; (4) Suppressor-grid bias modulated stage—15%. This means that if one kilowatt input is used to a final stage of each type the following order of outputs will result: (1) 700 watts; (2) 330 watts; (2) 220 watts; (4) 250 watts. Output, not input counts. Therefore, in order that the last three types of amplifiers have an output of 700 watts, they must have inputs of respectively 2121, 3181 and 2800 watts.

Many amateurs who desire high power would like to use one of those three types, but to obtain full use of the 1-kw. input rule they must resort to high level modulation. Why not ask the government to permit the following inputs: (1) Linear amplifiers—2000 watts; (2) Grid bias modulated stages—5000 watts; (3) Suppressor grid modulated stages—2800 watts? . . .

—John Owen Weaver, WQQQ, ex-WAYB

Editor’s Note.—Often overlooked is the point that a 1-kw. 100 % modulated ‘phone transmitter actually has a power output greater than a 1-kw. c.w. transmitter. Classifications, once established, could logically be forced to allow for this disparagement, for difference in efficiency between oscillators and amplifiers, perhaps even for difference in efficiency at various frequencies.

The signature of a letter on this subject published in the October issue incorrectly stated W2DLM to be the call of the writer, David Scott. Mr. Scott’s call is actually W2CLM. The owner of W2DLM is anxious to make certain that the opinions expressed in that letter will not be ascribed to him by readers of the Correspondence Department.

Off the Map

Saigon, French Indo-China

Editor, QST:

First place I ever got into where I couldn’t hear W1MK! Still have hopes, though.

73 to the gang.

—Clyde De Vinna, W80JJ

Camp SP-1, Wildwood, Pa.

Editor, QST:

Through the good offices of an article which you were kind enough to publish on page 46 of the April issue of QST, several amateurs have received employment, and the CCC net has profited by securing several good operators. The need for operators has again arisen, and it will be greatly appreciated if you will publish a similar article in the first available issue, giving information substantially as set forth herewith:

“Civilian Conservation Corps radio nets are now in operation in the State of Pennsylvania, Maryland, Virginia and the District of Columbia. The stations of these nets transmit official business during the day, and at night function as amateur stations, members of the Army Amateur Radio System. Due to the establishment of new stations, and occasional separation of present operators from the service for various reasons, additional operators are needed and enlisted from time to time. Requirements for operators are that they are residents of the states mentioned, possess a valid operators license, have the ability to send and receive code at not less than fifteen words per minute, have a good general education, and are otherwise able to qualify under CCC regulations.

A list of stations in the State of Pennsylvania who are interested in joining the CCC should write to the Radio Supervisor, Pa. CCC Net, Camp SP-1, Wildwood, Pa. Those living in Maryland, Virginia and the District of Columbia should write to the Radio Supervisor, Va., Md. CCC Net, Sperryville, Va. There are no known openings for operators residing in states other than those mentioned.”

Thank you for your cooperation in this matter.

—E. L. Skinner, Captain, Signal Reserve, Radio Supervisor, Pa. CCC Net

28-Mc. Hot

512 N. Main St., Wheaton, Ill.

Editor, QST:

You have done much good work in making unused bands more popular. But in view of the fact, as I understand it, that NBC finds 8 meters much superior to 5 meters in distance, volume and lack of shadows, why not suggest more use of 28 mc. for local ‘phone, as well as 56 mc.? Ordinary ham apparatus can be used—antennas not much more difficult to erect—even beams—and it will put signs on the air who when the band does open up for DX, some one might be on the air at the right distance to work.

The Monday before the July 28-mc. tests, W2ADL, I believe, was working 28- to 56-mc. duplex, around 8 p.m. I cut into that and reached the east coast heard the midwest—then we had a hot night on 28 mc. I worked five in 40 minutes, and, after the east coast passed out, I later heard quite a few W6 harmonics up to 11 p.m.—and still going. If W2AOL had not been on we should have missed the fun. A few more local 28-mc. signs for local work may help us in “figuring out” the 28-mc. band.

—Emerson Coakley, W8FM

Cooperation

Georgetown, Conn.

Editor, QST:

Some time ago I made a plea to the amateur fraternity to be more thoughtful of the new hams with weak questionable signals, myself being among that classification at the time. There was a very nice response to my comments and I did begin to QSO with quite a degree of success. From the contacts I made, I was able to improve my rig so that I did not have to apologize for being on the air.

. . . Recalling my early struggles I have been trying to fish out all of the r.a.o. notes in the 40-meter band, and in answering them I have been trying to help with the small amount of knowledge I am able to muster. The main thing is to stay with them so they can make tests for the improvement of their outfits as well as their knowledge of the art.

—Frank Hawks, W1JJ

Cut ‘em Right

4115 Iroquois Ave., Detroit, Mich.

Editor, QST:

Recently I put up a 66’ doubling transmitting antenna, 33’ on a side, 33’ feeders spaced at two inches and the whole works exactly 33’ off the ground; all wires accurately measured and strung taut. Exciting this at its frequency, 7150 kc., I have worked a complete circle of a range of 500 miles with not less than R7. Not much of a record, but consider the xmitter. Push-pull 45’s with 250 volts at 75 ma! To date I have had to write three letters to verify the fact that my xmitter was just that. W2ANB still doesn’t believe me, I guess, because this afternoon he gave me the welcome R0 plus!

I know what it is to have very little money for radio, a smaller amount of time, and an increasing desire to “get something consistent.” You fellows in my class, I’ve found one way—a proper antenna, and there’s no mystery about it, either.

—Walter A. Peterson, WE8XI

(Continued on page 70)
The HRO receiver has turned out to be a much more unusual receiver than we had hoped. We set out, of course, to provide every feature we thought the amateur would want, but we have had to go much further than that. That is why we did not have the set ready for delivery last month as we had expected.

For instance, we equipped the set with a new type of dial which logs directly to one part in 500. We promptly discovered that it would be necessary to correct for temperature changes to a degree we had not foreseen, because the slightest drift was magnified enormously. The solution of this little problem required, among other things, the use of air dielectric condensers throughout the H.F. Circuit each individually compensated for temperature error. This was done by using a combination of aluminum plates, brass spacers and steel studs, so proportioned that increased area, due to expansion of the plates, was balanced by increased spacing, due to expansion of the studs.

Furthermore, our fancy dial showed up errors in selectivity to an appalling degree. When the carrier width amounts to the thickness of a gnats eyebrow, as it does on a conventional dial even with band spreading, small errors in selectivity pass unnoticed. However, when the width of the carrier is an inch or so, due to the magnification of the dial and band-spread coils, then any variation becomes unpleasantly noticeable.

It perhaps would not be out of place to comment on the actual selectivity of the HRO. A visitor at our factory, speaking of a competitive receiver, told us that a carrier was completely detuned by moving the dial one division, and added, "That's selectivity for you!" May we point out that this does not mean selectivity, it merely means difficult tuning. We can explain this best by comparing the HRO and the FB-7. On 20 meter phone, using band-spread, a carrier covers about 3 divisions on the FB-7, and 10 divisions (nearly 3 inches!) on the HRO, yet the HRO is twice as selective as the FB-7. Specifically, the response of the HRO is down 60 db (1000 times weaker) at 10 KC off resonance, which is mighty selective performance. In short, band spreading, either electrical or mechanical, does not affect selectivity at all; it is a device to make tuning easy and accurate, and nothing more.

So much for that. First shipments of the HRO will probably be made about the time that you read this page. This is the reason why the HRO is late, and this is our apology. We are not sorry that our plans miscarried, in spite of all our headaches and heartaches, for we think the results are worth it. And when you try it out, we think you will find that the HRO was worth waiting for.

JAMES MILLEN
**TODAY'S Most Modern**

**Precision Measuring Instruments**

*When selecting your instruments for use in radio circuits you eliminate all guesswork when you specify Triplett. There is a Triplett instrument for every radio application, designed for your particular needs. Your transmitter circuits should have Triplett instruments for best operating results, appearance and all-around efficiency.

D. C. Triplett instruments are of the moving coil type; A. C. Triplett instruments are of the repulsion iron type. Expertly designed. Craftsmanship unsurpassed. Bakelite and metal cases — 2", 3", 5" round panel styles. Also rectangular and square styles. Portable 3" have tilting scales; 5" have mirror scales.

Ultra sensitive instruments for special and standard applications; relays for low current operation; thermo-couple for high frequency; rectifier type for sensitive A. C. measurements. Every modern application where good instruments are required.

*Consult your jobber for all standard instruments. Send your inquiries to*

**THE TRIPLETT ELECTRICAL INSTRUMENT COMPANY**

105 Main Street, Bluffton, Ohio

---

**International 'Phone Ethics**

Viale XII Giugno 18, Bologna, Italy

*Editor, QST:*

May I suggest that the I.A.R.U. appoint in each European country one or two A1 amateurs to report in QST the calls of the wobbulating 'phone stations? On tuning in the 7000-kc. band with a band-spread of 90% of the dial, one may hear something sounding like chirpy code; then, a few degrees further, a carrier starts going up and down for all it's worth, and a few grades on, at the zero beat, it happens to be (do you guess?) an amateur radiotelephone station! "See you!" One night, not long ago, with about F7VE and ether busters on, there were only a few kcs. of the band left for decent traffic. I do not QSO, and can only listen in, but I think of the other hams trying to do so under these conditions. We need a "Wouf-Hng" over here, and how; but will a hint to international ham courtesy be enough?

—Rene Bregazzo

---

**Vast Open Spaces**

2302 Market Ave., Fort Worth, Texas

*Editor, QST:*

The amateur in all countries is generally very fair about keeping in harmony with international rules or codes of ethics, and it is generally conceded that the 7-mc. band is for o.w. operation only, yet there isn't an evening that I don't hear some of our friends in Mexico on 'phone.

What I'm trying to get at is just this: Why can't the Mexican amateur work his 'phone rig on 3.5 or 14 mc.? There is plenty of room for good 'phone in these bands.

—H. C. Christian, W6AAQ

---

**"Pure" Cream, Perhaps**

108 South Poplar St., Pana, Ill.

*Editor, QST:*

I have a great problem I just wondering if some of the boys could solve for me. The main trouble is that my little kitten has a terrible a.c. hum, and I was wondering what kind of a filtering system I could use to eliminate it.

—James Murray, W0NET
Treat your station and yourself to this worthwhile Christmas Gift . . . and get an excellent set for home reception in the bargain

- The dial on this new General Electric All-wave Radio is divided into four frequency bands, covering 140-410 kilocycles, 540-1720 kilocycles, 1720-5400 kilocycles and 5400-18,000 kilocycles. Practically every service the amateur is interested in is included, with the range conveniently divided into these four bands. Never any question as to which band is in use—a visual band indicator tells you.

**BAND-SPREAD TUNING**

- Fine tuning with double-end needle and fully illuminated dial, giving excellent visibility. Two tuning ratios, 50 to 1 and 10 to 1, either instantly available. In addition, band-spread tuning is accomplished by an additional needle with separate scale. The band-spread needle is geared to the main needle, giving minute logging of the fine tuning obtained with the 50 to 1 ratio. Nine revolutions of band-spread needle to cover each frequency band. Thus, you locate desired frequencies more easily and rapidly. What's more, you can log short-wave stations accurately, and return to the desired frequency conveniently and quickly.

**NOISE REDUCED**

- The set is adapted for the use of double-doublet all-wave antenna, provision being made in the receiver for easy attachment.

**TONE! POWER!**

- High-gain, 6-watt audio system feeding a large built-in dynamic speaker. Plenty of volume for weak signals, and, at the same time, excellent fidelity for broadcast reception.

**GENERAL ELECTRIC ALL-WAVE RADIO**

MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONN.

Say You Saw It In QST — It Identifies You and Helps QST
Sub-divide 7 Mc?

Editor, QST:

... An idea has been sticking with me for quite a while regarding the 7000- to 7300-kc. band. It seems that there is considerable agitation toward widening it, if it be possible to do so. Well, why could not a portion of the band, preferably near one edge, be prohibited to amateurs in the U.S.A. but left open to hams of other nations, or perhaps of other continents? If we could get an extra 50, or 100-kc. slice, to what better purpose could it be put than that of furthering more reliable DX? After all, the 7-mc. band is used principally for DX work, and we could easily spare a few kc. to the cause—especially if we get an additional grant. What do others think?

