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Coaxial Feeder Construction
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All appointments in the League's field organization are made by the proper S.C.M., elected by members in each Section.

Mail your S.C.M. (on the 16th of each month) a posting of your radio activities for the previous 30 days. Tell him your DX, plans for experimenting, results in phone and traffic. He is interested, whether you are an A.R.R.L. member or not; so he can give you an appointment he can call you about them, too.

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LET us quote the old adage that "A chain is no stronger than its weakest link." Inasmuch as impregnation is one of the most important links in the life of a transformer, the following procedure will explain the care which is taken by us to make all links strong. We all know that paper insulation and cotton contain moisture at all times, the amount depending upon the humidity of the atmosphere.

Every coil is put in a ventilated oven for a period of 12 hours and pre-heated to drive off the bulk of the moisture. The coils are then placed in a large vacuum tank at a higher temperature where the remainder of the moisture is drawn off with a powerful pump capable of a vacuum of 29.75 inches. After this vacuum is attained, hot varnish is allowed to flow in the vacuum tank, completely covering the coils, maintaining all the time the 29.75 inches of vacuum. After this the vacuum is released and pressure of 100 lbs. per square inch is applied to force the varnish into all the possible crevices.

The varnish is then drawn off and the coils drain and dry in the vacuum tank for five hours, with a vacuum of 29.75 inches imposed on them once every hour.

The next step is to place these coils in an oven for 12 hours for their final drying and heat treatment.

From the preceding paragraphs it will be noted that all coils are under a continuous heat treatment for a period of 36 hours, thereby insuring our users of transformers that they have had a transformer's worst enemy (moisture) taken away, and sealed out by a protective coating of varnish baked into the coil. Following this the coils are laminated and clamped, then heated again for four hours to get rid of the surface moisture on all metal parts and are placed in their containers and poured with compound, while hot.

F. P. Kenyon
The American Radio Relay League

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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 nation 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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I T HAS always seemed a pity to us that some bright fellow didn’t have the idea, way back when, of making a series of disc recordings of the ham bands at intervals of a year or so with the particular idea in mind of building a history of the progress of ham transmitting and receiving technique. It would surely be good if, in one of our relatively morbid moments, when we feel that there is still so much rotten in the game, we could crank up the machine and listen to a cold, clear winter night in 1924. The mess of blumpy, squashy notes spluttering across the dial of our hopelessly broad-tuning receiver would most certainly jerk us into the realization that, in spite of all the things still left undone, we have taken terrific strides in the basic business of putting signals on the air and getting them out of it. This may seem a trite sort of observation, particularly since we have so recently been crabbing about the infernal complexity of modern ham equipment. But it is an inescapable fact and one that’s good to think about.

It so happens, of course, that we have no recordings of the ·old-time signals, and without them we find our recollection of earlier days unavoidably rose-tinted by fond thoughts of problems licked and impossibilities achieved. But a good makeshift is to tune somewhere up above 14 Mc. and park for a few minutes on one of the available diathermy signals, preferably using a good old detector and two-step for the job. One then only has to think of a series of ham bands populated by hideous noises of this kind, interspersed with raspy r.a.c. notes and twittery near-d.c. burbles slithering across channel after channel, in order to get the idea fairly accurately. For even in 1925, impossible though it now seems, raw a.c. as a plate supply was widely used even by the crack stations of the day. Rectifier tubes, let alone filter condensers, were expensive luxuries available only to the few. Crystal control was virtually unknown. As to ’phone, unfortunately there is no satisfactory way to gain a picture of the best ’phone signals of even ten years ago. Some of the poorest transceivers still to be heard on the ultra-high frequencies may bear some points of similarity but they are surely much too good.

No, the historical recordings don’t exist and even our keenest recollections are distorted. But no ham who was close to the technical problems of earlier periods can possibly tune across to-day’s bands without getting some semblance of a warm feeling around the eckles of his heart. The amateur has done a miraculous technical job. Exceptions will always rise to plague us but, by and large, the ham gives an example to the world of just how signals should be sent and received.

I’M GOING to revert now to the first-person-singular long enough to make an announcement of some interest to our readers. It’s easier that way because it is a subject pretty close to me.

If you’ll inspect the mast-head of this issue you’ll notice that QST has a new editor. I have named Mr. Ross A. Hull, long our associate editor, as the editor of QST. I retain for myself a title based upon the specification of the League secretary’s duties in our constitution, that of general manager of A.R.R.L. publications. Since that first dim year back in the early 20’s when QST’s staff first embraced more than one editor, I have been known as the editor-in-chief. For many years that was a perfectly proper description of my editorial duties, but for the last several years it has not been accurate. We have, I think, the most competent editorial staff with which ever a magazine was blessed, and it handles things in its stride. The stage in our development has been reached where I am no more the editor-in-chief of this journal than I am its advertising manager or its circulation manager or its credit manager—all of which I used to be. Mr. Hull has been in fact its chief editor for years back, as he has been of the Handbook, so let us put the credit where it is due.

Ross Hull needs no introduction to QST readers. He is as ardent and as complete an amateur as I have ever known. He tears into new ideas with an unbelievable fervor. In 1928 he directed with magnificent success our special technical program which developed new apparatus and methods to meet the technical restrictions which came upon us in 1929 when the Washington Convention took effect. He is largely responsible for the successful amateur attack on the ultra-high frequencies and his personal investigations in that field have brought him to world eminence. He was the first to demonstrate the bending of
such waves in the lower atmosphere as a function of meteorological conditions, and to establish a correlation between u.h.f. reception and air-mass weather phenomena. He has versatility and brilliance as well as the splendid old amateur spirit and plenty of editorial experience. Somewhere in this country there’s a firm named Ross that makes steering gears for large trucks. Some years ago they published an advertisement that illustrated the use of their equipment under particularly trying conditions and they headed it with the slogan “Ross steers these difficult jobs with ease.” Better bywords for Ross Hull could not be imagined; they describe him perfectly.

Let no one think this is my valedictory speech to QST. Of all the activities of the A.R.R.L. staff QST is my first and greatest love. It always will be. And as I said above, this is not a change in QST personnel; it is a simple recognition of the facts that have existed for some years. I shall continue not only to worry as QST’s business manager but, as secretary of the League, to act as the intermediary between the Board of Directors and the staff to insure the pursuit of editorial policies in accordance with the Board’s wishes and shaped to meet our members’ needs under changing conditions. There are doubtless some readers of this great journal of the American shack whose hearts, as they read these lines, leap with the hope that they are hereafter to find a new writer of this page. But not so, OM’s. I shall also continue my monthly effort to concoct words of cheer, warning or quasi-wisdom for this page, with the w.k. Bud pinch-hitting here in my absences; without that, I admit, I’d feel quite excommunicated. So I’ll BCNU.

K. B. W.

Future DX and Ionosphere Trends

By George Grammer,* WIDF

ALTHOUGH there probably isn’t much we can do about it, it is interesting now and then to sit down and speculate about probable future DX conditions, basing our speculations on the expected behavior of the ionosphere in the years immediately before us. The future is not an entirely uncharted sea, but neither is our coming voyage wholly over familiar waters.

As most amateurs know, it is generally accepted that long distance transmission is possible because of the existence of an ionized region, called the ionosphere, in the upper atmosphere. Radio waves entering this region are refracted, or bent, to an extent depending upon the frequency and the density of ionization. The ionosphere actually is divided into several strata, each “layer” being more or less effective in refracting or reflecting waves of different frequencies. The subject was covered quite thoroughly in Dr. Kenrick’s paper in September, 1936, QST, which every amateur interested in long-distance transmission ought to read.

The state of the ionosphere has been definitely correlated with sunspot activity through observations made over a considerable period of years. The critical frequencies of the $F_2$ layer—the layer of chief interest for DX transmission on 14 Mc. and higher—show marked increases with increases in the number of sunspots, and since the $F_2$ critical frequency is a measure of the highest frequency on which communication over long distances is possible, it follows that the greater the sunspot activity the better conditions will be for 14- 28- and even 56-Mc. DX work. Conversely, when sunspots are relatively few the critical frequencies are lower and transmission conditions on the higher frequencies are poor. So much for a rather hasty review.

Now scientists have been looking at the sun for hundreds of years, and it is known that sunspot activity rises and falls in regular cycles. Between any two periods of maximum or minimum activity there is an average stretch of about seven years; the actual time between maxima has been known to be as short as seven and as long as seventeen years. The alternative periods are not exactly similar, so that identical conditions would not be expected to prevail at times eleven years apart. Nevertheless, the maxima and minima come and go with regularity, and radio transmission conditions can be expected to vary accordingly. Hence the assertion that the future is not entirely uncharted.

Getting down to dates, the last sunspot minimum occurred about 1933. It is impossible to be very specific—or even to limit the time to one year—because the maxima and minima are quite broad; the curve is filled with irregularities. (Continued on page 180)
The First Interamerican Radio Conference

Seventeen Nations at Habana Applaud and Support Amateur Radio—'Phone Bands Standardized—Friendly Message Traffic To Be Encouraged

By K. B. Warner,* WlEH

A new kind of conference has entered the life of the American radio amateur—interamerican radio conferences. The first of these has just been concluded at Habana as I write, and the second is scheduled for Santiago, Chile, in 1940. Being administrative conferences with the right to deal with frequencies and write regulations binding upon the signatory administrations, they will be of much importance to us—much more important, for example, than the meetings of the C.C.I.R. In authority they will fit midway between the world conferences (such as Madrid and Cairo) and the domestic regulations of each country, such as are written by our F.C.C. The Madrid Convention encourages regions to make regional arrangements that may deviate slightly from the world plan, provided interference is not caused to other regions. Of course there have been regional agreements in both North and South America before the Habana meeting, but never before one whose effect extended through all of the Americas.

The Habana conference was characterized by a very fine recognition of the value of amateur radio, a complete willingness to assign our frequency bands to us exclusively, and a whole-hearted pledge to support our bands at the Cairo conference. The nations there represented agreed to the present widths of the amateur bands and the portions thereof available for 'phone operation. Moreover—and I think this is strikingly important—with a few exceptions they all agreed to permit the interchange by amateurs of friendly messages on behalf of third parties, by a special arrangement that relaxes the restrictions of the present world regulations. The contrast of philosophies between the New World and the old was never better exemplified!