—P. Samuel Christaldi, W8HT-W6ENY

Get More QSOs—Double Your DX—Be Courteous

C. W. telegraph operators are urged to confine adjustment of their stations to 14,000-14,150, 14,250-14,400, 3500-3900 and 1715-1800-kc. territory when working in these three bands, used by both telegraph and voice operated stations. This courtesy will not only help to avoid mutual interference between the different types of stations, but will make operation with other c.w. telegraphers doubly enjoyable and effective. Avoiding the parts of 20-40- and 80-meter bands in which phones are permitted, will operate to make ham work more successful for telephone and telegraph work alike.

Universal Joint Antenna Insulator

EVIDENTLY one manufacturer decided to do something about that insulator suggestion in the Experimenter's Section in February QST. The result, in ceramic form, is shown herewith. The insulator measures approximately ten inches the long way and six inches along the cross-bar. The feeders, of course, are fastened to the latter, the antenna and supporting guy being connected to the ends of the long piece. The arms are tapered towards the ends. The insulator is made of glazed porcelain, the lengths and thicknesses being sufficient to give long leakage paths and good mechanical strength.

The new "universal-joint" insulator is a product of Bud Radio, Inc., 1923 E. 55th Street, Cleveland, Ohio.
A Complete Line of Crystals by BLILEY

General Communication Frequencies
Extremely critical workmanship and rigid inspection provides a fine degree of precision. Mounted in special type BC3 holder (or strong adjustable air-gap isolantite holder). Supplied to all general communication frequencies between 20Kc and 15Mc. Write for prices.

Single Signal Filter
A precision product that assures maximum efficiency of S.S. receivers. Supplied within 5Kc of 465, 500, or 555Kc completely mounted.... $5.90

BC-3 Crystals
40-80-160 Meters
A new power-size X-cut mounted crystal. Can be run directly with the RK30. 0.03% precision. Frequency coefficient less than 23c/107ºC. Supplied in 40 and 80 meter bands within 10Kc for only $3.95

All progressive radio amateur distributors stock Bliley products. If he does not have your particular choice of frequency, he will get it for you without delay. Order from him.

The New BLILEY A-Cut Crystal
(Type BC3A)

Here is a new type crystal — a product of the most accurate cutting and lapping processes. The Bliley BC3A A-cut crystal insures over 80% less frequency drift and a power capacity of approximately 200 milliamperes — three times that of an X-cut crystal.

These crystals are ground for the 80 and 160 meter bands by Bliley craftsmen using equipment specially designed for this purpose. Ask your distributor for these crystals by name — Bliley Type BC3A — to be sure that you are getting what you want.

Outstanding Features
- Approximately 4 cycles drift per million per ºC.
- Frequency stability equal to an X-cut oven-mounted.
- Greater power capacity — excellent for tri-tets.
- 0.03% accuracy guaranteed in your equipment.
- Costs less than X-cut crystal and oven combination.
- Mounted in type BC-3 crystal holder.
- Supplied within 20Kc by your distributor for $9.00; within 5Kc for $11.00; to exact specified Kc, $14.00.

BLILEY ELECTRIC CO.
UNION STATION BUILDING
ERIE, PENNA.

Say You Saw It in QST — It Identifies You and Helps QST 73

Here is the full advertisement as a text format.
DEPEND ON "JOHNSON"
Transmitting Equipment

ANTENNA MATERIAL
● "Q" Transmitting Antenna. Accurately matches impedances and provides twice the radiation of the usual half-wave system. Regular band and 3-meter models. Ask for Bulletin 100-101.
● Antenna and Line Insulators. Airplane strain insulators, high tensile strength antenna insulators, feeder spacers and transposition insulators for transmitting and receiving antennas. Properly designed, highly-efficient yet economical components. See Bulletin 933.

STAND-OFF INSULATORS
● A superior line of Stand-Off, Thru-Panel and Jack-Type Insulators—the result of ten years' experience following the original development of the "stand-off" by the E. F. Johnson Company. Described in Bulletins 933 and 950.

TUBE SOCKETS
● Specified by tube makers and used in commercial transmitters the world over. Johnson "50 watt" and "100 watt" sockets are equalled in quality though low in cost. Low resistance filament contacts and water-proof construction. Request Bulletin 950.

TRANSMITTING CONDENSERS
● Johnson Type "D" Condensers are sturdy, compact, efficient—better Mycalex insulated. A complete range of Single and Dual Section models for every amateur transmitter, or, by described in Bulletin 100.

These and other JOHNSON products available from your regular Distributor.

E. F. JOHNSON COMPANY
Manufacturers of Radio Transmitting Equipment
WAASECA, MINNESOTA, U.S.A.

What the League Is Doing
(Continued from page 87)

Financial Statement

From the business standpoint things "picked up" a little with the League in the third quarter of the year. One of the sections of our bankroll was, however, suddenly short-circuited in August when a water main broke near our office and flooded our cellar, completely destroying a large stock of Handbooks, binders and envelopes, with the loss of a couple thousand hard-earned bucks. For your information, and at the instructions of the Board, the figures are printed below.

STATEMENT OF REVENUES AND EXPENSES FOR THE THREE MONTHS ENDED SEPTEMBER 30, 1934

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<td>45,876.36</td>
<td>118.71</td>
</tr>
</tbody>
</table>

Net Gain

$4,240.24

Net Gain

$2,493.44

Some Coil-Winding Kinks

Here are some suggestions for making wire stay in place on tubing forms.

Those who try to wind heavy wire on an ungrooved form and keep the turns in place, or, by described in Bulletin 100.

Say You Saw It in QST——It Identifies You and Helps QST
PRESENTS A COMMUNICATIONS RECEIVER

With features you have always wanted and at a price you can afford to pay—$69.50 complete.

THE ACR-136

The ACR-136 is a seven-tube superheterodyne receiver covering from 540 to 18,000 kilocycles. Pre-selection, A.V.C., front-panel band-switching, and a mechanical band-spread system with calibrated dial and vernier pointer which permit positive logging of any station, are outstanding features of this new amateur receiver. Both r-f and a-f gain controls are provided to permit unusual flexibility in controlling background noise. The tone quality is exceptional for this type of receiver. These features plus excellent sensitivity and selectivity make the ACR-136 an outstanding value. ★ ★ The ACR-136 is supplied complete with tubes, speaker and power-supply (self-contained). There is nothing else to buy, yet the net price to the amateur is only $69.50, f.o.b. factory. ★ ★ For more complete information and the name of your nearest amateur sales outlet handling the ACR-136, write to:

AMATEUR RADIO SECTION
RCA VICTOR COMPANY, INC.
CAMDEN, NEW JERSEY

Say You Saw It in QST—It Identifies You and Helps QST
Which works well if smooth forms have to be used. The stunt is to wind a coil, just as copper tubing would be wound, on a small-diameter form such as a dry cell. The diameter of the finished coil will be slightly larger than the dry cell because of the “spring” of the wire. The permanent form to be used should be slightly larger than the coil just finished, the difference in diameter depending upon the size of wire used. About one-half inch is satisfactory for No. 8 wire. The end of the coil is forced apart to fit tightly over the form and the rest of the turns forced on by turning the coil on the form. Roughening the form with sandpaper helps make the coil stay in place.

—W2GEB

W2GEB makes a point of winding space-wound coils when the temperature is high and the wire expanded. Then when the temperature is back to normal the wire contracts and grips the form tightly. Warming the wire in an oven before winding should make the job independent of the weather.

Another method making use of the temperature coefficient of the wire is used by W9HTT. In making the coil the needed length of wire is first measured off and one end attached to a solid support. The other end is fastened to the form and the coil wound by “walking up” the wire. As the wire is wound on, a helper heats it with a blow-torch at a distance of about six inches from the form. On cooling, the contraction sets the turns firmly. W9HTT has wound coils of wire as large as No. 4 by this method and has had no trouble with turns loosening afterward.

Those who want to try unity-coupled circuits will find these hints of interest:

Some of the gang seem to be having trouble threading the grid-coil wire through the plate-coil tubing in unity-coupled outfits. Simply wind the wire to be used for the grid coil around a tube base or other small form so that when the form is removed the coil will be smaller than the plate coil. The wire then will push through the tubing and the end can be caught and pulled through the hole drilled at the center turn. I use No. 20 BBE (braid, braid, enamel) wire.

—W2PHY

If you have trouble drilling window glass to pass feeders through, one reader suggests trying a BB gun or a .22. The bullet will make a quarter-inch hole, and it is claimed that the chances of cracking the glass are less than in drilling. Be sure to have a back-stop!

—W2PHY

Breathe a sigh of relief you of the “QSA4 R9 report from every DX station worked” complex. Many are the reports of American commercials that accompany foreign reports that are a mere QSA4 R4! And probably every DX man has received a report such as “louder than WIZ, and twice as consistent.”

—W2PHY
Here is 'fhe' Most Complete Manual For Service Men Ever Published

Service men throughout America have heralded the appearance of a kit of six Yaxley Volume Controls that will service more than 2500 sets as the greatest advance in volume controls that the industry has ever seen. Service men in practically all States of the Union are saving time and making money with the beautifully finished Yaxley Wrench which is given FREE with every order for a Yaxley Kit or in exchange for six tops from any Yaxley Control cartons. You can't afford to be without the kit—you can't afford to be without the wrench. And you'll certainly want your free copy of the Yaxley Replacement Volume Control Manual—the most complete and authoritatively accurate service manual ever published, which tells all about the 30 new Yaxley Replacement Volume Controls that will service 98% of the 3200 set models now in existence. Mail the coupon now!

YAXLEY MANUFACTURING COMPANY, INCORPORATED
Division of P. H. Mallory & Company, Incorporated
Indianapolis, Indiana
Cable Address: Pelmallo

☑ Please send free copy of Replacement Manual.
☑ 1 enclose 6 carton tops for FREE Wrench.
☑ 1 enclose $3.60 (which is 40% less than regular list price of Individual Controls) for Kit of 6 volume controls which entitles me to FREE Wrench.

Name: ____________________________________________
Address: __________________________________________
My Jobber's Name is ____________________________________________

Say You Saw It in QST — It Identifies You and Helps QST 77
Wishes You
A Merry Christmas
and Hopes, Too, That Someone—
Mother, Dad or Ex YL—Will Make It
So With New Tubes For Your Outfit

By way of suggestion, attention may be called to the RK-20 transmitters described in August and October QST or to the RK-20 equipped Lear Airplane Transmitter used by Col. Roscoe Turner and Clyde Pangborn on their flight from England to Australia. It is pictured on page 30 of November QST.

Or, you may be interested in a new small edition of the RK-20 now available. It is designed for the crystal controlled or electron coupled oscillator or R.F. amplifier. As in the RK-20, no neutralization is required. For your convenience this new tube is furnished with either one of two heater ratings. Type numbers and general ratings follow:

RK-23 ............... 2.5 Volt 2.0 Ampere
RK-25 ............ 6.3 Volt 0.800 Ampere
Max. Plate Voltage ................ 400 Volts
Max. Screen Voltage .............. 200 Volts
Power Output as Oscillator or Amplifier, Class C ........ 10 Watts
Power Output as Suppressor Grid Modulated Oscillator or Amplifier, Average Carrier, Class B .......... 3 Watts
Amateur Net Price ............... $5.95

For additional information on these and other Raytheon tubes for the amateur see your dealer or write to the office near you

RAYTHEON PRODUCTION CORPORATION
30 E. 42nd Street, New York, N. Y.

78 Say You Saw It in QST — It Identifies You and Helps QST
### General Radio

Amateur accessories are always in stock. Here are two handy forms for that multiband transmitter.

**Type 677-U** — 21 turns, 2½” diameter, resonant on 3.5 mc with 100 mfd capacity; weight 2 lbs. Price $1.50

**Type 677-Y** — 30 turns 4” diameter, resonant 1.7 mc with 100 mfd capacity. Weight 3 lbs. Price $1.75

Also 7-pin base to fit above forms at 75c and a matching base with jacks at 65c.