Representatives of seventeen nations assembled in Habana for this conference which lasted from November 1st to December 13th: Argentina, Brazil, Canada, Chile, Colombia, Cuba, Dominican Republic, Guatemala, Haiti, Mexico, Newfoundland, Nicaragua, Panama, Peru, United States of America, Uruguay and Venezuela. When the conference was concluded, four documents were signed by the delegates, all to become effective July 1, 1938. Two of these are treaties requiring ratification by the governments: one a North American regional treaty concerning broadcasting on frequencies below 1600 kc., the other setting up a continuing interamerican arrangement for interchanging technical data and for holding future conferences. The other two documents are administrative agreements between the communications administrations of the respective countries, not requiring formal ratification by the governments. One of these deals with miscellaneous things, the most important item in which is the recommendations to the Cairo conference. The fourth deals with allocations and regulations on behalf of services operating on frequencies above 1600 kc. and is, therefore, of the highest interest to us. The Newfoundland representative was obliged to retire early from the conference, and the Argentinian representative did not receive authority to sign, so that these two nations are not yet party to the compacts, but it is understood that they will announce their adherence. We understand that all the other nations signed all the documents.

With the Cuban government as gracious host, the conference was welcomed by the President of Cuba at an opening plenary session held in the House of Representatives. Part of his remarks deserve quotation here. After discussing some of the problems before the conference he said:

"Finally, you are confronted by the question of radio amateurs, and with the responsibility of preparing their defense before the forthcoming world conference at Cairo. It is impossible to forget the extent to which radio amateurs can

*R:ecretary, A.R.R.L.
contribute towards the brotherhood of peoples. To them we also owe, from its beginning, the greater part of the progress made in the technique of radio-electric communications, as well as the discovery of the unlimited field of short waves. While defending them we no more than pay homage to the memory of Marconi, that amazing amateur who gave humanity his marvelous invention which, destroying the barriers for the exchange of thought, creates an intimate understanding amongst the peoples, linking them through arts and intellects."

This conference differed from any other I have ever attended in that the representatives of "private interests," of which I was one, were not permitted to participate but were present only as observers, permitted to sit at the back of rooms and listen; this was strictly a conference between government people. However, we "camp followers," as we called ourselves, were able to do very useful work by discussing matters with foreign delegates out of meetings, and in actively working with the members of the U.S.A. delegation who had our matters in tow. It will be different at future inter-American conferences, for the new arrangement setting up the Interamerican Radio Office provides that at future conferences we and the other representatives of recognized special interests will have deliberative voices, although, of course, the actual voting will be the privilege only of governments.

It is time to report some of the detailed results of the conference. Like any radio conferences to-day, the greater part of the energy of this one was consumed with broadcasting matters. Although doubtless a very important matter, it did not concern me and I did not have time to follow it, so there is nothing of importance I can tell you about it. A good starting point seems to be the recommendations to the Cairo conference.

There is now a pleasingly well-developed consciousness of the need for Pan-American unity in radio matters, particularly as before the rest of the world. This conference adopted a series of recommendations to the Cairo meeting, dealing with matters both technical and otherwise and concerning numerous services. By a unanimous vote the American nations recommended that the 7-, 14-, 28- and 56-Mc. bands remain allocated as exclusive amateur bands for use all over the world; and they recommended that the Cairo conference continue the 1715-2000 and 3500-4000 kc. bands in regions other than Europe in their present status. This present status is a shared assignment between amateurs, fixed and mobile, but it is the intention of the American regions then to assign these bands exclusively to amateurs. The plans adopted with respect to a possible expansion of h.f. broadcasting at Cairo are such as to offer minimum hazard to our frequencies.

A conference such as the Habana one is important to us because it may yield or withhold certain lower frequencies within limits set by the world conferences. The Madrid regulations make certain frequency bands available for amateurs, but in some cases only on a permissive basis: they might be shared with other services. In any continent where there is a regional agreement it is necessary for that agreement to repeat the world-wide allocations before the individual nations are authorized to devote these bands to amateur use. Consequently it is good news of the first order that the administrative agreement signed at Habana assigns all the bands we now use from 1.75 Mc. to 60 Mc. exclusively for amateurs in every country participating. Moreover, they adopted "as a guide" the u.h.f. allocation which we recently reported as just adopted in the United States, which scheme includes the new amateur bands 112-118 and 224-240 Mc. Every amateur frequency may be used for c.w. telegraphy; this a sort of basic consideration. However, largely for our own good, they adopted recommendations addressed directly to us amateurs: "that the Administrations should point out the desirability that amateurs use the bands from 1750 to 2050 and from 3500 to 4000 kc. preferably for short-distance communication; that the Administrations recommend that the bands from 7000 to 7300 kc. and from 14,000 to 14,400 kc. should not be used for short-distance communication between amateur stations." Only one change was made in our allocations, and that one to which we had previously given our assent, as reported months ago in QST: the 1.75-Mc. band is to be changed in the Americas to 1750-2050 kc. instead of 1715-2000. Remember that non-harmonic "overhang" we have in our spectrum diagrams from 1715 to 1750? Well, it is going to be taken off the "left-hand edge" and put on the "right-hand edge" some day when the F.C.C. gets around to amending our domestic regulations.

In recent years there have been regional agreements in both North and South America. The North American one expired a few years ago. The South American one was originally negotiated in Buenos Aires in 1935 and, we believe, then related only to broadcasting matters. At a conference in
Rio de Janeiro in June of 1937, this agreement was revised and expanded to take effect the first of 1938. It covered not only broadcasting but several other services, including amateurs. It recognized and perpetuated all of the frequency bands we now use but opened all of them to 'phone operation except the frequencies 7150–7200 and 14,300–14,400 kc! The Habana conference had to take into account this Rio agreement. To make a long story short, the outcome is that the Rio agreement stands so far as concerns broadcasting as a South American regional proposition, but in all of its other manifestations, including amateur matters, it is abandoned and gives way to the new interamerican agreements of Habana.

The Habana conference, in my estimation, established a new mark for intelligence in international conferences by creating a sub subcommittee of "amateur experts" to deal with the amateur problem and make recommendations to it. The only thing the matter with the s.s.c. was that I wasn’t a member of it myself—hi! There was the usual subdivision of work; the plenary session set up certain committees, including a technical one; the technical committee divided into broadcasting matters and matters other than broadcasting; the latter subcommittee, when an appropriate stage in its work was reached, set up the s.s.c. of amateur experts. This was headed by Señor Don Carlos A. Tudela of Peru, who happens to be OA4Z and the chief technical expert of the Peruvian administration. Its other members were Messrs. Gerald C. Gross, W3GG, of the F.C.C.; Eduardo Noguera, HK3EN, of Colombia; Don Fernando Sánchez A., Mexican inspector of radio; and Don Alfonso Hernandez Cata y Galt, chief of the Cuban radio laboratory. An excellent group it was, with a good appreciation of amateur problems. This was the group which recommended the reaffirmation of our bands and their defense at Cairo, and it was in this group that the very difficult question of subdividing the amateur bands for 'phone was considered and resolved. Cuban amateurs, through the Radio Club de Cuba, were active participants in the conference, and the amateur s.s.c. had the assistance of additional practical amateurs in the persons of Messrs. Justo Mahía, CM/CO2JM, Rafael Bordeneuve, CM2RW, and Lieut. Enrique S. Morales, of the Cuban signal corps, all of whom were members of the Cuban delegation.

This question of 'phone in fact was the main problem of the amateur committee. There was this Rio agreement, opening almost everything to 'phone, effective the first of the year. There was a rather widespread recognition that the Rio plan was unwise to an extreme. There was the existent hit-or-miss policy of the Latin countries, resulting in the distribution of 'phone signals at random through all the bands. Finally, there was the definite proposal originated by the Cuban government, and backed by the Mexican government, that 100 kc. of the 7000–7300 band be made available for 'phone in the Latin countries. This was the opening situation. The final decisions were as follows:

- 1.75-Mc. band is available in its entirety for 'phone, at the discretion of individual administrations. In the 3.5 band, only the frequencies between 3800 and 4000 are available for 'phone. In the 7-Mc. band the frequencies between 7050 and 7150 kc. may be assigned for 'phone work in the Latin-American countries but not in the United States, Canada or Newfoundland. In the 14-Mc. band, the frequencies between 14,100 and 14,300 kc. are available for telephony and may be so used in the Latin-American countries, Canada and Newfoundland. The United States obligates itself to confine telephony in this band to the present frequencies 14,150–14,250 at least until December 31, 1939. No mention of 'phone was made on frequencies above 28 Mc. The conference recommended to the governments that 'phone in the 14-Mc. band be permitted only after an adequate probationary period in which to acquire experience, plus a technical and practical test—in other words, that something like a Class A license be required.

The United States has no present intention of expanding 4-Mc. 'phone. This agreement simply means that all the nations undertake to have no 'phone operating below 3800 kc. in this band. Thus Mexican amateurs possibly may be permitted to operate between 3800 and 4000, and, of course, Canadian amateurs already enjoy 3750–4000. But after July 1st we are to be spared the murderous interference from Mexican and Canadian 'phone stations in the lower portion of this important traffic band: the Mexican 'phones will move up in the band and the Canadian 3550–3550 assignment will be eliminated.

The most illuminating characteristic of the Habana conference was the insight it provided the northern nations into the differences in communication which exist in the tropical and subtropical regions in all radio services. It seems to be a physical fact that their natural noise level is so

(Continued on page 68)
A Low-Cost 100-Watt Transmitter
Three-Band Rig Using 6L6's and Push-Pull 809's
By Vernon Chambers,* W1EQ

Nine times out of ten the word "inexpensive," when used as a transmitter adjective, implies that the piece of gear is of the low-power variety. Now, however, several manufacturers are supplying us with tubes that permit moving these low-cost rigs up into the medium-power class. The transmitter to be described falls into this classification, since it will deliver at least 100 watts output, although costing only about twenty-five dollars to build, exclusive of power supply. A pair of new RCA 809's in the final, three-band operation with one crystal, inductive coupling between the driver and final stages and ease of construction are some of its features—besides low cost.

The Circuit
The circuit, shown in Fig. 1, uses a 6L6 Tri-tet oscillator followed by a 6L6 doubler, with either of these circuits, depending on the frequency, feeding into the push-pull 809's. For 3.5-Mc., the oscillator output is fed to the final grid circuit; on this band the doubler tube is entirely cut out. For 7- or 14-Mc. output all three stages are used, the doubler being excited at either the fundamental or second harmonic of the crystal frequency; the doubler drives the final grids at the output frequency.