### SPECIAL

**Split Stator Condensers**

General Radio, large receiving. $1.25 spacing; 89 mmf effective capacity

### Leeds Type 1-E Power Supply

**200 volts DC, 2½ volt, 3 amp AC**. Ideal for freqmeters, receivers, etc.

Price $6.50

Sub chassis mounting R C A chokes 18 Henrys, 125 MA. Special each, 49c

### LYNCH "Hi-Fi" simplex and duplex antenna systems in stock.

Complete details on request.

### ACME-DELTA

de luxe power equipment. We carry the complete line in stock.

### The National SW-3

In stock is still the pace-maker after 3 years in the field. 2½ volt AC, 6 volt AC-DC and 2 volt models in stock at $19.50

Band spread and general coverage short wave coils, per range. $3.00

All National products as advertised in October QST always on hand for immediate shipment.

### National Steel Cabinets

Crystaline black finish with sub-base and bottom cover.

**Type C-SRR**. $2.10

**Type C-P5K**. $3.60

**Type C-SW3**. $3.30

**Type C-FB7**. $4.20

### National Transmitting Condensers

Low power — compact; all 2½” length

<table>
<thead>
<tr>
<th>Type</th>
<th>Capacity</th>
<th>Weight</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMS-150 mmf 1000 v</td>
<td>3.00</td>
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<td>75c</td>
</tr>
<tr>
<td>TMS-200 mmf 1000 v</td>
<td>3.50</td>
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<td>75c</td>
</tr>
<tr>
<td>TMS-250 mmf 1000 v</td>
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<td>75c</td>
</tr>
<tr>
<td>TMS-300 mmf 1000 v</td>
<td>4.50</td>
<td>lbs.</td>
<td>75c</td>
</tr>
<tr>
<td>TMS-400 mmf 1000 v</td>
<td>5.00</td>
<td>lbs.</td>
<td>75c</td>
</tr>
</tbody>
</table>

Other lengths in proportion

We can also supply soft drawn tinned copper wire for welding.

No. 12, 100 ft., 85c

No. 10, 100 ft., 85c

### Magnet Wire

All even sizes from No. 14 to No. 8 in 250, double cotton, or double silk on 250 spools. Prices on larger quantities are yours for the asking.

**Super Special Hardwick-Hindle**

200-watt vitrious resistors, 69 ohms, 1000 ohms, 6500 ohms; in these sizes only; each 39c

3000 ohm 100 watt 6 taps ............. 39c

20,000 ohm tapped at every 500 ohm, 85 watt ............. 39c

### Ward Leonard

100-watt vitrious resistors; 400 ohms, 800 ohms, 1000 ohms, 1500 ohms.

Each 25c

### Leeds 5-Meter Receiver

Fully described in June QST. It pays to read this over again. Receiver less tubes. $13.75

A thin dime brings our bulletin B-73 and 25 manufacturers folders. There is a wealth of information of interest to builders in this collection of data. Send for yours today.

---

**Say You Saw It in QST — It Identifies You and Helps QST**
**THE IMPROVED CATHODE-RAY OSCILLOSCOPE**

Linear sweep model for broadcast stations and advanced amateurs, physics labs., etc.

- Controlled linear sweep.
- Controlled external sweep.
- Freq. locking device for sweep frequency.
- Picture centering adjustments.
- Wide range focus adjustments.
- Complete component shielding.
- Unit is self contained and includes batteries and 110V-60 cycle power supply.

This instrument embodies all features ordinarily contained in only the highest priced Cathode Ray equipment.

**Completely Equipped Ready to Use**

**F.O.B. Newark — $97.50**

Literature now available

---

**Thordarson Specials**

FILTER CHOKE

250ma. — 12h — 110 ohms

**POWER TRANSFORMER**

600-600-200ms

7½ V, 104; 5 V, 3A; 7½ V, 4A.

A Real Husky Transformer

$3.35

---

**TUBES**

210

20W

15W

Guarantee

New Construction

$1.15

$1.35

---

**DUPLEX POWER SUPPLY**

110v, 250ma.

55V, 250ma.

Uses for 83's in a bridge rectifier—

These units can be had on special order in any size mounting or form.

$35.00

---

Both parties are annulled. Only one contact with a Polish station will count.

The competitor gaining the greatest number of scores in his country will get a diploma. The three foreign competitors gaining the greatest number of points of all foreign countries will get special diplomas.

Those who took part in the VK contest last month will verify the good time they had. Give the SP hams some signals to work with, gang. QSL whether you are in the contest or not, otherwise you penalize a competing station.

---

**Standard Frequency Transmissions**

<table>
<thead>
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<th>Date</th>
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<th>Station</th>
<th>Date</th>
<th>Schedule</th>
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<td>W6XK</td>
<td>Dec. 30</td>
<td>C</td>
<td>W6XK</td>
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<tr>
<td>Dec. 28</td>
<td>BB</td>
<td>W6XK</td>
<td>Jan. 26</td>
<td>A</td>
<td>W9XAN</td>
</tr>
<tr>
<td>Dec. 29</td>
<td>B</td>
<td>W6XK</td>
<td>Jan. 27</td>
<td>C</td>
<td>W6XK</td>
</tr>
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</table>

**STANDARD FREQUENCY SCHEDULES**

<table>
<thead>
<tr>
<th>Time (p.m.)</th>
<th>Sched. and Time (p.m.)</th>
</tr>
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<tbody>
<tr>
<td>8:00</td>
<td>8500 7000 4:00 7000 14,000</td>
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<tr>
<td>8:08</td>
<td>8600 7100 4:08 7100 14,100</td>
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<tr>
<td>8:16</td>
<td>8700 7200 4:16 7200 14,200</td>
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<tr>
<td>8:24</td>
<td>8800 7300 4:24 7300 14,300</td>
</tr>
<tr>
<td>8:32</td>
<td>8900 7400 4:32 7400 14,400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time (a.m.)</th>
<th>Sched. and Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>6:00</td>
<td>7000</td>
</tr>
<tr>
<td>6:08</td>
<td>7000</td>
</tr>
<tr>
<td>6:16</td>
<td>7200</td>
</tr>
<tr>
<td>6:24</td>
<td>7300</td>
</tr>
</tbody>
</table>

The time specified in the schedule is local standard time at the transmitting station. W9XAN uses Central Standard Time, and W6XK, Pacific Standard Time.

**TRANSMITTING PROCEDURE**

The time allotted to each transmission is 8 minutes divided as follows:

2 minutes—QST QST QST de (station call letters).
3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W9XAN is "G"; and that of W6XK is "M."
1 minute—Statement of frequency in kilocycles and announcement of next frequency.
2 minutes—Time allowed to change to next frequency.


**WWV 5000-Kc. Transmissions**

The 5000-kc. transmissions of the Bureau of Standards' station, WWV, are given every Tuesday from 12:00 noon to 2:00 p.m.,...
T. R. McElroy

World's Fastest Radio Telegrapher*

OFFICIAL RECORD—
(never equalled)
56½ WPM
CHICAGO
1922

AUTHENTIC RECORD—
(not in tournament)
73 WPM
CHICAGO
1933

Announces the MAC-KEY the perfect Semi-Automatic and Straight Key

"I'll not write a lot of bunk about my key. I'll tell you these truths: Each Mac-Key is adjusted by myself and shows perfect speeds 8 wpm to 45 wpm; each is an exact duplicate of the key with which I've established records in sending Morse & Continental code these past 15 years. Each is sold with my guarantee that you can send better with a Mac-Key than with any other instrument made—or your money refunded after 5 days trial."

* No. 1 — Correctly designed vibration dampener.
* No. 2 — Straight key changeover lever.
* No. 3 — Absolutely accurate speed adjustment.
* No. 4 — Extremely costly and sensitive platinum contact points, adjustable without changing cores.
* No. 5 — Main spring selected after costly metallurgical research and personal painstaking experimental work.
* No. 6 — Base and superstructure, one piece, extra heavy casting. Rigidity necessary for the securing of smooth rhythmic sending.
* No. 7 — Dash lever suspended from main lever. This is one of the two most important features of my key. Remember, 15 years' experience going into each Mac-Key. All levers swung on tool steel pinions between hardened pivot trunnions.
* No. 8 — Lever full hand width above table where it must be for correct sending. This is equally important when used as a straight key.

I emphatically assert that my key is the only one made with which it is possible to send perfect Continental code with its multiple dash figures and letters.

Price $17.50 f.o.b. Boston. Temporarily subject to 40% discount.

Whether I can continue this customary discount depends upon volume. Take another peek at my guarantee. Then see your local dealer or write me direct enclosing money order for $10.50. If you think you've been enjoying ham radio heretofore, wait till you try a Mac-Key and hear code you never dreamed yourself capable of turning out. But do it now, please. I've put my whole life into my key. Honestly, it is marvelous.

Won't you please justify my faith in ham operators and order NOW if you can dig up the ten fifty. 73's EVERYBODY, AND I REALLY MEAN IT.

T. R. McELROY, 23 Bayside Street, Upham's Corner P. O., Boston, Mass.

*Official champion of the world, 1922 to 1933.

Distributed in metropolitan Boston by the RADIO SHACK, 46 Brattle St., Boston

Say You Saw It in QST — It Identifies You and Helps QST
Why OIL-FILLED CAPACITORS?

With unparalleled experience gained through countless units supplied for radio and industrial uses, Aerovox now offers you oil-impregnated, oil-filled capacitors, featuring:

- Compact round or square metal containers.
- High-tension insulator terminals for ample protection against high-potential breakdowns.
- Thoroughly dehydrated sections, oil impregnated, and filled with all of oil. No air pockets.
- Sections constructed to resist strains, plate flutter and capacity variations.
- Hermetically sealed metal containers, absolutely seepage-proof.
- Design insures proper circulation of oil through section as it heats and expands under load, and contracts when load is removed, for adequate cooling and maintained insulation.

SEND FOR DATA on complete line of Aerovox condensers and resistors. Also free copy of Aerovox Research Worker—a monthly batch of practical dope.

AEROVOX CORPORATION
73 Washington Street • Brooklyn, N. Y.

RADIO ENGINEERING, broadcasting, aviation and telephone, Morse telegraphy and railway accounting taught thoroughly. Engineering course of nine months duration equivalent to three years of college radio work. School established 1874. All expenses low. Catalog free.

DODGE'S INSTITUTE, Day Street, Valparaiso, Indiana

STUART W. SEELEY (WZBC)
Development Engineer, Sparks-Withington, writes:

"I GOT THE SURPRISE OF MY LIFE with LYNCH GIANT KILLER TRANSMISSION-LINE CABLE"

"In using 600 ft. of your GIANT KILLER CABLE, I find I can work "Duplex" to within 15 kc. of my own frequency. Because of the fact that the receiving antenna is some 300 ft. from the nearest house or power wires, there is absolutely no man-made interference present.

If the whole arrangement had worked one quarter as well as it does, I would have been more than satisfied. I stayed up until about 3 o'clock on a Sunday morning, and several of the fellows in the 80 meter phone band had the surprise of their life when I told them they could break in on any of my transmissions even though they were only 20 kc. off my frequency of 3970."

LYNCH GIANT KILLER CABLE is being used on transmitters and receivers with surprising results. If you haven't read the Lynch Ham Antenna Bulletin, you've missed a lot.

It's FREE at your dealers, or from ARTHUR H. LYNCH, INC.
227 Fulton Street New York, N. Y.
The Pioneer of Noise-Reducing Aerials

Say You Saw It in QST — It Identifies You and Helps QST and from 10:00 p.m. to midnight, E.S.T. These transmissions are accurate to ½ cycle (one in ten million).

I.A.R.U. News

(Continued from page 40) olas began the publication of its own independent official organ. The magazine was titled "URE," and was a success from the start. Averaging thirty pages or so of well-printed, well-illustrated coated paper, its appearance is as commendable as the material it contains. It is produced under the active direction of Angel Uriarte, EA4AD, President of U.R.E. Technical information over-balances the average issue; local and international news comprise the remainder. The per copy price is 2 pesetas, the annual subscription rate 20 pesetas, or, at the date of writing, $2.75. The address: U.R.E., Apartado 262, Madrid, Spain.

W9AUH

(Continued from page 47) concentrating on ORS parties and SS contests, "Moss" is an enthusiastic member of the NCR, interested in ten-meter experimenting (he's out for the ten-meter trophy, incidentally) and has a couple of 56-me. rigs.