The method by which the circuit changes for operation on different bands are brought about will become clear from inspection and comparison of Figs. 1 and 2. The actual coil form and socket connections for the oscillator and doubler are shown in Fig. 1, while Fig. 2 shows the essential r.f. circuits for the two sets of operating conditions. When a 3.5-Mc. coil is used at $L_3$, no coil is used in the $L_2$ socket. In this case the oscillator plate, through the coil form wiring indicated in Fig. 1, is connected to the primary coil of $L_3$, while the 6L6 doubler plate is disconnected. With $L_3$ open, the doubler control-grid and screen circuits also are disconnected.

For 7- and 14-Mc., $L_3$ is plugged into its socket, when the jumpers in the coil form automatically connect the doubler control grid and screen in circuit. Either the 7- or 14-Mc. $L_3$ coil makes the proper connection to the doubler plate. The 3.5-Mc. $L_3$ coil should not be used when $L_3$ is in place. It will be noted that the primary of $L_3$ is tuned only on 3.5 Mc.; on the other two bands the primary is untuned.

The circuit is arranged so that the cathodes of the oscillator and doubler are keyed simultaneously. Since the 809's are high-$\mu$ tubes, their plate current is quite low at zero bias without excitation, and therefore no fixed bias is necessary to protect the tubes when the key is open.

The Oscillator
The oscillator circuit and constants are practically identical with those described on page 162 of the 1938 Handbook. Actually the only change is in the plug-in band-changing arrangement described above. Since the set is intended for use with 3.5-Mc. crystals, the cathode circuit has a fixed coil. It could be made plug-in if crystals ground for other bands are to be used. A 100,000-ohm grid leak is used to give good harmonic output. The plate voltage is dropped to a suitable value for the screen through resistor $R_5$. An inexpensive 100-$\mu$fd. receiving condenser provides feed-back control in the cathode circuit. By-passing has been made inexpensive by

*QST Laboratory Assistant.

A pair of 809's in push-pull is driven by 6L6's used as crystal oscillator and doubler.

This inexpensive rig will deliver better than 100 watts on three bands.
the use of paper condensers. Desirable features of this type of oscillator are break-in keying and the fact that only one crystal is needed for three-band operation.

**THE DOUBLER**

As previously explained, the doubler goes into operation only when 7- or 14-Mc. output is desired from the amplifier. Its plate supply is from the same source as for the oscillator. The plate coil (primary of \( L_2 \)) is an untuned affair closely coupled to the final grid coil (secondary of \( L_3 \)). The screen resistor, \( R_s \), is connected between the screen grid and pin No. 2 on the oscillator plate socket, the d.c. connection being made by a jumper in the coil form when \( L_3 \) is plugged in. The grid coupling condenser, \( C_{11} \), is connected to the No. 3 pin on the socket for \( L_2 \); a second jumper in the coil form completes the connection to the oscillator plate when \( L_3 \) is in the socket. \( C_{10}, C_{11} \) and \( C_{12} \) are the plate, screen and cathode by-pass condensers respectively. \( R_4 \) is the grid-leak resistor.

**THE FINAL AMPLIFIER**

The push-pull 809's are wired in the conventional cross-neutralized circuit with split-stator plate tank condenser. Plug-in coils are used in both the final and grid circuits, and all by-passing is done with paper condensers. It is a common experience with symmetrical push-pull circuits to encounter parasitic oscillations, and this amplifier as originally laid out was no exception. In this

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**FIG. 1—TRANSMITTER CIRCUIT DIAGRAM**

- \( L_1 \): 10 turns, No. 16, diameter 1 inch, coil length 1¾ inches.
- \( L_2, L_3, L_4 \): See coil table.
- \( C_1 \): 100-µfd. receiving condenser (Stor).
- \( C_{2a} \): 100-µfd. receiving condenser (National SE-100).
- \( C_3 \): 50-µfd. receiving condenser (National SE-50).
- \( C_4 \): 210-µfd. per section, 0.07" air gap, split-stator (Cardwell XT-210-PD).
- \( C_5 \): 18-µfd. neutralizing condensers (National STN).
- \( C_6 \): 0.001-µfd. 600-volt paper (Aerovox 684).
- \( C_7 \): 100-µfd. mica (Aerovox 1468).
- \( R_1 \): 400 ohms, 1-watt (Ohmite).
- \( R_2, R_3 \): 0.1-megohm, 1-watt (IRC).
- \( R_4 \): 15,000 ohms, 10-watt (Ohmite).
- \( R_5 \): 1500 ohms, 1-watt (Ohmite).
- \( R_6 \): 25,000 ohms, 10-watt (Ohmite).
- \( R_7 \): 15,000 ohms, 10-watt (Ohmite).
- \( R_8 \): 25,000 ohms, 10-watt (Ohmite).
- \( R_9 \): 1500 ohms, 1-watt (Ohmite).
- \( RFC_1, RFC_2 \): 2.5-mh. r.f. chokes (National R100).
- \( RFC_3 \): Transmitting-type choke (Coto CI-20).
- \( J_1 \) to \( J_4 \): Midget closed-circuit jacks (Utah).
case the insertion of a small coil in each grid lead, combined with a slight change in one of the neutralizing condenser leads, cured the oscillation; the lead was moved from the grid to the far side of the parasitic choke. Changing both leads, inel-

cidentally, only tended to bring the oscillation back again. The final arrangement of leads and chokes is shown in the circuit diagram, but it is quite likely that the reader may find a different arrangement desirable should parasites be encountered.

A closed-circuit jack is in the plus-B lead for metering; similar jacks are in the plate supply leads of both 6L6's. A fourth jack is in series with the final grid resistor. A 0-300-ma. meter, with cable and plug, permits current readings in any of the four circuits.

**CONSTRUCTION**

With cost and ease of construction the paramount considerations, the use of a metal chassis was given no more than a passing thought. Instead, a housing in the form of a breadboard layout was built up. Except for a thin sheet of aluminum along the top and a masonite panel along the bottom at the front, the housing is entirely of wood. The aluminum sheet allows better and shorter ground connections, while the masonite, being only a quarter-inch thick, permits easy mounting of receiving condensers, jacks and meter. For the baseboard, panel, end pieces and panel brackets, clear 3/4-inch white pine is used. All of the necessary pieces may be cut from a ½ by 12 inch board measuring not more than 60 inches long. These pieces are as follows: base 8¾ by 17 inches; end pieces, 8¾ by 3½ inches; panel, 7 by 17 inches. The triangular-shaped panel brackets measure 3½ by 4 by 5½ inches. The aluminum, cut from 1/32-inch stock, is 6¾ inches wide by 15¾ inches long.

The small variable condensers, C1, C2 and C3, the meter and the jacks are mounted on the masonite panel. The cathode condenser, C1, is at the left-hand side, 1¾ inches in from the edge. The oscillator plate and amplifier grid tuning condensers, C2 and C3, are mounted in order to the right. The spacing is 2½ inches between shaft centers. The meter, also centered vertically on the panel, is located 5 inches from the right-hand edge. The jacks are ¾ inch from the bottom edge, two on either side of the meter.

On top of the baseboard are the tube, coil and crystal sockets, the final tank and neutralizing condensers, and the terminal strips for power, keying and antenna connections. The sockets (National CIR) for the 809's and the oscillator and doubler coils are provided with small standoff insulator-8 which permit mounting above the base with the aid of only one machine screw. Sub-base octal sockets are used for the two 6L6's. Old-type five-prong ceramic sockets are used for the crystal and final coil, the one for the coil on the metal pillars provided, and the other counter-sunk into the base. Holes are drilled along the rear edge of the base to accommodate the three terminal

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**FIG. 2—THE ESSENTIAL R.F. CIRCUITS FOR OPERATION ON DIFFERENT FREQUENCY BANDS**

The circuits are automatically switched when the coils are changed, as explained in the text.

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**FIG. 3—SUGGESTED POWER SUPPLY DIAGRAM**

T1—Plate transformer, to deliver 750 volts d.c. at 200 ma. through choke-input filter (900 volts a.c. each side center-tap).

T2—Plate transformer, to deliver 400 volts d.c. at 150 ma. through choke-input filter.

T3—Rectifier filament transformer; 2.5 volts at 10 amp. for 866's; 5 volts at 3 amp. for 83

T4—Filament transformer, 6.3 volts at 7 amp. (See text).

L1, L2—Swinging choke, 5/20 henrys, 200 ma.

L3, L4—Smoothing choke, 12 henrys, 200 ma.

C1—2 µfd. 1000-volt filter condensers.

C2—Dual 8-8-sf.d. electrolytic, 450-volt working.

R1—20,000 ohms, 50-watt.

R2—20,000 ohms, 25-watt.

Control switches, denoted by “X,” are s.p.s.t.
strips. The ones in the corners are the keying and r.f. output strips while power leads are brought to the center one. The actual layout can be seen plainly in the top-view photograph. A few details may prove helpful, since with one or two points located, the correct layout will follow naturally. The tank condenser is centered above the meter on the panel below. A hole is drilled to pass the shaft, 5 inches in from the right-hand end of the upper panel and 3 inches up from its bottom edge. The condenser mounting holes must then be drilled in the base so that the condenser is supported with the rotor plates swinging toward the right.

A bakelite shelf fastened to the tank condenser supports the neutralizing condensers. Running along the under side of the tank condenser is a long spacing rod held in place with a machine screw at either end. A strip of bakelite, 1 1/2 inches by 5 3/4 inches, is clamped to the condenser by two angle brackets which are held in place by the spacing rod screws. The neutralizing condensers are mounted through holes drilled at either end of this shelf. All the wiring between \( C_6, C_3, \) and \( C_1 \) should be done before the assembly is bolted to the panel, since this will avoid a great deal of poking and twisting later on. Leads going to the tubes and coil may be left floating temporarily.

The grid prongs of the 809 sockets should point toward the socket for \( L_3 \) to give short and symmetrical connections. The sockets should be placed so that the rotors of the neutralizing condensers will clear the tubes comfortably. The two 6L6’s and the oscillator plate coil form a straight line between the front and rear of the base, the first tube toward the front being the oscillator tube. The crystal and \( L_4 \) sockets are to the left and right, respectively, of this line. At the far right is the socket for \( L_4 \), the final tank coil. All other parts are mounted below the base, as shown in the bottom-view photograph. The cathode coil is screwed to one of the wooden end pieces in a position close to the cathode condenser. The wiring should be as direct as possible, with ground connections going directly to the aluminum sheet. Soldering lugs slipped under any nut that holds a bolt in direct contact with the metal will be convenient ground connections.

### COIL CONSTRUCTION

In describing the coils we shall refer to the various connections by their socket-prong numbers. These numbers, which appear on the diagrams, are as viewed from the tops of the sockets. Five coil forms are needed for the two 6L6 circuits; three of the forms are equipped with six prongs and the remaining two with four prongs. All coils are made with No. 20 d.c.c. wire, close-wound. The oscillator 3.5- and 7-Mc. coils (\( L_2 \)) used in conjunction with the doubler are wound on the four-prong forms, with the ends of the winding going to the No. 1 and No. 4 prongs. When the windings have been completed jumpers are placed inside the form between Nos. 1 and 2 and 3 and 4.

The coils labelled \( L_3 \) are wound on the six-prong forms. As shown in Fig. 1, on 3.5 Mc. the plate winding is connected to the oscillator tube, while on 7 and 14 Mc. the corresponding winding is arranged to plug into the doubler plate circuit.

(Continued on page 64)
A Regenerative Receiver With High Audio Selectivity
A Tuned R.F. Unit Incorporating Some Unusual Features for Improved Performance

By F. Malcolm Gager* and Arthur F. Graham**

The simple—though effective—t.r.f. receiver described here should appeal to the many amateurs who still get their thrills in amateur radio through the use of inexpensive equipment. Descriptive material for effective tuned r.f. receivers has been given in many publications too numerous to mention. The parent that the conventional r.f. circuits were considerably affected by a swinging antenna, so that the beat note swept in and out of Selectosphere resonance. This difficulty was eliminated by the installation of a link circuit between the antenna input and the radio-frequency amplifier. An alternative circuit also is shown, and when used the La's of each radio-frequency amplifier coil must be arranged to resonate with Cs almost out.

Another unconventional addition is the use of a 6F5 as an audio amplifier with variable regenerative gain. This added gain is useful for both speakers, and particularly so with the Selectosphere. It will be noted that when the volume control in the grid circuit of this tube is in the minimum position the regenerative voltage fed back from the plate load circuit of the 6F5 is negligible. When the variable arm is moved toward the grid the regenerative action is brought into play, simultaneously with an increase in gain. The plate load of the 6F5 consists of a tuned circuit inductively coupled to the 6F5's grid, as indicated in the circuit diagram. The transformer used in the present receiver is a push-pull output transformer from a Jensen D8G with the voice coil winding removed and about 60 turns replaced for a tickler coil. The polarity of this coil

THE TOP VIEW OF THE RECEIVER SHOWS THE STRAIGHT-FORWARD R.F. LAYOUT
The chassis occupies about half the panel width; the remainder of the space is available for the two speakers.

Fig. 1 is the wiring diagram of the receiver proper; Fig. 2 the detailed output switching circuit. With the Selectosphere in use it became ap

* Dept. of Physics, Boston College, Chestnut Hill, Mass.
** Selectosphere Company, Box 3, Newtonville, Mass.
1 The fundamental circuit diagram is similar to that given on page 117, The Radio Amateur's Handbook, Fifteenth Edition.
2 Radio, October, 1936.
is important, as is also the value of the tuning condenser, $C_1$. The latter condenser should resonate with the full winding of the transformer at the Selectosphere’s resonant frequency, approximately 1000 cycles. The correct adjustment is for the circuit to go into self-oscillation when the grid control of the 6F5 just reaches the full-on position. This regenerative feature is particularly effective when using the Selectosphere to boost weak signals, and no instability is encountered even when the 6F5’s grid control is adjusted to a point just below that for self-oscillation.

The audio power amplifier is a 6F6. Its load circuit, indicated in detail in Fig. 2, incorporates a selector switch allowing a combination of outputs on four of the five positions available. Position 1 connects the receiver output to the dynamic speaker. In Position 2 this speaker is paralleled with the Selectosphere; Position 3 connects the Selectosphere by itself and in Position 4 the headphones terminals are connected and the speakers silenced. A snap switch can be included in series with the voice coil if such difficulty arises.

The second position, using the Selectosphere and dynamic speaker in parallel, is a helpful operating position when hunting over the bands. A host of signals can be heard on the dynamic, and when one is selected the tuning can be set to give the approximate beat note for Selectosphere operation. When the output switch is thrown to position the desired signal is on, or very near, the Selectosphere’s peak response frequency.

Coil data for four bands are given in Table I. The r.f. and detector coils are identical. The coils should be doped to keep the turns in position.

<table>
<thead>
<tr>
<th>Band</th>
<th>Total Prt. T.</th>
<th>Total Sec. T.</th>
<th>Cathode Tap</th>
<th>Band-Spread Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.75 Mc.</td>
<td>20</td>
<td>60</td>
<td>6</td>
<td>33</td>
</tr>
<tr>
<td>5.0 Mc.</td>
<td>15</td>
<td>27</td>
<td>13½</td>
<td>14½</td>
</tr>
<tr>
<td>7 Mc.</td>
<td>10</td>
<td>13</td>
<td>3½</td>
<td>4½</td>
</tr>
<tr>
<td>14 Mc.</td>
<td>5</td>
<td>7</td>
<td>4½</td>
<td>1½</td>
</tr>
</tbody>
</table>

Primary Windings: All close-wound at bottom of coil form, with No. 30 d.c. wire.

Secondary Windings: No. 24 d.c. wire, the length of each coil being 1¼ inches.

Taps are counted from the ground terminal of the coil.

CONSTRUCTIONAL DETAILS

Top and bottom views of the receiver are given in the photographs. The panel is standard relayrack stock 19 by 8½ inches. The chassis, 9 by 7 by 2 inches, is secured to the panel by two bolts,
plus the clamping effect of three variable-resistor units. The left-hand speaker (looking at the front) is conventional 5-inch dynamic. The particular one shown is the type having a separately-excited field, but permanent-magnet dynamic or magnetic units can be substituted.

The high-selectivity speaker on the right is the regular Selectosphere minus the mounting base panel control. The five lower control units, starting with the left-hand unit, are the antenna or link trimmer, the r.f. volume control, the detector regeneration control, the audio regeneration control, and the receiver output selector switch. The dial plates of these controls are secured by the central lock nuts of the variable resistance units, with the addition of an application of liquid solder at the four corners. This solder gives the effect of small rivets at the corner holes, but care must be taken in using it so as not to remove the paint from the panel.

The shield between r.f. and detector circuits is self-supporting from the condenser shields by soldering. This shield goes directly to the common r.f. ground. The two tuning condensers are mounted from the base by angle brackets. This sets them up from the chassis, makes for shorter leads to the high-selectivity speaker and above the band-setting condenser, and eliminates vibration. The input arrangement to the receiver is indicated on the top of the dynamic speaker. To the right of this speaker and above the band-setting condenser is seen a short section of wood dowel through which a bolt catches the main panel with the band-setting condenser's mounting clamp. This precaution makes the assembly very rigid and either rack or table mounting can be used. The four corners of the chassis are fitted with rubber feet to cushion the receiver.

VIBRATION HINTS

When a receiver of this character incorporates speakers along with regeneration, it is excellent practice to tie things down fairly tightly with lock washers. The tube sockets in this receiver were mounted away from the lower side of the chassis by their washers and as an added precaution the "deadpin" holes in the sockets had their contact wipers removed. Vibration problems should not be tolerated in any receiver because often what one calls a poor note is traceable to some receiver defect. The top of chassis layout can be changed to suit the individual; the amateur is known to be resourceful in these matters and if the constructor does not care to follow this layout exactly, no harm will result. Lastly, where the three volume controls and two holding-down bolts grip the panel to the chassis, thin fibre washers were inserted so that there would be no

(Continued on page 87)
Inexpensive Coaxial R.F. Transmission Line
Low-Loss Low-Impedance Line Which Can Be Built for Ten Cents per Foot

By Douglas A. Smith, W2BZR

The recent mention in the technical press of coaxial cable in connection with television development has created the impression that a “coaxial” line is something very special while our familiar “concentric” lines are a different breed; we hasten to explain that the two terms are practically synonymous, both implying that the two conductors have a common geometric center or axis. After consulting Webster, we’ve come to the conclusion that of the two words, “coaxial” probably is more accurately descriptive, hence deserves preference. The television cable is special—but not because the conductors are coaxial.—EDITOR.

The peculiar situation at W2BZR which prompted the use of coaxial transmission line was this: The station is surrounded by trees and is at the base of a knoll. Up on the plateau at the top of the knoll is an excellent antenna location—wide-open spaces and plenty of good tall trees. Last winter a 14-Mc. aluminum-tubing vertical radiator was erected on the plateau, mounted on a 40-foot mast. The greatest problem was how to feed it, as the radiator was about 200 feet from the transmitter.

Some will say, “That should have been easy; just use a 600-ohm line with a matching section at the antenna.” More easily said than done. Such a line and matching section were tried, but the results were very discouraging. Finally, a single-wire matched impedance line tapped 11 feet 9 inches from the base of the vertical antenna was tried, and then we started to get results.

However, the open-wire lines had two unfortunate features: They were unsightly and they passed directly under a 2800-volt feeder line operated by the local power company. Needless to say, when our line was discovered it was promptly condemned and had to be taken down. So there we were with a perfectly good antenna 200 feet from the transmitter—and no way of feeding it. But, no, there must be some way of getting soup up that hill to such a grand antenna location, and there was a solution—coaxial cable buried under the ground.

The biggest drawback to the lines commercially available was cost. In one instance 250 feet of line would have cost $250. The lowest-priced cable we could locate was a few cents less than a quarter per foot—this still ran to too much money. So we decided to build the line ourselves.

Brass vs. Copper

Most commercial lines are made of copper tubing; we actually bought 250 feet of this ½-inch thin-walled tubing in 50-foot coils, and found it filthy on the inside. At least a good tablespoonful of muck and copper filings was swabbed out (in the same manner as cleaning a gun), and we realized that this type of tubing would never do for high-frequency work. So we lugged it back to the metal supply house, and while trying to get a line on cleaner copper tubing with fewer irregularities in the inside, we saw some thin-walled brass tubing. The inside of this brass tubing was so clean and shiny as the inside of a shot-gun barrel. It fitted our ½-inch Isolantite heads perfectly, with only about 0.01 inch play between the bead and the tubing. One disadvantage (we thought, before asking the advice of a Bell Laboratory man) was that the brass tubing only came in 14-foot lengths. Another question we had in mind was whether the brass would be as efficient a conductor as copper. This fear also was quelled by our Lab friend. Either copper or brass tubing can be used with equal success. Of course we realize that the conductivities of copper and brass are different, but in r.f. transmission the skin effect is the same.