In sending in a few lines about himself and the station, "Moss" writes that he is sales manager of a firm wholesaling radio parts and takes a postman's holiday with W9AUH because he "likes radio." The evidence certainly supports it!

Quartz Crystal Fundamentals

(Continued from page 40)

With modern temperature and pressure control equipment, frequency variations may be controlled to within one part in ten million, and apparatus having this stability has actually been constructed.

Quartz resonators are becoming increasingly important in other electrical circuits. Many functions can be performed by them that could be achieved only with great difficulty, or perhaps not at all, by other means. Such applications have been made in electric wave filters, equalizing networks, and other communication circuits. Crystals used for this work are generally of the perpendicular-cut type, since they have certain inherent properties which make them more suitable for this work than the parallel-cut type.

Another application of quartz crystals is in the measurement of the explosion pressure in big guns. To do this, several round quartz plates are placed in a hole made in the barrel of the gun, with a suitable plunger and electrode arrangement for transmitting the pressure to the crystal plates. A recording galvanometer measures the charge on the crystal.
WE PRESENT IT'S READY

THE NEW PR-12 PROFESSIONAL RECEIVER
—PATTERSON'S MASTERPIECE—THE ULTIMATE FOR 1935
IN THE SCIENCE OF DX COMMUNICATION

8 to 550 Meters
Shielded 100%
Preselector Stage
Self Contained Power Supply
Large 10½ Inch Dynamic Speaker
Crystal Filter
SS CW Tuning
Chromium Plated Chassis 18-gauge

8 to 550 Meters
Shielded 100%
Preselector Stage
Self Contained Power Supply
Large 10½ Inch Dynamic Speaker
Crystal Filter
SS CW Tuning
Chromium Plated Chassis 18-gauge

TUBE LINE UP

1 — 6D6 Radio Frequency Amplifier
1 — 6A7 Combination Oscillator & 1st Detector
2 — 6D6 Intermediate Amplifiers
1 — 75 Diode Detector
1 — 75 First Audio Amplifier
1 — 76 Second Audio Amplifier

2 — 42 Class A Prime Output
1 — 5Z3 Rectifier
1 — 6D6 Beat Frequency Oscillator
1 — 6D6 Modulation Meter and “R” Meter

PRODUCTION OF THIS CUSTOM BUILT RECEIVER WILL BE STRICTLY LIMITED. ORDERS WILL BE FILLED IN THE ORDER OF RECEIPT. ORDER AT ONCE TO AVOID DELAY.

F.O.B. WILMINGTON, DEL.
OR LOS ANGELES, CALIF.

PRICES COMPLETE
ABSOLUTELY NOTHING ELSE TO BUY

<table>
<thead>
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<th></th>
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<th>Time</th>
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<td>$177.70</td>
<td>$84.18</td>
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<td>123.70</td>
<td>62.51</td>
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<td>133.70</td>
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<td>143.70</td>
<td>73.25</td>
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<tr>
<td>Console, Complete, with Crystal</td>
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NO TIME PAYMENTS OUTSIDE U.S.A.

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<td>$46.70</td>
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</tr>
</tbody>
</table>

DELAWARE RADIO SALES CO.
Eastern Distributors
WILMINGTON, DELAWARE

(Prices and Terms Subject to Change Without Notice)

Say You Saw It in QST — It Identifies You and Helps QST
Quartz crystals have been used as a source of high frequency sound in the Pierce Acoustic Interferometer for the determination of the velocity and absorption of sound in various media. There are many other special applications of quartz crystals, and the fact that a small piece of rock can be substituted for a highly resonant electric circuit element, and in many cases give an improved performance, makes the use of quartz unique in the electrical art.

PREPARATION OF CRYSTALS

Let us now consider the more practical side, that of the actual preparation of the quartz plate from the raw material. An entirely perfect quartz crystal is rare, but fortunately a crystal need not be perfect in its entirety to obtain several good plates. A good crystal may be rough and dirty on the outside, but should be clear on the inside when viewed by the naked eye, showing no smoky or dark regions and no colors. It must also be free from bubbles and cracks. Usual specifications are that it shall be free from twinning, have no flaws, and be of optical quality.

In cases where apparatus is not available for redetermining the axes of the crystal plate when cut, it is good practice in grinding to retain at least one of its natural hexagonal faces as a reference. An ordinary crystal has six hexagonal faces and a pyramidal point on one end; the opposite end is generally broken off in mining and is full of flaws. Heading this article is a picture of a crystal as it appears in nature, with a picture of a prepared X-cut crystal superimposed upon it.

Manufacturers equipped for cutting and grinding crystals which have to meet exacting demands use the polariscope and the X-ray for determining the various axes, the latter determination being based on ray reflection. By these methods the axes may be determined within several minutes of arc of their true value.

Since quartz is very hard (hardness=7) special cutting and grinding equipment is required. Copper or brass discs revolving in a pan of carborundum powder and water, with a small quantity of soap added to prevent chattering, are used. The soft metal discs are far superior to steel as it appears in nature, with a picture of a prepared X-cut crystal superimposed upon it.

Since quartz is very hard (hardness=7) special cutting and grinding equipment is required. Copper or brass discs revolving in a pan of carborundum powder and water, with a small quantity of soap added to prevent chattering, are used. The soft metal discs are far superior to steel because steel will readily be ground off, whereas if copper or brass is used the carborundum grains imbed themselves in the metal and give a good grinding surface.

After the rough cutting operations, the quartz must be examined for twinning. This is done by putting the slabs in a bath of hydrofluoric acid (HF); any twining in the plate will be shown by a variation in the amount of quartz dissolved. Plates having the slightest amount of twinning must be discarded, since they will not oscillate.

The thickness grinding is done on a soft iron plate revolving in a horizontal plane, special forms being used to hold the crystals in position. Great care must be taken so that the two faces of the plate are accurately parallel, and that the faces are orientated properly with respect to the axes. A small variation from the true value may
**GROSS RADIO, INC., 51 VESEY STREET, NEW YORK CITY**

**QUALITY • VALUE • SERVICE**

The "EAGLE" Three-Tube Short Wave Receiver

"Hand Spread" over any portion of the tuning range — only finest material used throughout. Employs one 32 R.F., one 32 detector and one 33 Pentode Audio — 15 to 200 meters — four coils, supplied. The "EAGLE" is economical — two dry cells will operate the filament. See March or April 1933 QST for full description of this most excellent value in short wave receivers.

'Eagle" completely wired and tested. $11.95 Three tubes tested in your receiver. $3.00

**GROSS C C TRANSMITTER—OUTPUT 25-30 WATTS**

The "CW-25" transmitter kit due to its low cost makes it possible for anyone to own a modern crystal controlled station. A schematic hook-up and parts layout sheet as well as tuning instructions are furnished, thus enabling the most inexperienced operator to wire and put the set on the air, for real results. The "CW-25" is supplied with a shrivel finished sturdy metal chassis under which all parts are mounted, making the wiring and components dustproof. A plug-in crystal holder is furnished with the kit. Only one milliammeter is required for tuning the transmitter and each stage is provided with a jack for this purpose. The "CW-25" uses one 47 ma, 1.29 watts... (see transmitter by Grammer page 46)

** blanket chassis**

Ideal for mounting power supplies, RF units, etc. 18-gauge metal — welded corners — black telephone finish inside and out. Complete with bottom plate, knobs, terminals, 10,000 volt insulation, 40-80-160 Meter Amplifier Coils $11.70

**220 VATT VITREOUS RESISTORS With Variable Sliders**

For immediate delivery

- 1000 ohms $2.99
- 5000 ohms $1.05
- 10,000 ohms $1.11
- 25,000 ohms $1.20
- 50,000 ohms $1.29
- 100,000 ohms $1.59
- 400,000 ohms $1.85
- 1,000,000 ohms $1.94

Porcelain Base 50 Watt sockets (side wiping contacta) $0.99
Midget Double-Spaced 50 mmf neat. cond. $0.69
Midget Double-Spaced 35 mmf neat. cond. $0.49

**UNIVERSAL ANTENNA COUPLING SYSTEM INDUCTANCES**

Wound on threaded double X natural bakelite tubing, can easily be tapped, with clips supplied, ea. $1.50

(Use one coil for single-wire feed and two coils for two-wire systems)

**LOW C 40-80-160 Meter Amplifier Coils**

(See transmitter by GRAMMAR page 46 May QST) Plug-in, wound on threaded natural bakelite tubing, will tune with 50 or 60 mmf. condenser, any size, each $1.75

**New!! BEEDE BAKELITE**

Cased. 3 1/2" Meters. 0-5 to 10-1000 MA. In all standard ranges. $3.95

**GROSS ADJUSTABLE DESK STAND**

New!!

Martin Vibropile Jr. $10.00

**GO-DEVIL AUTOMATIC KEY**

$6.00

**SPECIAL TUBES!!**

CARBON PLATE 203-A $8.75
CARBON PLATE 800 $1.94

**510-A tube Thoriated Tungsten Filament Graphite Plate — Isolatite Base $2.45**

**Raytheon RK-90**

The New RF Pentode Power Amplifier Tube in stock...

($5.00)

(see page 14 June QST)

**SOLID ENAMELED ANTENNA WIRE**

No. 14 (any length) per 100 ft. $0.35
No. 12 (any length) per 100 ft. $0.35
No. 10 (any length) per 100 ft. $0.90
No. 8 (any length) per 100 ft. $1.30

**Hoyt Milliammeters and Voltmeters**

Perfectly damped meters at a price. These are not to be confused with the usual inexpensive meters. 2" mounting hole, frame 3 1/4" diameter, supplied in the following sizes: 10 ma., 25 ma., 50 ma., 100 ma., 150 ma., 250 ma., 300 ma., 4 V. AC, 10 V. AC, 15 V. AC, 10 V. DC. Price each $3.60

20% DEPOSIT WITH ALL C. O. D. ORDERS. REMIT BY M. O. INCLUDE POSTAGE

GROSS RADIO, INC., 51 VESEY STREET, NEW YORK CITY

Say You Saw It in QST — It Identifies You and Helps QST 85
ED WILCOX: W9DDE
now offers
McMurdo-Silver’s famous
5C SINGLE SIGNAL SUPER

Here’s your chance to bring your station up to
the minute for the winter’s radio activities. The 5C
is the improved model of the 5B, used exclusively at W9USA at the World’s Fair.

Illinois Amateurs! $10 down puts this equipment
in your station. Balance small monthly payments.

WILCOX RADIO SALES
“CHICAGO HEADQUARTERS FOR AMATEUR PARTS”
506 S. WABASH AVE., WEBster 4101, Chicago, Ill.

Merry Christmas!
SEE PAGE 96

Here It Is!

MARTIN JUNIOR
For Limited Time
ONLY $10

Think of it!
A Genuine MARTIN Vibroplex
for only $10
All standard features.
Heavy contact points,
2¼ pound black japanned
base. The only difference
is in size. Ideal for
radio. Easy to use. Easy to own
at this low price. Don’t wait—
order YOURS NOW! Remit by money
order or registered mail.

OTHER VIBROPLEX MODELS
Famous Improved Vibroplex, Black or Colored, $17; Nickel-Plated, $19. Easy-Working Vibro-
plex No. 6, Black or Colored, $17; Nickel-
Plated, $19. Write for catalog.

THE VIBROPLEX CO., INC.
825 Broadway New York, N. Y.

cause one axis to be shortened and another
lengthened, resulting in wide deviations of the
elements from the formulas given. This is espe-
cially true with X-cut crystals, in which the
mechanical axis is quite long and the electrical
axis small.

For very high frequencies polishing rouge is
sometimes used for the final grinding operations
and frequency adjustments.

Convention Highlights
(Continued from page 86)

W. K. McCulla of McCulla Manufacturing Com-
pany talked on “ham” receivers. Dr. Andres,
Yaxley Manufacturing Company, had a good
technical talk, properly illustrated. Mr. Johnson
of RCA was listened to attentively. R. J. Kryter,
of Esterline-Angus Company, talked on a non-
radio subject, explaining Einstein’s relativity.

At the forum meeting, led by A. A. Hebert,
everyone had a chance to hear SCM Mossbarger
(Kentucky); SCM Irvine (Ohio) and SCM Hinds
(Illinois). Many A.R.R.L. problems were dis-
cussed.