But how about bending this hard-drawn brass tubing? The answer is to use right-angle coaxial joints. These are pictured in Figs. 1 and 2. With such a gadget geometrical layout of the line is possible. However, it is possible to obtain a good...
deal of flexibility when the line is completely assembled. Our line wends its way between trees and bushes and through the brow of the knoll leading to the plateau, much like a long snake—underground of course, about six inches.

Those unfamiliar with concentric-line construction can readily get the idea from Figs. 1 and 2. The inside conductor, a piece of No. 12 wire with Isolantite beads crimped into position every two inches (approximate eye measurement), is slid into the brass tubing. The resulting line has a characteristic impedance between 72 to 75 ohms, which is approximately the impedance at the center of a half-wave antenna.

The advantages of this type of line over open-wire lines are many. With coaxial cable the impedance is constant. Second, the losses are negligible at frequencies up to 14 Mc. Even at 28 and 56 Mc. the losses are so trivial over the average length feeder that they might as well not be considered. However, for the sake of those who really want the facts the tabulation below is taken from information compiled by Bell Laboratories:

<table>
<thead>
<tr>
<th>Length (in feet)</th>
<th>2 Mm.</th>
<th>4 Mm.</th>
<th>7 Mm.</th>
<th>14 Mm.</th>
<th>30 Mm.</th>
<th>40 Mm.</th>
<th>56 Mm.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Mile</td>
<td>8.5 db</td>
<td>1.5 db</td>
<td>.16 db</td>
<td>.22 db</td>
<td>2.2 db</td>
<td>.3 db</td>
<td>.4 db</td>
</tr>
<tr>
<td>Per 100 Ft.</td>
<td>1.6 db</td>
<td>2.2 db</td>
<td>3.0 db</td>
<td>4.1 db</td>
<td>4.1 db</td>
<td>4.4 db</td>
<td>4.4 db</td>
</tr>
<tr>
<td>Per 1000 Ft.</td>
<td>.16 db</td>
<td>.22 db</td>
<td>.3 db</td>
<td>.4 db</td>
<td>.4 db</td>
<td>.4 db</td>
<td>.4 db</td>
</tr>
</tbody>
</table>

The advantages of this type of line are many. With coaxial cable the impedance is constant. Second, the losses are negligible at frequencies up to 14 Mc. Even at 28 and 56 Mc. the losses are so trivial over the average length feeder that they might as well not be considered. However, for the sake of those who really want the facts the tabulation below is taken from information compiled by Bell Laboratories:

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<thead>
<tr>
<th>Length (in feet)</th>
<th>2 Mm.</th>
<th>4 Mm.</th>
<th>7 Mm.</th>
<th>14 Mm.</th>
<th>30 Mm.</th>
<th>40 Mm.</th>
<th>56 Mm.</th>
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</thead>
<tbody>
<tr>
<td>Per Mile</td>
<td>8.5 db</td>
<td>1.5 db</td>
<td>.16 db</td>
<td>.22 db</td>
<td>2.2 db</td>
<td>.3 db</td>
<td>.4 db</td>
</tr>
<tr>
<td>Per 100 Ft.</td>
<td>1.6 db</td>
<td>2.2 db</td>
<td>3.0 db</td>
<td>4.1 db</td>
<td>4.1 db</td>
<td>4.4 db</td>
<td>4.4 db</td>
</tr>
<tr>
<td>Per 1000 Ft.</td>
<td>.16 db</td>
<td>.22 db</td>
<td>.3 db</td>
<td>.4 db</td>
<td>.4 db</td>
<td>.4 db</td>
<td>.4 db</td>
</tr>
</tbody>
</table>

Third, a coaxial line complete grounding of the outer conductor can be obtained, either by a typical ground connection at one or both ends or at the middle, or by burying it underground. Thus there is no possibility of transmission line radiation and its attendant highly undesirable features.

Now for the actual construction of the line. Figure out how many feet of wire will be needed and get a little extra. Use hard-drawn or semi-hard No. 12 bare copper wire; the impedance will be off slightly if enamelled wire is used. Next procure the Isolantite beads or spacers. For ⅛-inch outside diameter 0.02-inch wall brass tubing, a bead approximately ⅛ inch in diameter should be used. The tubing and bead sizes are readily available and will give an impedance of 75 ohms, according to the Handbook formula for designing coaxial lines.

String the beads loosely on the wire. If you have a long length to work it is best to construct two reels, winding the wire on one and having the other available for the finished beaded wire. The problem is to crimp the wire on each side of the individual beads to keep them from slipping, and yet not break or distort the wire. After about two weeks of experimenting with all sorts of gadgets, a 50-cent pair of pliers (Woolworth's best) as shown in Fig. 2 was decided upon. Simply file the cutting edge to a point where the pliers will no longer cut wire. Leave a slight space, of the order of 0.01 inch, between the edges. Then procure an end file at the local hardware store and file two square notches opposite each other in the two old cutting edges; these notches to be just a hair or two less in width than the diameter of the No. 12 wire. The depth should be such that when the wire is squeezed in the notches it will have a tendency to be flattened and two little bulges will fill out at either side of the notches into the 0.01-inch gap left between the old cutting surfaces. These bulges will keep the beads from slipping along the wire. The "crimps" as they are termed, must be made on each side of the bead, and should be as close to the bead as possible to keep it from sliding back and forth. Be sure the notches in the "crimper" are filed square and not round. It is not necessary to take the temper out of the 50-cent pliers before filing; they will file very easily "as is."

After a few evenings spent crimping the beads on the wire you are probably either ready to call the whole thing off, go to the doctor to have your thumb cured of arthritis—which happened here!—or else you're ready to slide the brass tubing on.

I say "slide" because that is exactly what we did here. We kept our center conductor (250 feet) all in one piece and slid the 14-foot sections of tubing, together with the necessary fittings, over the beads already crimped on the wire. Not a single bead chipped or broke. This method makes .

1Thanks to help from W2HZR.
FOR the past year or more the 28-Mc. band has been particularly hot; signals from all continents have been coming through with good regularity and many amateurs have been quick to take advantage of the chance to make WAC under almost ideal conditions.

There was little QRM at first and a simple regenerative receiver was satisfactory. During the Summer and Fall of 1937, however, two changes occurred; ten meters got even hotter and the American 'phone band was shifted to its present position. These events brought out the shortcomings of many receivers and the merits of others. The better conditions increased QRM alarmingly, the regenerative receiver became inadequate from the standpoint of selectivity, and many proud owners of superhets were disagreeably surprised at the performance of their equipment. Many of the simpler and cheaper receivers having 28-Mc. coverage were found to be lacking in sensitivity, with images indistinguishable from real signals.

On the old 'phone band, 28 to 28.5 Mc., images had not been bothersome as there were very few signals above 29 Mc. to cause trouble, and only those signals between about 28.9 and 29.4 Mc. could appear as images in superhets having 456 kc. i.f. channels. After the 'phone band was changed to include frequencies from 29 to 30 Mc., the low-frequency half became full of images, which were particularly objectionable since most of the foreign amateurs chose to operate between 28 and 28.5 Mc.

FIG. 1—THE SINGLE-STAGE 28-MC. PRESELECTOR
No vernier dial is necessary, as a band-spread tuning condenser is used with but two tuned circuits.

FIG. 2—BOTTOM VIEW OF THE SINGLE-STAGE UNIT
Simple, isn't it? The two rectangular shields house only the coils. Note the shielded output lead.

ELIMINATING IMAGES
A preselector would seem to be the only means for overcoming the difficulty, but it soon became apparent that the commercial preselector had exactly the same shortcomings as the receiver, both being designed primarily for lower frequency operation, and the results were, of course, disappointing. This was to be expected as no particular effort had been made to reduce the circuit losses nor to compensate for the low grid impedance of conventional tubes above 15 Mc.

One solution for the image problem is to use a receiver having a high-frequency i.f. channel, for in such a receiver the signal-to-image ratio automatically will be quite high, and furthermore no signal in the 28-Mc. band can appear as an image interfering with any other signal between 28 and 30 Mc. Another solution is to employ a preselector built especially for 28-Mc. operation. In considering the design of such a preselector the characteristics of the receiver with which it is to be used are very important. A few of the very

best communications receivers have good sensitivity on ten and the only improvement desired is some stepping-up of the signal-to-image ratio with comparatively little voltage gain. There would be no point in using a high-gain preselector with such receivers, since they already go down to the noise level. The majority of sets will, however, need considerable gain as well as reduction of images, and these requirements automatically indicate the use of acorn tubes. One ordinarily thinks of acorn tubes as being primarily built for ultra-high frequency operation; that is, above 56 Mc. As a matter of fact, there is a surprising difference between the acorn pentode (956) and the corresponding conventional tube (6K7, 6D6, etc.) even on 14 Mc., and at 28 Mc. the difference is still more marked.

**PRACTICAL PRESELECTORS**

Figs. 1 and 2 show an extremely simple and inexpensive preselector employing one 6K7. In view of some of the statements above the choice of this tube might seem illogical. The reason for its use is to demonstrate the possibility of overcoming grid loading effects and to show that adequate performance is obtainable with elementary circuits (Fig. 3). This unit, as constructed, has a voltage gain of about 8 and a signal-to-image ratio of 7, when used with a receiver having an intermediate frequency of 456 kc. It is entirely suitable for use with receivers of the better class which already possess fairly good sensitivity. Such receivers will have signal-to-image ratios between 5 and 30, and the addition of the preselector will therefore increase the ratio 7 times.

The detrimental grid-loading effect cannot be completely eliminated, although it may be reduced considerably by tapping the grid about one-third of the way down the coil. By so doing, the Q of the tuned circuit can be maintained at a value much higher than that ordinarily obtainable, and at the same time voltage on the tube grid is not cut down appreciably. The explanation is simple: The more efficient tuned circuit develops higher impedance with attendant higher signal voltages, and the tapped coil is in reality a matching transformer, the grid impedance of a 6K7 at 30 Mc. being about 30,000 ohms. Circuits employing acorns do not require such treatment, the grid impedance of the 956 being over one-quarter megohm at this frequency.

Figs. 4 and 5 show a more elaborate two-stage preselector employing acorn tubes and probably representing the best unit of its type that would be practical for home construction. With the gain control wide open, the voltage amplification is about 300 and the signal-to-image ratio is 100 when used with a receiver having an intermediate frequency of 456 kc.