One of the outstanding events was the big
smoker late Friday night, but it did not compare
with the banquet Saturday night. John Reinartz
acted as the toastmaster and gave the speakers
only three minutes for the after-dinner talks.
This allowed more time for the program of music,
dancing and singing; and also gave the prize
committee an opportunity to make the distribu-
tion of well-worth prizes to the big gathering
of YL’s, OW’s and OM’s. The convention closed
on Sunday with trips to WBNS and the airport.
A well-conducted convention and the thanks of
all to F. R. Gibb, W8IJ, the general chairman
and his very efficient committee. —A. A. H.

Canadian Convention

THERE is considerable metropolitan rivalry in
Canada, but even the most rabid of the King’s
subjects in Ottawa and Montreal were forced to
concede that Toronto proved the ideal setting for
the fourth annual Canadian Convention, held at
the King Edward Hotel on October 5th and 6th.

With a total attendance of 166, the gathering
ranked high both in point of numbers and in the
whole-hearted and widespread display of good
fellowship.

Things got going at 2:30, Friday afternoon,
with greetings to the assembled delegates by
Samuel B. Trainer, VE3GT, committee chair-
man. The high spot of the afternoon session was
the address by W. A. Shane, engineer in charge of
CRCF and owner of VE3BW, on “Some Prob-
lems in the Development of Amateur ‘Phone
Transmitters.”

The Friday evening program opened promptly
at 8:00 with an address by G. H. Baldwin of
the Canadian Westinghouse Co., Ltd., on “The
Double Doublet Antenna for Short Wave Recep-
tion.” This was followed by two 16-mm. talkie
ASK THE FELLOW WHO OWNS ONE
Gross CB-25
Radiophone and C.W. Transmitter
Quantity production has made it possible for us to sell this laboratory constructed and wired transmitter at the new extraordinarily low price.

BUILT TO THE HIGHEST STANDARDS OF QUALITY AND PERFORMANCE
By fortunate combination of ingenious design and skillful construction, Gross transmitters offer a degree of perfection which we believe is unexcelled. Enthusiastic users in this and foreign countries testify to their high order of satisfactory performance. Literature descriptive of this outstanding transmitter will be sent upon request.

Output 25 to 28 watts — 100% Class B modulation — operates on all amateur frequencies — uses two 46's in Class C Stage and two 46's in Class B — entirely self contained from microphone jack to antenna coupling coil.

Price, Less Jubes, $90
GROSS RADIO, INC.
51 Vesey Street - NEW YORK

“NEW (A) CUT QUARTZ CRYSTALS”

FEATURES OF THIS NEW PLATE:
Temperature-frequency coefficient practically zero.
Greater activity allowing damped plates for Mobile and Aircraft purposes.
Greater oscillator input power.

A-CUT CLASS A

<table>
<thead>
<tr>
<th>Frequencies between</th>
<th>Max. drift over 45.0° C</th>
<th>Price</th>
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<tr>
<td>400-5,000 KC</td>
<td>50 cycles or less</td>
<td>$60.00 mounted</td>
</tr>
<tr>
<td>5,000-10,000 KC</td>
<td>50 cycles or less</td>
<td>$75.00 mounted</td>
</tr>
</tbody>
</table>

Other Commercial frequency prices upon request
Prices on plates having less than 10 cycles drift upon application

A-CUT CLASS B

160-80 meter Amateur bands, max. drift over 45.0° C, 125 cycles or less, plate same as above except for temperature-frequency coefficient. Ground to within 500 cycles of frequency stated, mounted $25.00 each. Unmounted $15.00.
40 meter band, mounted $30.00 each. Unmounted $20.00 each.

NOTE—This guarantee of temperature-frequency coefficient does not apply unless the plate is mounted in a low temperature coefficient holder.
"X" and "Y" cut plate prices upon application

BELLEFONTE RADIO ENG. LAB. BELLEFONTE, PENNA.
Learn the Wireless Code
Here is a popular, low priced and well made wireless practice set. It is just the instrument for learning the code. Send for a circular showing our complete line.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan

OFFICES IN PRINCIPAL CITIES

LITTelfuses

INSTRUMENT LITTelfuses, for meters, 1/40 amp. up.
HI-VOLT. LITTelfuses for transmitters, etc., 1,000, 5,000 & 10,000 volt ranges, 1/4 amp. up.
NEON VOLTAGE FUSES & Indicators (TATTELITES), 100, 250, 500, 1,000 & 2,000 volt ratings.
AIRCRAFT FUSES, AUTO FUSES, FUSE MOUNTINGS, etc. Get new Cat. No. 6.
Littelfuse Labs., 4599 Ravenswood Ave., Chicago, Ill.

READ AND SEND CODE

Learn Easily at Home This Quicker Way
No experience needed. Beginners read code quickly, copy accurately. If already an op, speed up your wpm with this approved amazing New Master Teleplex. Only instrument ever produced which records your sending in visible dots and dashes—then sends back to you audibly through headphones. Fascinating, fool-proof; gets results because you learn by HEARING as well as seeing. Used by U.S. Army and Navy, R. C. A., A. T. & T., and others. We furnish Complete Course, lend you the New Master Teleplex, and give you personal instruction with a MONEY-BACK GUARANTEE. Low cost, easy terms. Write today for folder Q 24, no obligation.

TELEPLEX CO.
76 Cortland St.
NEW YORK, N. Y.

films dramatically evaluating modern telephone equipment, supplied by the Canadian Bell people. The concluding address of the evening was by Allan B. Oxley, of Philco Products of Canada, Ltd., who explored the realm of unrealized possibilities for inventive and research genius under the title, “Untrodden Paths.” At the stroke of midnight the ritual of the Royal Order of the Wouff Hong was ably presented to 57 assembled novices, under the direction of Frank W. Hartley, VE3JT.

Saturday morning found the gang assembled at the Radio College of Canada on Bay Street, competing for the Burgess Code Speed Trophy. Gowan, ex-VE3DS, won the cup. The afternoon opened off with a traffic meeting chaired by SCM Trainer, followed by a “phone meeting” led by Dr. B. T. Simpson, W8CPC. Clint De Soto, of Hq., talked on “Audio Frequency Technique,” following which the entire assembly congregated at the eastern entrance of the King Edward Hotel for a photograph. Then E. E. Wenger, chief engineer of Triplett, described the construction, functions, and uses of instruments in amateur work. The Saturday afternoon session concluded with an address and demonstration by H. S. Dawson, of Rogers Radio Tubes, Ltd., on “Detecting and Analyzing Distortion in Vacuum Tube Equipment,” presenting an interesting concept of the mechanics of distortion.

Following an excellent banquet, Canadian General Manager Alex Reid took charge as master of ceremonies. He called on Clinton B. De Soto, who informally discussed “International Amateur Radio”; A. H. Keith-Russell, sometime C.G.M. and for many years holder of the Burgess Code Speed trophy, who presented the cup to the victor; Dr. Simpson, W8CPC; Noel Wright, VE2DU, of Montreal, who inspiringly adjured those present to “Never Say Never”; committee members Trainer, Hartley, and L. W. Mitchell, VE3AZ; and numerous prominent hams from the larger cities of the two provinces represented. But most pleasing of all, when the convention adjourned at midnight nearly every one went away with a well worth-while prize.

Sunday saw a fishing party headed north led by Jack Staley, VE3GR, and several foursomes of VE golfers challenging for a special cup awarded in connection with a tournament at the Weston Golf and Country Club, under VE3GT. As for us, we headed homeward, replete with good Canadian ale and memories of a gentlemanly, convivial, and rousing good convention.

—C. B. D.

The Roanoke Division Convention

THE 1934 Roanoke Division Convention was held at Hotel Roanoke, Roanoke, Va., on October 5th and 6th. The Convention was a success in every sense of the word. The Convention Committee was fortunate, indeed, in selecting Hotel Roanoke as Convention Headquarters since the hotel, under the able management of
1934 Troubles can be overcome in 1935 with OST binders priced at $1.50 postpaid.

QST binders

American Radio Relay League
West Hartford, Connecticut

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COUPLING: Extremely practical where space is limited, this coupling has Steatite insulation that will not char under flash over and does not absorb moisture. Equally important, it possesses high electrical efficiency as well as the mechanical rigidity so lacking in couplings of the fibre disk type.

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PEAK PRE-SELECTOR
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1 - Tremendous increase in signal strength.
2 - Consequent increase in sensitivity.
3 - ABSOLUTE rejection of image.
4 - Considerable increase in selectivity.
5 - Reduction of noise to signal ratio.

BUILT IN COILS covering 14-200 M; selector switch; airplane dial; smooth regeneration; self contained filament supply; heavy gauge black crystal steel chassis and cabinet.

ATTENTION! Price $13.50 List with 40% discount to Hams. YOUR PRICE: $19.30 1am tubes. Write for Literature. On sale at leading dealers and Mail Order Houses.

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Makers of PEAK PRODUCTS
1845 Broadway Dept. Q124 New York, N.Y.
(Note new address — larger quarters)

Kenneth R. Hyde, proved to be ideally suited for the purpose, and a splendid spirit of cooperation was in evidence throughout the meeting.

The Convention was formally opened by Director Caviness at 1:30 p.m., Friday. Mr. Moomaw of the Roanoke Chamber of Commerce welcomed the amateurs to the city, and Mr. Hebert of A.R.R.L. responded to the address of welcome. The technical part of the program for the afternoon included talks as follows: Lt.-Comdr. Rogers on “The Naval Reserve”; Mr. John Shanklin on “Beam Antennas”; Mr. E. L. Battey on “A.R.R.L. Organization.”

At the evening session Prof. Haynes of VP1 gave a lecture on “Noises,” illustrating with equipment brought from the Institute; Mr. Roy Corderman of Washington answered questions; Mr. Bob Avery of WDBJ ably discussed “Speech Amplifiers”; Mr. Fox of the National Carbon Co. made an interesting talk on “Soaring,” showing a motion picture of a soaring meet and explaining the part that five-meter radio equipment played in it. Mr. R. N. Eubank of WRVA demonstrated quite a few of the many things one can do with an oscilloscope.

Saturday morning was devoted to trips through the Norfolk and Western Railway Shops, where the amateurs were shown how a locomotive is built. Saturday afternoon we had the opportunity of hearing talks by the following: Mr. Stewart, vice-president of A.R.R.L., on “The Madrid Convention”; Mr. Fred Schnell, W9UZ, on “Antennas”; Sgt. Day of Washington on “The Army Amateur Radio System”; Mr. Hebert on “The A.R.R.L.; Director Woodruff of State College, Pa., on “Radio Building Blocks”; and Mr. Quaintance of the F.C.C. in Washington on “Changes in the Regulations.”

Special meetings were arranged for the ladies on both Friday and Saturday, and they enjoyed card playing and a shopping tour through the business section of the city.

The banquet hall of the hotel was the scene of all activity Saturday night. Director Caviness acted as toastmaster, and the usual after-dinner talks, limited to five minutes, were thoroughly enjoyed. The speakers included: Mr. Wohlford, W3CA, Chairman of the Convention Committee; Director Woodruff, W8CMP; Vice-president Stewart, W3ZS; Mr. Hebert, W1ES; Mr. Battey, W1UE; Mr. Schnell, W9UZ; Mr. Fox, W2AHB; Mr. Corderman, W3ZD; Mr. Quaintance, W3JQ; Mr. Avery, ex-W3FF; Miss Elizabeth Zandonini, W3CDQ; Mr. Eubank, W3AAJ; and Lt.-Comdr. Rogers, W3AAV. Mr. Hebert showed a motion picture of the A.R.R.L. Directors in action at their last meeting and of the headquarters establishment. The drawing of prizes ended the meeting, and the amateurs of the Roanoke Division are now referring to the Convention in Roanoke as “the best we’ve ever had,” and they are thoroughly appreciative of the hard work that W3CA and the other members of the Roanoke Amateur Radio Club did to make it such a Convention.

—H. L. C., W4DW
New and Redesigned
A.R.R.L. OPERATING FORMS

AMATEUR RADIO STATION LOG

<table>
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<tr>
<th>DATE</th>
<th>STATION CALLED</th>
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The new A.R.R.L. LOG BOOK is designed for maximum ease and simplicity in keeping a record of station activities. If properly filled in it covers every technicality, insuring compliance with F.C.C. rules.