When properly connected, it will transform a decidedly mediocre receiver into one having exceptionally fine 28-Mc. characteristics. The circuit diagram is shown in Fig. 6. The acorn preselector will of course effect some improvement when connected to a high-quality receiver, but naturally the improvement will be much less marked and the gain control of the receiver must be retarded to hold background noise down to a reasonable level. Since a signal-to-image ratio of 300 or 400 to 1 usually is ample, a two-stage unit completely solves the image problem except on the very poorest receivers; for instance, if the receiver alone has a signal-to-image ratio of 4.5 to 1, the ratio becomes 450 to 1 when the preselector (with 100 to 1 ratio) is added.

The reader has probably noticed that the two circuits are unconventional in only one respect: The use of a tuned output-circuit link coupled to the receiver input. This arrangement appears to be just as effective in coupling the preselector to the receiver as it is in coupling between various

---

**FIG. 3—DIAGRAM OF THE SINGLE-STAGE UNIT**

- **C1, C2**: Tuning condensers, two gang, 25 µfd. per section (National Type 81X).
- **C3**: 0.1 µfd., 200-volt, tubular paper.
- **C4**: 0.1 µfd., 400-volt, tubular paper.
- **R1**: 35,000 ohm, 1/2-watt.
- **R2**: 50,000 ohm, 1/2-watt.
- **L1, L2**: Tuned winding: 6 turns of No. 20 E. 9/16" diameter, 1/2" long. Pick up winding: 3 turns of No. 30 d.s.c, close wound, spaced about 1/16" from low end of tuned winding.

**FIG. 4—THE TWO-STAGE ACORN JOB**

The vernier dial is advisable in this case, as tuning is fairly sharp.
stages of a transmitter. It must be pointed out, however, that output tuning has some disadvantages; it cannot be employed satisfactorily when the preselector is to be used with certain types of receivers, particularly those wherein impedance changes at the input circuit react on receiver tuning. Such receivers usually exhibit hand-capacity effects (without the preselector) and are very sensitive to any change in antenna characteristics. While most superhets do not have these defects, there are a few which are so constructed that the antenna is coupled directly to the first detector circuit and this circuit, in turn, reacts upon the high-frequency oscillator. When used with a preselector having a tuned output, the combination becomes almost impossible to handle since any attempt to peak up the preselector will detune the signal. In general, however, the tuned output circuit adds greatly to the performance of the preselector, increasing both gain and signal-to-image ratio.

**COMBINATION UNITS**

The two preselectors so far described were chosen to represent two extremes. The amateur who contemplates the construction of such equipment would do well to consider a combination unit embodying the various features of each which will be best suited to his plans. For instance, a 956 substituted for the 6K7 in Fig. 3 will increase the gain from about 8 to 17 and the signal-to-image ratio from 7 to 20. Conversely, 6K7's could be substituted for the acorns in the two-stage model. In this case over-all gain could be made as much as 70 with a signal-to-image ratio of 50 to 1. Simply by tapping the grids of the 6K7's down the coil about one-third of the way, the signal-to-image ratio would be double but gain would be decreased only about 25%. A two-stage acorn circuit minus the tuned output would give performance approximately equivalent to that of two 6K7's with three tuned circuits, since it is very difficult to transfer the r.f. voltage directly from the plate of a tube to the input of the receiver without introducing considerable loss and undesirable feedback.

With regard to the matter of gain control, it may be seen that the first acorn tube is operating wide open at all times, gain adjustment being made at the second tube. This is done to provide the best signal-to-circuit-noise ratio under the assumption that receiver and preselector together would be too noisy if both were operated at full gain and, furthermore, that fairly strong signals might overload the receiver input circuit if the preselector gain were not limited in some manner. Without going into the matter too deeply, it may be said that the tube to which the antenna is coupled should always operate at maximum gain in order to provide best ratio of signal to circuit noise. It follows, then, that no gain control is needed on the single-stage model. (Continued on page 80)
The "QSL Forty"
A Compact and Inexpensive 3.5- and 7-Mc. Transmitter

By Fred Sutter,* W8QBW-W8QDK

In the June, 1936 issue of QST appeared an article by Mr. Frank Edmonds, W2DIY, which to the present writer's way of thinking is highly inspirational. (But let's drop this "present writer" stuff and have a real ham talk in the first person singular, OK?) In fact it is even more than inspirational; it fairly stampedes one into action. At any rate it stampeded me, and there resulted here at W8QBW rig after rig using 6L6 and 6L6G tubes, Tri-tet, mongrel and straight circuits with all kinds of values and coils. And Came the Dawn! A tiny transmitter using the 6L6G tube, straight circuit, on a wee chassis 3½ by 5½ inches, which would light a 40-watt G. E. Mazda dummy load to more than full brilliancy. Now if you will measure your QSL card and find that it is 3½ by 5½ inches you will see why this one was christened the "QSL 40."

My original thought in this was to arrive at a simple oscillator with soup enough to excite that Big Tube which is the dream of every new ham. A 6L6G running a 300-watt amplifier—as Mr. Edmonds puts it in his article, "this two stage set-up would be a nice rig for c.w.," a very miracle of understatement! But when I found out how the little fellow went to town both here at W8QBW and at W8QDK the big tube idea faded down to about $1.25 and the 2000-volt transformer went on the shelf and is still there. R.I.P.

Now, as to results. On 40 meters the rig has worked all W districts from this QTH, which is in Grosse Pointe, Mich., along the shore of Lake St. Clair. A report of S7 is unusual, S8 and S9 being rather the rule. The poorest report so far is S4 from W7GAF in Stanfield, Oregon, about 1775 miles, and the next poorest is S5 from W6KBZ, Reno, Nevada, about 1950 miles. When W8QDK went on the air for the first time in July, 1937, the first 29 CQ's resulted in 24 QSO's, on 40 meters, all during daylight hours. Surely no reasonably minded ham can demand more from a $1.35 bottle.

The Photographs

Looking at the photographs it will be noted that in front is the plate-condenser knob and the plate meter. On the side are the key binding posts, at the back a 5-prong socket for the power and on top are the coil, tube, crystal and protective pilot bulb. Underneath is an r.f. choke, a resistor, three tubular condensers and, of course, the meter and 100-µfd. midget. There isn't much which could be left out except perhaps the pilot bulb, but as this with its socket costs but 14 cents it is good inexpensive crystal insurance. The cost of all this exclusive of crystal, which every ham

*1000 Kensington Road, Grosse Pointe, Mich.

FIG. 1—THE TRANSMITTER CIRCUIT DIAGRAM

C1—100-µfd. midget (Hammarlund MC-100-SA).
C2, C3—0.1-µfd. paper tubular, 1600-volt (Aerovox 1084).
C4—0.1-µfd. paper tubular, 1600-volt (Aerovox 684).
RFC—2.5-mh. r.f. choke (National R-100).
R1—200 ohms, 10-watt (Ohmite Brown Devil).
M—0–300 d.c. milliammeter (Triplett 221).
P—Mazda Type 40 pilot bulb.
L1—7 Mc. 13 turns No. 14 enamelled, diameter 2½ inches, length 1½ inches.
3.5 Mc.: 21 turns No. 14, diameter 2½ inches, length 2½ inches.
L2—6 turns No. 14 at end of L1. Same on both bands.
already has, is about $7.50. If the builder possesses a meter and a 100-µµfd. midget, the outlay drops to about $2.50.

THE CIRCUIT

The circuit is that of the Edmonds article with a few changes (of course!). The glass 6L6 was used instead of the metal tube, $R_2$ was omitted, $R_1$ was changed from 400 ohms to 200 ohms and a space-wound coil was used instead of the form wound coil. It is more than probable that a technician (which I am not) can point to many offenses against theory and practice, but the fact remains that the rig delivers 40 watts and it does get out. I have not lost a tube except one which, being defective, was replaced without charge by the manufacturer. A few words regarding this “overload” bugaboo may not be amiss. Any electrical device used intermittently for short periods will carry heavy overloads because it does not have time to cool down between loads.¹ On c.w. a keyed oscillator has an input consisting of dots and dashes, little time to heat up and plenty of time to cool down. A demonstration of this may be seen in the above rig where the pilot bulb, on 40 meters, key down, burns dull yellow. When the rig is keyed, the pilot bulb does not light at all. The current flows, but it is interrupted before the bulb has time to heat to visibility. This applies also to the plate and screen of the 6L6G tube. However, a voltage overload is a matter of insulation, which may, or may not, withstand the excess voltage. If it does stand up then evidently the voltage “overload” is not an overload after all.

¹ With tubes, the total cathode emission available is also an important factor. If the emission is not great enough, the efficiency under a heavy overload will be poor, more than the normal proportion of heat will be developed, and even though the overload may not last long gas may be released which will poison the cathode. Most tubes are rated conservatively enough to stand a reasonable overload, even the receiving types under discussion.—Editor.

THE BOTTOM VIEW SHOWS LITTLE SPACE TO SPARE

The socket for the power leads is on the lower chassis edge, slightly to left of center.

THE CHASSIS

Use light aluminum, No. 16 gauge or lighter, 9 by 11 inches with the corners cut out 2½ by 2½ inches and bent to form a top 3½ by 5½ inches. The plan, Fig. 2, is looking down on the top of the not-yet-folded chassis. As there is little if any waste space it is best to follow the dimensions accurately. You can make the chassis bigger, if desired, but this one is so small that there is practically no wiring, the parts themselves reaching from “here to there.” The plate condenser is insulated from the chassis, being mounted on a bit of bakelite. Don’t forget that.

THE COILS

Quite a comprehensive article could be written on “how to make” these spaced-turn coils, but most of it is in the Handbook and the photograph ought to tell the rest. You will probably make quite a few of these coils at one time or another, so had better make a drilling template about five inches long of ½-inch strip steel. Space the holes eight to the inch, using a No. 44 drill for No. 14 wire, and do

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FIG. 2—WORKING DRAWING OF CHASSIS BEFORE FOLDING
Medallions to CW-DX and to Phone-DX Winners in each Section—Swap Number Groups (RST Report—Self-Assigned Serial Nr.) in DX QSOs—Operating Time 90 Hrs. in the 9 Days—Score is Sum of DX Contact Points Times Number of Official Countries Worked (or Number of W-and-VE Districts, for Others)—Gavel Trophy to Leading Club!—W-VE’s Invite All the World Take Part

By F. E. Handy* W1BDI

Two separate periods for competitive work by either radiotelegraph or radiotelephone operation are again provided this year. Both come in the month considered to offer the ultimate in DX that the season affords! The time-tested rules for contest exchanges will be the same for both periods, except that no quota plan applies in the phone period. We expect entries to be in one period or the other—but one can take part in both, if he likes. Scores of course are independent for each period.