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RADIOGRAM

The radiogram blank has been revamped to allow for that much needed room for the body of the message and to facilitate copying of messages. 7½ x 8½ sheet padded 100 sheets to the pad.

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MESSAGE FILE

The F. C. C. requires amateurs to keep messages handled for a period of one year. The message file has been designed to facilitate compliance with that regulation. An expanding file of thirteen compartments (one for each month and one for extra papers), it provides for more messages per month than the average station will handle. On the face of the FILE, space is provided for a complete and accurate record of traffic handled. It will accommodate a year's traffic. For a practical and convenient solution of the regulation, you can't beat it.

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SRR 56 MC RECEIVER

A Non-Radiating Super-Regenerator Receiver ideally suited to 56 M.C. Beam Communication.

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ANTENNAS

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SPECIFICATIONS

for 30-40-80-160 meters for transmitting and receiving. Lynch materials used exclusively. When writing give specifications.

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The 'AT' cut crystal recently developed has a very low frequency drift with temperature variations and will handle more power than ordinary crystals. One inch square 'AT' cut PRECISION Crystals supplied within 0.1% of your specified frequency and calibrated accurate to 0.03% are priced as follows: 1750 and 3500 kc. bands — $6.00 each. 7000 kc. — $9.00. (Add $1.00 if holder is desired.)

'X' cut PRECISION Crystals, one-inch square from the highest grade of Brazilian quartz and carefully ground for maximum power output supplied within 0.1% of your specified frequency and calibrated accurate to within 0.03% are priced as follows: 1750 and 3500 kc. bands — $3.00 each. 7000 kc. band — $3.50 each. (Add $1.00 if holder is desired.) Jacks to plug holder into — $.15 pair.

Crystals and ovens for commercial use quoted on at your request. When ordering our product you are assured of the finest obtainable. Now in our fifth year of business.

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Kansas A.R.R.L. Convention

ATTENDANCE records were broken at the eighth annual Kansas State A.R.R.L. Convention, held at the Hotel Kansan in Topeka, October 13th and 14th. One hundred seventy-five OM's, OW's and YL's were there, and found their two-day stay in the capital city chock full of technical information and fun — also of prize equipment supplied by manufacturer-patrons of QST.

The speaking program provided by the convention hosts, the Kaw Valley Radio Club, Topeka, included a section A.R.R.L. report by O. J. Spetter, W9FLG, SCM for Kansas; the League's message to Kansas amateurs, by Director H. W. Kerr, W9DZW-GR; and talks by Capt. W. A. Beasley, W9FRC, Topeka; Everett Dillard, W9BKO, Kansas City, Mo.; E. Crockett, Jr., W9KG, Kansas City, Kan.; Dana Pratt, W9BGL, Topeka; Guy Wilson, W9EL, Kansas City, Mo.; and representatives of Burstein-Applebee Co., Kansas City; Radio Laboratories, Kansas City; and the Midwest Grunow Co., Kansas City.

Award of the historic Kansas Wouff-Hong trophy, made from wood from a spar of "Old Ironsides," was to Capt. Beasley, W9FRC, president of the host club, as the state's outstanding amateur for the year 1934. Presentation, together with award of Wouff-Hong certificates to the previous holders, O. J. Spetter, W9FLG, Topeka, for 1932, and William Obrist, W9BEZ, Wichita, for 1933, was at the concluding banquet, when prize awards were also made.

While the OM's were in technical sessions, including the general meetings and the round tables for c.w. and 'phone men, the OW's were entertained in a special program with KVRC OW's as hostesses, attending a talkie and the banquets, and sightseeing and shopping.

The Kansas gang showed due appreciation of the veteran Kansas convention attendant, Director Kerr. Labeled "To Gramp," an indestructible, weatherproof certificate of merit (made from a linoleum mat and oil paint) was presented to him at the closing banquet.

A 56-Mc. Transmitter Hunt

(Continued from page 58)

which of the two points 180 degrees apart the sigs were coming.

"Nat" Pomeranz and "Bun" Blanchard, using a loop and plenty of dead reckoning, crashed through the bushes surrounding the h.t. at 11:15 a.m. These were the only successful crews, although there were many hopeful ones nearby.

At 3:30 p.m. the h.t. divulged its location in a general announcement, and the remainder of the gang poured onto the site as if by magic.

16 m.m. movies taken of the winners as they arrived and of the whole crowd lined up with their cars were shown at the following meeting of the local club and these, together with the personal experiences of each contestant, proved thoroughly enjoyable to the club members and guests.
Sweeping changes in short-wave radio technique have been made since publication of the last edition. These changes have called for a drastic revision of the book. The chapters devoted to apparatus design and construction have been rewritten all through, with new illustrations and new circuit diagrams. Needless to say, the new methods and technique which have so recently almost revolutionized ultra-high frequency working have been treated in full detail.

The twelfth edition is more than half as large again as the first edition. The chapter on receivers, for instance, has been enlarged and rewritten to cover all the recent developments; while the chapter on transmitters has been expanded to permit discussion of all the new methods devised during the last year. New circuits and layouts are given and a special attempt made to treat all possible problems which could be faced in designing or adjusting transmitting equipment. Drastic changes in circuit arrangements for the ultra-high frequencies have meant a complete rewriting of the chapter devoted to that subject. New transmitters and receivers employing new circuits are described for all three of the ultra-high frequency bands. Full details are also given of directive antenna systems for these bands. All of the chapters have had their share of attention to bring the book up to the minute. The chapters on antennas, keying, power supplies, have all been revamped so that all equipment and circuits can truly be said to represent the best in current practice.

In other words, our policy of leaving nothing in the book that does not represent the very latest practice has been maintained to the letter.

268 Pages—237 Illustrations $1

At any price, an amateur could ill afford to be without it

(Buckram Bound, $2.00)

The American Radio Relay League, Inc.
West Hartford, Connecticut
POPULAR DEMAND has now made possible a reduction in the price of THE HARVEY TRITET

Each unit is constructed of heavy gauge aluminum with front panel finished in black wrinkle lacquer properly engraved. Uses two 59 tubes combined with the highest quality parts and also incorporates a switch for selecting either crystal or electron-coupled control. REMEMBER that no other tube lineup, using low cost, low voltage tubes can equal this type exciter unit when furnishing power at 8 times the fundamental frequency of the crystal. Price fully wired and tested with one set of coils, fast tube and crystal.

$42.50

ALSO AVAILABLE—Tritet front panel, sides and base properly drilled and engraved..............$10.50

SAME as above but with blank front panel........................$8.50

TYPE HF-3 5 meter, non-reflecting receiver. ............$92.50

TYPE MO-45 5 meter, 10 volt transmitter.................$99.50

TRANSCEIVERS 2-volt $18.75 6-volt $17.95

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Write Dept. Q for Catalog.

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HERE'S what you have been looking for!

Don't sacrifice the low-loss properties of the new Acorn tube with poor insulation. Use the ultimate in low-loss insulation — VICTRON "AA", whose power factor at R.F. is only 0.0003. Everything you need for maintaining a signal with low loss in R.F. circuits is available — Condensers, Coils, Sockets, Insulators, etc.

Cat. No.  List Price
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703RV Five-meter choke Victron insulated......$1.25
LV 1 Liquid Victron coil dope per case...........$1.00
C-140 C-50 C-18 mmf. Victron variable condenser. 2.00, 2.40, 2.30
704SWS 13 to 200 meter coil set (Victron)...........2.00
455 50-watt high-quality molded socket Victron sockets, coil forms, coil selectors, etc. 1.50

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ALDEN PRODUCTS CO., DEPT. Q
715 Centre St. Brockton, Mass.

With the Clubs

(Continued from page 31)

Allentown Amateur Radio League

The first anniversary meeting of the Allentown (Pa.) Amateur Radio League was held on November 2nd. A club transmitter has been completed using a single RK-20 on 3855 kcs. The rig will later be modulated on 1.75 and 3.9-mc. 'phone. The call is W3EJC and QSOs with other club stations are desired. The first year of the A.A.R.L.'s existence has been most successful and the new president, W3DOV, intends to keep things on that basis.

Cleveland Heights Amateur Radio Club

The Cleveland Heights (Ohio) High School Amateur Radio Club was organized in 1931. During the summer school vacation period an auxiliary club functioned, known as the Cleveland Heights Amateur Radio Club meeting at the home of one of the members. In the fall a club station was put on the air at the school, W8PJE. About this time the club ran into some of the difficulties that confront most all amateur radio clubs sooner or later, difficulties that waste time, accomplish nothing and benefit no one, namely arguments on politics, how to spend dues, parliamentary law, etc. Many hours were wasted arguing technical points of conducting meetings. Some thought the money in the treasury should be spent, others thought it should be saved. Holding office in the club meant a bit of prestige so politics entered the picture; campaigns were staged by candidates and petty rumors as to the character of other candidates were spread. Friendships were strained, club organization tottered. For three years the club went through just such things. And there are few clubs that don't go through such a period! But the Cleveland boys learned their lesson; they realized that such procedure was N.G. With graduation breaking the gang up rather badly in 1933 the need for a new club became evident; it must be not only a summer club but one to run the year 'round. So, benefiting by past experience, the Cleveland Heights Amateur Radio Club was reorganized. All unnecessary trouble-making elements were eliminated. First, it was decided not to have any officers, each meeting to be conducted by a volunteer, who is responsible for a good program. Second, dues were eliminated. To become a member one must furnish by W8FFK. This idea of a club run on a very plain, simple basis has been a success. As a member of the club station was put on the air, W8FJE. About this time the club ran into some of the difficulties that confront most all amateur radio clubs sooner or later, difficulties that waste time, accomplish nothing and benefit no one, namely arguments on politics, how to spend dues, parliamentary law, etc. Many hours were wasted arguing technical points of conducting meetings. Some thought the money in the treasury should be spent, others thought it should be saved. Holding office in the club meant a bit of prestige so politics entered the picture; campaigns were staged by candidates and petty rumors as to the character of other candidates were spread. Friendships were strained, club organization tottered. For three years the club went through just such things. And there are few clubs that don't go through such a period! But the Cleveland boys learned their lesson; they realized that such procedure was N.G. With graduation breaking the gang up rather badly in 1933 the need for a new club became evident; it must be not only a summer club but one to run the year 'round. So, benefiting by past experience, the Cleveland Heights Amateur Radio Club was reorganized. All unnecessary trouble-making elements were eliminated. First, it was decided not to have any officers, each meeting to be conducted by a volunteer, who is responsible for a good program. Second, dues were eliminated. To become a member one must furnish by W8FFK. This idea of a club run on a very plain, simple basis has been a success from the start. The membership has grown, everyone has a good time, there are no enmities; it is a really fraternal gathering. The club has a paper, the Broadcaster, which keeps the gang informed of "doings" around the locality. Meeting activities include technical discussions, movies, hamfests, experiments and social activities. If refreshments are desired, everyone present chips in. The one outstanding thing is that everyone has a good time, at the same time
Eimac Announces a Second Exceptional Tube

The Only 50-Watter That Allows High-Voltage Operation

UNSURPASSED IN RUGGEDNESS AND PERFORMANCE

THE new EIMAC-50-T Low-C Triode is the only small-size transmitting tube which has no 2000 volt plate voltage limitation. In no sense of the word is it an overgrown receiving tube. It has a truly high vacuum, Tantalum Grid and Plate and a hard Nanex Glass Envelope. There are no internal insulators to give off gas or break down, and the expedient of a "Getter" has not been resorted to in exhausting the tube. Its exceptionally high mutual conductance indicates that it is very easy to drive, even with only 1000 volts on the plate. Approximately 10 watts of grid driving power, such as secured from a 45 watt stage, will usually be sufficient to obtain normal output and efficiency as a class C amplifier.

A pair of EIMAC-50-Ts in Class B Audio will give 150 watts of audio power output at 1000 volts, 250 watts output with 3000 volts on the plates.

EIMAC 50-T

CHARACTERISTICS

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<tr>
<th>EIMAC-50T</th>
<th>EIMAC-150T</th>
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2 MFD, 2000 V.

Take advantage of this present supply of condensers. They are the best that can be obtained. Believe us they are good.

$2.50

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SPECIAL VALUE! AUDIOVOX DOUBLE BUTTON MICROPHONE

Complete

EASTERN DISTRIBUTORS—GAMMATRON PRODUCTS

Heavy nickel plated stand and microphone. Gold plated diaphragm. 200 ohms per button. Your money back if you are not convinced that this represents a very BIG value. Weight 2 lbs.

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STANDARD AD MOUNTING

ACME-Delta
POWER SUPPLY EQUIPMENT

New Acme-Delta Power and Filament Transformers, new Swinging and Smoothing Chokes and the necessary coupling transformers, especially and specifically designed for use with the Raytheon RK-18, the remarkable new RK-20, R. C. A. 800, and the Hygrade-Sylvania 895 and 830-B tubes, are now ready. See the complete catalogue in QST for December, 1933. Extra copies will be gladly sent you on request. Delta Manufacturing Co., 190 Willow St., Walther, Mass.

F. S. Dellenbaugh, Jr. G. E. M. Bertram

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Excellence of response, clean, clear signals free from background noise, and exceptional ruggedness together with beauty of design and finish, make the D-104 Astatic Crystal Microphone an ideal Christmas gift.

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ASTATIC
CRYSTAL MICROPHONE
Astatic Microphone Lab., Youngstown, Ohio

“Pioneers in the Development of Crystal Devices”

Band Switching for the Transmitter

(Continued from page 39)

same kind of wire used in winding the coils. The only other precaution necessary is to connect the screen by-pass condensers directly from the tube socket terminal (grid), to chassis (B minus).

As indicated above, the unit may be used as an exciter unit to drive higher powered tetrode stages employing the same principles of coil padding and shorting, thus providing greater power output with the same ease of control. Of course, the unit is ideal as a low-powered transmitter also. It may easily be connected to an antenna impedance-matching network, circuit constants of which are given in Fig. 2. It will be noted that a two-turn link is provided to couple to the final tank circuit. This coil should be sufficiently small in size to fit inside the final tank coil near the cold end. Ample coupling is obtained by this means, which also eliminates the necessity for changing clips on the plate tank. It is apparent that if a panel-operated switch, similar to those used in each member benefits by association with others. What more should a “ham radio” club desire? We are indebted to W5EFW for this information on a truly “different” radio club.

Miscellany

The South Town Amateur Radio Association, Chicago, is conducting a membership drive over 150 new members are expected by the end of the first year! The Western Massachusetts Amateur Radio Association, Springfield, is sending code practice each Friday night from 7:30 to 8:00 E.S.T. This is on 56 mc. i.e.w.... The Lakewood (Ohio) Radio Club announces the results of its recent QSO Contest: First, W5MOH, 7 mc.; Second, W5GUL, 3.5 mc.; Third, W5DRB, 7 mc. The club station W8MJ is on the air on 7030- kcs. A code class on 3766- kcs has been started from W2JC, station of the Bloomfield (N. J.) Radio Club, Wednesdays at 8:00 p.m. Sundays at 9:00 a.m., E.S.T. The Indianapolis Radio Operator’s Club is located at Indianapolis, Indiana, not Beech Grove, Indiana as reported in November QST.

Visit the Clubs

One good feature of the majority of ham clubs is that they don’t require a visiting ham to produce a long list of credentials before entering the club portals. By and large, any ham is welcome at any ham club, so don’t be bashful about dropping around to your local society. Clubs are splendid places to get acquainted with other amateurs and to participate in interesting discussions on amateur radio. At headquarters we have recorded the addresses of the several hundred amateur radio clubs affiliated with A.R.R.L., their places and times of meeting. Do you want to be put in touch with a club in your vicinity? Would you like to attend a club meeting in another city you are visiting? Address the Communications Manager (enclosing 3¢ stamp, please) for data on Affiliated Clubs in your vicinity.

— E. L. B.
A new line of transmitter parts for new conditions are offered by National. The transmitting condensers illustrated above are the new type TMC and TMS units, compact, efficient and inexpensive. They are of standard National Quality, in spite of their low price, and have sturdy aluminum plates and frames, and low loss Steatite insulation.

Companion parts to the new condensers are the coil forms XR-10, XR-11, and XR-12. Low loss material, of course, and of well proportioned efficient shape. Types XR-10A and XR-12A forms are also available at very low cost where the highest electrical efficiency is not essential.

NATIONAL COMPANY, INC., MALDEN, MASS.

NEW 1935 HANDBOOK
will make a swell Xmas present
SEE PAGE 89

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Any make of carbon microphone completely rebuilt and modernized. Nothing is left undone to make it equal or better than new. Assembly and test is as critically done as that on a new instrument. Missing parts are replaced. A new gold spotted duralumina diaphragm is used on all stretched diaphragm models. Work returned within 24 hours. Large size: $6.00. Medium: $5.00. Small: $3.00. Send microphones through an ELECTRO-VOICE dealer or direct to the factory.
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PORT ARTHUR COLLEGE
Port Arthur (world-known port) Texas

Say You Saw It in QST — It Identifies You and Helps QST
the transmitter, is used to short circuit the turns in the antenna unit, all the transmitter controls will be on the panel right at the finger tips.

**OPERATION**

Keying methods are not shown in the diagram, since center-tap, grid-blocking, and screen-grid keying (using a relay) will all work satisfactorily. Successful operation of the transmitter only requires ability to keep the plate-meter readings at the lowest value and the antenna current at the highest. For maximum output, the final stage should be operated as a straight amplifier, using the first 859 as a doubler when doubling is required. For telephony, the screen voltage on the final should be secured through a 50,000-ohm dropping resistor from the high-voltage tap so that both screen and plate will be modulated simultaneously. A pair of 46 tubes in Class-B are recommended to modulate one 859, and 210's in Class-B where two tubes in parallel are used in the final amplifier.

To sum up, it is obvious that the outfit will do just about everything we can expect from a transmitter in the line of fool-proof flexible operation. Perhaps some other inspired kilocycle juggler can figure out how to get full output on 1.7 mc. with a 7-mc. crystal. Then it will be truly complete.

**A 10-Watt P. A. System**

(Continued from page 80)

method of construction has been adequately taken care of in the design. The one principal objection, that of having the gain control right at the speaker, can be overcome if necessary by using an auxiliary gain control located at the microphone or head amplifier.

The chassis is made of 24-gauge sheet iron, the dimensions being 12½ by 23½ by 1-inch high. It was made by cutting a section of metal 15½ by 26½, and first bending over a ½-inch lip on each side to lend rigidity. Then the one-inch sides were bent down, and the corners carefully and securely soldered. The result is a chassis which it is possible to warp out of shape with sufficient pressure, but which is more than sufficiently rigid.
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when bolted into the carrying case, and is remarkably light in weight. All parts are surface mounted, requiring no difficultly executed cut-outs. All wiring is passed through the chassis in bushings cut from small rubber tubing, to protect the insulation against friction wear which might eventually cause a destructive short circuit. Lock washers are used under every nut or screw head.

The carrying case was made to order from specifications. It is of fibre, upon a wood frame. Four heavy bolts are passed through the bottom, securing the chassis to the wood frame. The speaker is bolted to the side wall, resulting in a

FIG. 2—SUGGESTED HEAD AMPLIFIERS
A is a two-stage battery-operated affair for condenser microphones. The circuit is standard; the amplifier should be built into a shielded case along with the condenser head.
B is a single-stage battery amplifier for either dynamic, velocity, or crystal microphones. For dynamic or velocity microphones the input transformer can be made by removing the primary from a standard audio transformer, and substituting ten turns of heavy wire. For crystal microphones, the grid input circuit shown at C should be used.
C is an a.c. substitute for B. Some care in mechanical construction may be necessary to eliminate hum. No part of the circuit should be connected to the metal chassis or box, except through the .002µfd. mica condenser. A separate by-pass condenser of the same capacity right at the microphone head may be helpful.

The output transformer in each case is a standard tube-to-line unit, and is coupled through a shielded cable to one of the 200-ohm sections on the p.a. system input transformer.

rigid, well-mounted assembly. A heavy paste-board subsidiary baffie is placed between the speaker frame and the side wall, to aid the acoustical characteristics; a protective wire mesh screen covers the cone opening, eliminating possi-
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bility of accidental damage. In transit, the entire cone opening is covered by a flat rectangle of heavy fibre, secured to the wall of the case by four baggage clips.

The entire back of the case is removable, but the amplifier is usually used with it in place, the top clasps alone being fastened in order that the power and microphone cables can be brought out below. This cover aids in bringing out heavy note response, and also reduces acoustical feedback.

In conclusion, perhaps a word or two about performance would be in order. The average 1000-seat auditorium can be comfortably filled with sound without resorting to full output; in fact, up to the present we have encountered no indoor installation in which full volume was required. Outdoors, in a fairly noisy suburban business district, speech is usefully audible at a block away—with quality that is pleasing, crisp and clear.

Amateur Radio Enjoys a Holiday
(Continued from page 85)

field. Other antennas are used for miscellaneous work. One of the club members makes his residence at the shack.

One amateur in expressing his thanks wrote, "Not since the good old spark days have I attended a ham gathering that made me feel that I was part of a live-wire, progressive bunch that was going places and doing things. Saturday's performance certainly revived my faith in the art."

Among some of the DX amateurs present were: W7AOB, W1HRX, W1SZ, W1BES, W8NE, W4AKW, W4MU, W4LU, W3DQ, W2KR, K4SA, X1G, W1EYF, W2DC, W8CPC, W2KE, W7BIX, W5ACF, VE3WA, W5DJB, K5AD, W4AEW, W7EM, W2AYN, W5ZA, and a W6 who neglected to sign the register.

Our hats off to members of the Lakeside Radio Club: Thorne Donnelley, W9NKH; Wm. P. Hilliard, W9PZ; J. B. Swanson, W9IKV; Orland Murphy; Paul H. Davis, W9GES; Lewis B. Gilmer, W9MTC; Wm. Schrader, W9EIP; Ralph W. Jenkins, W9QA; George E. Joyce, W9RA; Pat Paulson, W9MPT; C. A. Petrie, ex-W8AWN; P. C. Sandretto, ex-W9BIG; Ralph Glover.

Amateur Radio at Air Races
(Continued from page 81)

table that the newspaper officials who used our facilities did not see fit to give credit to the amateurs for the services they had performed.

No end of credit must be given to local and other amateurs for their splendid cooperation in "standing by" for the air race group during their operations. No QRM whatever was experienced.

A meeting of those who participated in this work was held after the races, and every man expressed his pleasure in having had a part in the
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radio work of the 1934 National Air Races. All are looking forward to next year's event when, no doubt, amateurs will be called upon to duplicate this year's job.

International 28-Mc. Contest
(Continued from page 9)

V. One point will be score for each completed 100 miles of contact, with a specific station (e.g. a contact with a station 99 miles away scores no points, contact with a station 658 miles away scores 6 points). All distances will be measured by a Great Circle line between stations. (A.R.R.L. contestants must present a log summary with distances and claimed score, at the conclusion of the contest to receive points under (3); also a paper on development work to rate credits under (2) above.)

VI. In computing his final score a competitor may claim points for each different station worked once during each calendar month. Proof of contact in writing may be required by the contest committee.

VII. R.S.G.B. Award: (a) The decision of the president of the R.S.G.B. will be final in all cases of dispute. (b) Entries must reach the Secretary, R.S.G.B., 53 Victoria Street, London, S. W. 1, not later than November 15, 1935.

VIII. An A.R.R.L. Award Committee shall consider the file of reports and data submitted by competitors. Its decision based on (1) The number of weekly reports to A.R.R.L. on 28-mc. work, 25%. (2) Equipment description and development work on same, 25%. (3) Number of points in accordance with Rule 5, 50% will determine the 28-mc. Achievement Award. Entries (from W/VE) must all be received at A.R.R.L. on or before October 15, 1935.

From March until early August the 28-mc. band gave excellent results, 1000- and 1500-mile work becoming quite common. Since then conditions have been poor. Last year, in late November and December, this band was quite "alive," and we hope similar conditions may obtain this year. Interest in the 28-mc. contest is running high. According to the reports received VE2AC, W6CAL, W9NY, W9GFZ, W7ACS and W1ZB are about tied for honors. Harmonics of some stations in other amateur bands, and some local QSOs have been made, but the reports themselves are thus far the predominating factor in the A.R.R.L. 28-mc. competition. W1BSF, W8CFT/9, W9AGV, W3CEE, W9FQ, W8MDL, W1CCH, and WICRO-DAE are actively interested in the contest and all have reports on record in their favor.