Suggestions for changes have been carefully considered. At the request of radiotelephone amateurs, contacts by voice with telegraph stations will no longer be considered legitimate for contest exchanges. All reports in this section of the contest must be voice-to-voice. This is really just a clarification of rules, since in practice just about 99 per cent of QSOs have always been with stations working in the mode indicated by the designation for a section of the contest. It has been wasteful of time to hook stations of the “other” mode to explain what was wanted. Since operating c.w. in a phone sector has been considered unethical by many, we add that in addition to the phone contest recording for credit only the voice-voice QSOs, that the telegraph contest period will contemplate only telegraph-telegraph QSOs.

Disqualifications

Remember the disqualifications made last March for off-frequency operation, improperly modulated notes, and the like? Violations of government regulations will again be penalized. There must be no repercussions about poor amateur operating at Cairo! Official Observers will be asked to hew to the line, reporting all violations to the contest committee. Special cooperation is being requested of the F.C.C.

* Communications Manager, A.R.R.L.
16001 P.M., C.S.T., March 6th or 10th, see discussion under “the contest period.”
8 In Phone exchanges only two numerals will be given in the report, the first always the “readability” and the second the “strength.” In other words, telegraph entrants will send and receive six figure groups, and phone entrants will receive five figure groups.
9 QHM—Will start to listen in the middle of the band and tune toward the low frequency end.
10 QLM—Will start to listen in the middle of the band and tune toward the high frequency end.
11 QST—Will start to listen at high frequency end of band and tune towards middle of band.
12 QML—Will start to listen in the middle of the band and tune toward the low frequency end.
13 QLM—Will start to listen at the low frequency end of band and tune towards middle of band.
14 QST—Will work in the middle of the band and tune toward the high frequency end.
itself. We shall ask the monitoring stations to give the DX bands redoubled attention. Any stations known to have been logged in violations by the F.C.C. during the contest will also be disqualified automatically. The interest of all amateurs requires strict observance of frequencies, d.c. power supply regulations, etc.

The Cairo meetings will be in session as we amateurs take part in our contest. Amateurs of all nations must work in the frequency bands assigned them, or regardless of nationality, must be disqualified if checked in the contest period as off-frequency with sufficient evidence to prove a deviation to the award committee. It makes little difference what nationals are out of bounds, we are not going to allow any practices to be built up that would constitute grounds for complaint against the amateur service. The interests of all amateurs in their frequency bands are too precious to risk by any yielding to selfish interests of others.

For more at length on "DX competition policy" see page 21, May 1937 QST.

HINTS FOR DX SUCCESS

Intelligent listening is a first essential. You have to hear them before you can work them. Tuning specifically "from the middle to the end" as well as "from either end toward the middle" should be a useful practice. Don't crowd band edges—that's just an invitation to be disqualified!

Use all bands that you can! Operating points, personal efficiency, and the "man behind the station" (most of all count) W/VE has not wanting to show themselves "lids" will avoid all use of "CQ DX." No distant stations will waste time answering such calls when one call from "outside" will bring hundreds of answers from more efficient operators. All stations should try to work BREAK-IN for real operating efficiency. Hams outside W/VE urge more speed, asking W/VEs to shoot the number along first before anything else. U. S. and Canadian amateurs approve continued use of CQ by all stations in remote localities, but plead that these CQs be made shorter—when so many U.S.—Canadian stations are competing for each one! CQ DX is "out" for W/VEs. Remotely located participants: Please sign often in CQs or calls. Use QHM, QML, QLM, QMIF 4 as a guide of when or how long to call.

GENERAL CONTEST PLAN

Amateurs with the prefixes W and VE will be taking part in a QSO Party with stations in all parts of the world. When they effect DX QSOs, they will exchange self-assigned serial numbers (two 3 or three-figure reports plus three self-assigned numbers that stay the same for all stations). This whole group is entered in the contest report. From this record each station will submit its score. From the scores (which the Contest Committee will verify by cross-examination of logs) the winners will be determined for each locality, and medallions awarded. Three points can result from a full exchange in any band, but no more can be obtained from the same station unless both stations connect in another band for additional exchanges. Contacts with non-participants can count, where you explain the system. refer to this announcement if necessary, and the operator assumes (and sends you) a serial number for his records and your report.

Stations outside 8 the U. S. and Canada will try to work as many W and VE stations as possible to exchange serial numbers. Stations in all localities need only take part on the dates announced and report results at the end of the tests to receive credit in QST, and be eligible for awards.

The main competition each operator must consider comes from operators in his immediate A.R.R.L. Section in the case of W and VE stations 8 in the case of all other amateurs it comes from the individual operators in their country or locality using the same prefix. The W/VE awards are for the operator running up the best record for each Section under the Rules.

Separate certificates will be awarded the c.w. winner, and the 'phone winner, for each country, and likewise for each A.R.R.L. Section. It's a chance for 14- and 28-Mc, 'phone hams to do their stuff in the second period—but it will in no sense be a competition of 'phone with c.w. operators. Select either period: try your luck and DX, and report results one and all!

Logs on the first period will be marked "C.w. station works," and those for the second period, "'Phone work."' The transmitter must be kept on c.w. or 'phone, too. It is unethical to shift to c.w. to call a station, or send numbers, when taking part in the 'phone period (and vice versa), and disqualification will be made of offending stations. Likewise, whistling of code for numbers (or similar means) is regarded as improper. Counting of consecutive numbers, spelling of the letters that constitute numbers, using word lists from the Handbook, etc., are regarded as the proper methods.

THE CONTEST PERIOD

To avoid misunderstanding and possible confusion, the exact local starting and ending time for our DX competition is given in the above table. These times are based on "Greenwich," and should be computed for any part of the world from the Greenwich meridian. The contest runs (First Period) from Saturday, March 5th, through Sunday, March 13th (until Monday, March 14th, G.T.); (Second Period) from Saturday, March 19th, through Sunday, March 27th (until Monday, March 28th, G.T.).

SERIAL NUMBERS

The first digits of the serial number sent shall constitute the Readability 8—Strength 8 and Tone 8 reports of the station to which the number is sent. Every operator taking part in the contest assigns himself a distinctive threenueral group, used by him throughout the contest as the last part of each number exchanged (sent). Try to send and receive one complete serial number with each DX station.

TIME LIMIT

Up to and including 90 hours' total contest operation (for either period) there is no penalty, and nothing to do when computing your score. Should you find that you operated a total of 100 hours (for example), your gross score should be multiplied by the fraction 90/100 to give your net or "corrected score."
You can operate 6 hours per day, 12 hours each Saturday, and 16 hours each Sunday, working DX in the contest, and come out about right. This plan permits the average ham to plan for his working day for meals, for 8 hours' daily sleep, etc. Cross examination of logs makes it possible to check the operating time submitted as may be necessary, of course. The time limit puts contestants on a fair basis whether employed or having full time to apply to the contest. Operate as much as you want to during the contest period. Keep track of the time you start and stop operating your station. This must be shown in your log report.

LOG, NINTH A.R.R.L. INTERNATIONAL RELAY COMPETITION

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<td>Logs from W or VE, show, for each band:</td>
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<tr>
<td>Name</td>
<td>Nr. DX Stations QSOed</td>
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<tr>
<td>Address</td>
<td>Nr. Countries (prefix) QSOed</td>
</tr>
<tr>
<td>Transmitter Tubes</td>
<td>Logs from remote points indicate; for each band:</td>
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<tr>
<td>Plate watts (input last stage)</td>
<td>Nr. W/VE stations QSOed</td>
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<tr>
<td>Nr. Hours Station Operation</td>
<td>Nr. W/VE stations QSOed</td>
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<tr>
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<th>Date and Time</th>
<th>Station Worked</th>
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<th>Worked Record of New Countries for Each, Freq. Band</th>
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<td>7:32 P.M. E.S.T. (or 0002 G.T.) Mar. 5th</td>
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<td>565,543 478,001</td>
<td>3</td>
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<td>On 10 P.M.</td>
<td>Mar. 6th</td>
<td>7:15 P.M. E.S.T. 9:40 P.M. E.S.T. ON4AU Belgium 2</td>
<td>G2SZ G.B. 11</td>
<td>488,543 488,111</td>
<td>2</td>
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<tr>
<td>Off 10 P.M.</td>
<td>On 7 P.M.</td>
<td>Mar. 6th</td>
<td>7:38 P.M. VK3WL Aust. 3:30 P.M. ZL2CI N. Z. 11:50 P.M. PGX Japan 1</td>
<td>579,543 487,543 349,545</td>
<td>3 3 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off 11:55 P.M.</td>
<td>Mar. 12th</td>
<td>12:55 A.M. E.S.T. 3:10 A.M. E.S.T. VE7EK Aust.</td>
<td>VK7RC Aust. 21</td>
<td>588,543 577,000</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off 4:05 A.M.</td>
<td>On 1:30 P.M.</td>
<td>4 h. 05</td>
<td>2 P.M. E.S.T. PY2BN Brazil 1</td>
<td>487,543 486,582</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Off 4 P.M.</td>
<td>On 1:30 P.M.</td>
<td>2 h. 30</td>
<td>14 h. 29</td>
<td>Multiplier = 2 + 3 + 1 + 1</td>
<td>24 X 7 (countries) = 168 Score</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

"Points" multiplied by the number of

1) Countries or localities (prefixes) for all bands

2) U. S. and Canadian licensing areas for all bands equals the SCORE. (This is the final score unless the operating time exceeds 90 hours.)

I hereby state that in this contest, to the best of my knowledge and belief, I have not operated my transmitter outside any of the frequency bands specified in, or in any manner contrary to, the regulations my country has established for amateur radio stations; also that the scoring points and facts as set forth in the above log and summary of my contest work are correct and true.

Signature of operator(s)

- Add second column in log to give total operating time.
- "Countries" for W/VE Participants. Change this to read "Districts" or "Licensing Areas" on all reports from other parts of the World.
- A progressive record of the number of new countries (or licensing areas) is kept in these columns. A notation is made for each station worked but the figure increases numerically only as additional prefixes (or lic. areas) are added on a certain band. These columns are not added, but the last number notation in each column added to similar numbers in other columns gives the "multiplier." Counting the "number of notations" in each of these columns gives the number of different contacts with "DX" stations or "W/VE stations" on each band, as the case may be, so the information at the beginning of the log-record may be filled in.