---

Strays

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(2) No advertising of any character will be accepted, nor can any special typographical arrangement, such as all or part color, or other extravagance, which would tend to make one advertisement stand out from the others.

(3) The first-rate rate is 15c per word, except as noted in paragraphs (4) and (5).

(4) Remittance in full must accompany copy. No cash or orders will be accepted for any advertising to be inserted.

(5) Closing date for Ham-Ads is the 20th of the second month preceding publication date.

(6) A special rate of 7c per word will be applied to advertising which is considered non-commercial in nature and is placed and signed by a member of the American Radio Relay League, Inc. (ARRL), and by his use of bona fide equipment, owned and used as an individual, or apparatus offered for exchange or sale is not being sold on a mercantile basis.

(7) Special arrangements may be made for position in the Classified section of QST.

Having made no investigation of the advertisers in the classified columns, the publishers of QST do not assume responsibility for the integrity or for the grade or character of the products advertised.

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QSLs! Best values! Inquire! WQFZQ, Box 1804, Phoenix, Ariz.

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NEW RCA—Victor amateur receiver: National parts, receiver, HAN, Howard, Cardwell, Cardwell, RCA-DeForest "Accorns", 500, 501 in stock; RR-10, RR-19; Thor, Kenyon, Sprague, Bliley; Aerial wire, insulators, etc. Hatry & Young, Hartford.


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CRISTALS—x cut 1\° sq. 30-60 meters within 3-ko, of frequency. Ransom & Hom Labs., 10477, St., New York.

SBX-A used 10 hours complete with 40M. B.S. coils, tubes, and H.D. power supply. $50.00 cash. Write for list of transmitting frequencies ordered. Ransom & Hom Lab., No. Syracuse, N. Y.


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AMATEUR equipment manufactured to order. Holmes d.

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75¢, blanks from the saw 50¢, grinding instructions 2M, plug­
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Sagamore Rd., Cleveland, Ohio.


COLLINS 30FX transmitter tubes and QSLs, free samples. Printer, Corwitll, Iowa.


CRYSTALS: Guaranteed excellent oscillators, 160 or 50 meters, your approximate frequency $1.35 postpaid. Crystal Maker's blank $5.00. Irregular shapes $1.00.

Prototype Bakelite holders, non-exposed 1/4" sil­vered electrodes, plugs into G.R. or tube socket mountings, any possible frequency. D. C. Airx, W2FL, 131 Greenwood Ave., East Orange, N. J.


WANTED—big transmitting tube. Make best offer. WlGHM.

SELL—FB7A timer, RCA tubes, power supply, coils for 160, 80, 20, 40, $45. W8KRB, 609 Stratford Drive, Ann Arbor, Mich.

3. $5.00. 3000 volt mica condensers, $2. each; Westinghouse MG 500 volt d.c. 200 mils from 110 a.c. mounted, $12; 2 oil G.E. 1.7 mfd 2,500 volt, 1 Westinghouse 1 md 3,500 volt condensers, $12 each; Cash paid for High Q detector and loadinii unit. Must be in good working condition and priced within reason. Cash sale for parts taken. George X. Mc Collum, W8KRB, 1253 Madison Ave., West Springfield, Mass.

USE FB7AX and RF 20, 40, 80 coils, 5897 power pack tubes, factory test before shipped, $59; 4 always .004 12,500 volt condensers, $45. W2GIF, 3007 North Luna Ave., Chicago, Illinois. You cannot buy a better crystal than Hipower at any price.

Libby, McCollum, others. Palmer's Trading, Route One, Du­luth, Minn.

3N034W, $7.50; 203As and 854s, new. Amateur Service, Fairview, N. J.

BEST place to trade your old receiver for Patterson, National, Meburdo, RME, others. Palmer's Trading, Route One, Du­luth, Minn.

WANTED—Wireless Specialty Co type IP 501 receiver complete with Audio Amplifier and IP 503 Long Wave Loading Unit. Navy Type SB-143 Radio Receiver complete with De­ector-Amplifier unit and loading unit. Must be in good working condition and priced within reason. Cash sale for parts taken.

WANTED—supplies on request. Hipower Crystal Co., 3607 North Park Ave., San Diego, Calif.

226 W. Madison St.

No Substitutions — 4 Hour Service

John Wallace — Technical Adviser

NEWARK ELECTRIC CO.

296 W. Madison St. Dept. Q Chicago, Ill.
Your Nearest Dealer

Your nearest dealer is entitled to your patronage. You can trust him. He is equipped with a knowledge and understanding of amateur radio. He is your logical and safe source of advice and counsel on what equipment to patronize the dealer nearest you—

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<td>99A Milk Street</td>
<td>206 Prospect Street</td>
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<td>All OMs, OWs, and YLs welcome — W1HRF</td>
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<td>1639 Tremont Place</td>
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<td>Radio Equipment Sales Co.</td>
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<td>359 Capen Blvd. — Tel. Univ. 9380</td>
<td>14036 Woodward Avenue, Highland Park</td>
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<td>171 E. Jefferson Avenue</td>
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<tr>
<td>833 West Jackson Blvd.</td>
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<td>415 South Dearborn Street (Est. 1921)</td>
<td>2512 Peach Street</td>
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<tr>
<td>W9RA and W9PST — Amateurs since 1909</td>
<td>Amateur, service parts, including Billey, National, Raytheon. W8CXY</td>
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<td>226 W. Madison Street</td>
<td>227 Asylum Street</td>
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<tr>
<td>Chicago's oldest radio parts store — established 1921</td>
<td>What do you need? We have it</td>
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<tr>
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<td>John T. Wallace, Technical Adviser</td>
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<td>1012-14 McGee Street</td>
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<td>Distributors: RCA Victor, Stromberg-Carlson, Standard Ham Lines</td>
<td>“Specialists” in supplies for the Amateur and Serviceman</td>
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This advertisement is paid for by the firms listed above. Qualified dealers Say You Saw It in QST — It Identifies You and Helps QST.
Is Your Best Friend

you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

You can have confidence in him

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<td>Radio Laboratories</td>
<td>1515 Grand Avenue</td>
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<td></td>
<td>Amateur Headquarters — Complete Stock — Quality Parts</td>
<td></td>
</tr>
<tr>
<td>Los Angeles, California</td>
<td>Pacific Radio Exchange, Inc.</td>
<td>729-31 South Main Street</td>
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<tr>
<td></td>
<td>Most completely diversified stock of amateur equipment in the West</td>
<td></td>
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<tr>
<td>Manchester, New Hampshire</td>
<td>Radio Service Lab. of N. H.</td>
<td>1008 Elm Street — Tel. 218-W</td>
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<td>Branches — Portland, Me. and Barre, Vt.</td>
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<tr>
<td>Milwaukee, Wisconsin</td>
<td>Radio Parts Company, Inc.</td>
<td>332 West State Street</td>
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<tr>
<td></td>
<td>Complete stock Nationally Known products</td>
<td></td>
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<tr>
<td>Newark, New Jersey</td>
<td>Kaltman &amp; Romander</td>
<td>62 Court Street</td>
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<td>Drop in for an over-counter QSO</td>
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<td>Peoria, Illinois</td>
<td>Klaus Radio &amp; Electric Co.</td>
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<td>Freeland Radio Supply Co.</td>
<td>5 N. 7th Street</td>
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<td>“If it’s radio we have it”</td>
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<td>Radio Electric Service Co., Inc.</td>
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<td>32 Broadway, Room 23</td>
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<td>St. Louis, Missouri</td>
<td>Walter Ashe Radio Company</td>
<td>1100 Pine Street</td>
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<td>W9FIS in charge of the oldest and largest parts store in St. Louis</td>
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<td>St. Paul, Minnesota</td>
<td>Lew Bonn Company</td>
<td>2484 University Avenue</td>
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<tr>
<td>San Francisco, California</td>
<td>Offenbach Electric Company, Ltd.</td>
<td>1452 Market Street</td>
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<td>“The House of a Million Radio Parts”</td>
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<td>Springfield, Massachusetts</td>
<td>T. F. Cushing</td>
<td>349 Worthington Street</td>
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<td>An amateur, endeavoring to sell good parts</td>
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<td>Syracuse, New York</td>
<td>Roy C. Stage, W8IGF</td>
<td></td>
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<tr>
<td></td>
<td>Complete stock of standard Ham &amp; BCL parts</td>
<td></td>
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<td>Standard Discounts. Free technical service</td>
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<td>Toronto, Canada</td>
<td>A &amp; A Radio Service Supply</td>
<td>101 Queen Street, West</td>
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<td>Canada’s foremost radio supply house</td>
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<td>Toronto, Canada</td>
<td>Wholesale Radio Company, Limited</td>
<td>1133-39 Bay Street</td>
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<td>Canada’s Largest Amateur Supply House</td>
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<td>George’s Radio Co.</td>
<td>816 F Street, N.W.</td>
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Say You Saw It in QST — It Identifies You and Helps QST
You Are Protected When You Buy From QST Advertisers

"Advertising for QST is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from QST's advertising rate card.

For Your Convenience

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SURE they're Rugged. Those boys take plenty of punishment out there these Saturday afternoons. But if they're Rugged what must CARDWELLS be! Thousands of CARDWELLS are doing their jobs month after month, year after year with never a replacement. CARDWELLS are built to stand tough going. They have to prove themselves in the laboratory before they "make the team". And don't forget — the workmanship and precision that goes into a CARDWELL is unsurpassed in any piece of equipment. There's a CARDWELL for every Tube and Purpose — Write for literature.

NEWS! Type 519-8 for neutralizing 820 tubes. A compact condenser with extra wide spacing. Designed for panel or shelf mounting. Provided with positive, non mutilating rotor lock.

CARDWELL "TRIM-AIR" MIDGET CONDENSERS
CARDWELL "STANDARD" MODELS FOR RECEIVERS and MEDIUM POWER TRANSMITTERS
CARDWELL MIDWAY "FEATHERWEIGHT" CONDENSERS, RECEIVING & TRANSMITTING
CARDWELL 16-B TRANSMITTING CONDENSERS FOR LARGER TRANSMITTERS
CARDWELL HIGH VOLTAGE CONDENSERS FOR COMMERCIAL RADIO-TELEGRAPH and BROADCASTING STATIONS
CARDWELL S-2244 OIL DIELECTRIC FIXED CONDENSERS FOR HIGH FREQUENCY FURNACES and TUBE BOMBARDERS

THE ALLEN D. CARDWELL MFG. CORP'N.
83 PROSPECT STREET, BROOKLYN, N. Y.

"THE STANDARD of COMPARISON"

Say You Saw It in QST — It Identifies You and Helps QST
Be Santa Claus to Your Friends
Complete the Circle with 1935 Copies

QST can help you with your Christmas list. Each year an increasing number of individuals finds it to be the ideal gift. A subscription present is unique, too. It serves as a monthly reminder of your thoughtfulness. A yearly subscription, including League membership, costs only $2.50, little enough for the ones you have in mind. And — we'll send an appropriate gift-card conveying your Christmas Greetings at the proper time.

Once you form the habit of giving QST as a Christmas present you'll come back year after year with the same thought.

QST

38 La Salle Road + West Hartford, Connecticut
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The FBX-A

...is the answer to congested channels
   Superhet selectivity, plus a single signal filter, enables operators to close the door on unwanted signals.

...is the answer to DX
   High gain and low background noise provides extreme usable sensitivity for pulling in weak signals.

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   The extremely low net price of $51.90 brings this strictly first-quality performance within the reach of every pocketbook.
The days of guessing about station operation are at an end. Only a few short months ago RCA introduced a series of cathode-ray tubes of proven quality and performance. Useful in modulation indicators and oscillographs, RCA Cathode-Ray Tubes have found wide application in amateur stations. Today, no one needs to guess about his modulation. Simple, practical and accurate modulation indicators and oscillographs using RCA Cathode-Ray Tubes can be built, or complete units manufactured by leading amateur supply houses can be purchased at a very reasonable price.

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