28 QST for
Election Results

Two former directors have been returned to office and one new one elected to the A.R.R.L. Board as the result of balloting in the 1937 elections in the Atlantic and Dakota Divisions and in Canada.

CANADA

In a comparatively light vote, our Canadian brothers returned Alex Reid to office as Canadian General Manager by an almost two-to-one vote over his opponent, Leonard W. Mitchell. The story:

Alex Reid, VE2BE .................................. 302
Leonard W. Mitchell, VE3AZ ...................... 114

As reported previously, Alex Larivière, VE2AB, becomes the alternate by reason of the withdrawal of his only opponent, John C. Stadler, VE2AP.

ATLANTIC DIVISION

The Atlantic Division similarly decided it wants to retain its present director and reflected Brad Martin by a thumping majority over his two opponents; in a close race for the alternate position, Raymond E. Macomber, W3CZE, nosed out his only opponent. The balloting:

For Director:
Walter Bradley Martin, W3QV ...................... 679
Roy C. Corderman, W3ZD .......................... 281
Edward L. Thompson, W3COQS .................. 79

For Alternate:
Raymond E. Macomber, W3CZE .................. 540
Herbert M. Walleze, W8BQ ....................... 495

DAKOTA DIVISION

With the previous director, Carl Jabs, not a candidate, the race was between Fred W. Young, W9MZN, and Frank A. Vowles, W9BBL, with the former winning handily:

Fred W. Young, W9MZN .......................... 127
Frank A. Vowles, W9BBL .......................... 57

Mr. Young, the new director, is 32 years old, is an instructor in mathematics and science at the State Teachers' College at Mankato, Minn., and is already familiar to some extent with directorial problems, having been the alternate director of the division in 1936 and 1937. He was president of the Southern Minnesota Radio Association in 1934 and 1935 and is at present an O.P.S.

McCargar, 41 years of age, is in the Freight Traffic Department of the Southern Pacific Co., and is a real old-timer, having been in ham radio since 1911 and a member of the League virtually from its start. He has been both a commercial radio and wire operator and spent five years in the Navy as a Chief Radioman. All this, coupled with the fact that he has for the past several years been the alternate director for the Pacific Division, as well as representing it at board meetings on two occasions, insures the division a representative of wide experience in communications problems and League affairs.

Year by year, the voting in League director elections comes closer to being 100 per cent by licensed amateurs. As most members are aware, the by-laws were changed in 1934 to specify that thereafter no new members of the League could vote in elections unless, at the time of voting, they were licensed amateurs. However, since no member of the League who was a member in good standing at the time of this change could be deprived of his voting privilege, it has been necessary to permit voting of unlicensed members who were then members and who have since maintained continuous membership, without any lapses. As the years go by, this unlicensed "prior membership" percentage steadily drops, and from an 18 per cent figure in the 1934 elections has fallen to an average of just over 6 per cent in the contests just held. As a matter of interest, we cite the figures by divisions:

<table>
<thead>
<tr>
<th>Division</th>
<th>Licensed</th>
<th>Reliing Upon Amateur Prior Membership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlantic</td>
<td>98.46%</td>
<td>6.54%</td>
</tr>
<tr>
<td>Canada</td>
<td>94.31%</td>
<td>5.69%</td>
</tr>
<tr>
<td>Dakota</td>
<td>96.29%</td>
<td>3.80%</td>
</tr>
<tr>
<td>Average</td>
<td>93.96%</td>
<td>6.04%</td>
</tr>
</tbody>
</table>

Cairo

Secretary Warner sailed for Cairo from New York on January 4th, and will be on the scene by the time this issue reaches members. He will be joined there by Arthur Watts, of the Radio Society of Great Britain, and also, a few weeks later, by Paul M. Segal, the League's general counsel and the other member of the American amateur delegation; the trio will combine to make up the official delegation of the I.A.R.U.

The official U. S. government delegation to Cairo was announced by President Roosevelt a (Continued on page 81)
Plate Modulation of Screen-Grid Tubes

Notes on Operation Without Simultaneous Screen Modulation

By Francis M. Dukat,* W1BOD

PLATE modulation of screen-grid tubes, whether of the tetrode or pentode variety, has long been considered impossible, although linear operation can be secured by modulating plate and screen together. Recently linear plate modulation up to 100 per cent has been claimed for the new aligned-grid (beam) transmitting tetrodes. The conventional pentode and the aligned grid types are not radically different in characteristics, but the following is submitted to demonstrate the existence of certain peculiarities which permit the aligned-grid tubes to be plate-modulated more successfully than pentodes.

First, it may be stated that it is not entirely impossible to plate-modulate the ordinary pentode. The characteristic curves of an ideal pentode are shown in Fig. 1. For fixed control-grid and screen voltages the plate current is constant for any value of plate voltage. Suppose a such a tube were operating Class-C at a d.c. plate potential, $E_b$, a constant peak excitation, $E_{cb}$, and a fixed screen voltage and load, so that the plate current pulse flowed over some line, $A$, and the peak of the pulse occurred at (1). If the d.c. plate voltage is doubled the plate current pulse will flow over line, $B$, and peak at point (2). The peak current is unchanged, the fundamental component will be relatively unchanged, and there would be no increase in output. However, if the d.c. voltage is decreased to the value, $\frac{E_b}{2}$, the plate current pulse will operate over $C$, and when the pulse reaches the zero plate voltage line at (3), there can be no further increase in output. Therefore, the peak of the plate current pulse will be limited, the fundamental component will be reduced, and the output reduced proportionately. In such a tube, the modulation would be possible if the carrier were set originally at $\frac{E_b}{2}$ and modulated up to $E_b$ and down to zero. Modulation at higher plate voltages would be possible if the peak excitation were increased to $E_{cb}$ or $E_{cb}$.

On this basis it would seem that there should exist some value of plate voltage at which the ordinary pentode could be plate modulated. Curve (1) in Fig. 2 is a plot of the output of a Type RK-20 operating under normal conditions of excitation and screen voltage as the plate voltage is varied. Linear plate modulation under these conditions of operation would be possible at a plate voltage of 600 volts. The carrier power is only about 12 watts, which is considerably less than the carrier power possible with suppressor modulation. Supposedly, if the excitation could be increased, the carrier plate voltage could be increased for the same distortion, and proportionately greater output obtained. Unfortunately, increased excitation will result in excessive screen current and overloading of the screen. In the aligned grid tubes, however, the screen current-space current ratio is considerably less than in the ordinary pentode. Therefore, more excitation can be applied before the screen overloads. Another factor that acts to advantage in the aligned grid tubes is the fact that the plate of this type of tube has some control itself over the total space current. Thus, if a Type RK-47 is operating under normal Class-C conditions and the screen voltage is reduced to zero, it will be found that the output is not zero and that the plate current at 1250 volts is of the order of 15 to 20 milliamperes. This will help on the modulation peaks where the screen begins seriously to limit the plate current. The net result of these two factors is to permit the aligned-grid tubes to be modulated at a plate voltage that approaches the maximum allowable from a voltage-breakdown standpoint. Modulation of the RK-47 is possible at 900 volts plate and of the RK-48 at 1500 volts plate if the excitation is adjusted for the maximum allowable screen current and the plate current kept within rating. This plate cur-

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* Raytheon Production Corp., Newton, Mass.
rent rating is one based on the increased screen current and reduced maximum plate dissipation under carrier conditions.

Since the required excitation is higher, the driving power is increased slightly. The driving power for the RK-47 is about 1.3 watts for plate-modulated 'phone as compared to about 1 watt for combined screen and plate modulation under the same bias conditions. On the other hand, the modulator requirements are less for plate modulation since the screen does not have to be modulated. The following are recommended operating conditions for the RK-47, RK-48 and RK-39/41:

<table>
<thead>
<tr>
<th></th>
<th>RK-47</th>
<th>RK-48</th>
<th>RK-39/41</th>
</tr>
</thead>
<tbody>
<tr>
<td>E5 plate d.c.</td>
<td>900</td>
<td>1500</td>
<td>400 volts</td>
</tr>
<tr>
<td>E2 screen d.c.</td>
<td>300</td>
<td>400</td>
<td>200 volts</td>
</tr>
<tr>
<td>E1 control grid d.c.</td>
<td>-100</td>
<td>-100</td>
<td>-45 volts</td>
</tr>
<tr>
<td>Ie plate d.c.</td>
<td>50</td>
<td>150</td>
<td>60 ma.</td>
</tr>
<tr>
<td>Ie screen d.c.</td>
<td>30</td>
<td>50</td>
<td>17.7 ma.</td>
</tr>
<tr>
<td>Ie control grid d.c.*</td>
<td>8</td>
<td>9</td>
<td>4.0 ma.</td>
</tr>
<tr>
<td>Peak r.f. input *</td>
<td>175</td>
<td>180</td>
<td>70 volts</td>
</tr>
<tr>
<td>R.f. input power *</td>
<td>1.3</td>
<td>1.4</td>
<td>0.25 watts</td>
</tr>
<tr>
<td>Carrier output</td>
<td>50</td>
<td>102</td>
<td>17 watts</td>
</tr>
<tr>
<td>Audio power (plate modulation—Mod. factor of 1.0)</td>
<td>36</td>
<td>112.5</td>
<td>12 watts</td>
</tr>
<tr>
<td>Peak power output—Mod. factor of 1.0</td>
<td>200</td>
<td>648</td>
<td>68 watts</td>
</tr>
<tr>
<td>Plate load of modulator</td>
<td>11,200</td>
<td>10,000</td>
<td>6700 ohms</td>
</tr>
<tr>
<td>Screen resistor</td>
<td>12,000</td>
<td>22,000</td>
<td>11,400 ohms</td>
</tr>
<tr>
<td>Max. screen dissipation</td>
<td>15</td>
<td>20</td>
<td>3.5 watts</td>
</tr>
</tbody>
</table>

* Approximate values only. Adjust for rated screen dissipation.

Curve (2) shows a typical plate modulation characteristic for the RK-47. The modulation begins to fall off slightly from the ideal, Curve (3). However, if the screen voltage is supplied from the d.c. plate supply through a dropping resistor by-passed for r.f. only, the screen voltage will rise at the high modulation peaks and tend to straighten out the characteristics. Measurements made using a screen supply of this sort, Curve (4), show that the characteristic varies little from the ideal. Increasing the bias and excitation in such proportion as to maintain rated screen dissipation will improve the linearity but at the expense of driving power. Usually there is an optimum value of screen voltage. Too-high screen voltage will result in excessive screen dissipation before the excitation is optimum, while too-low screen voltage will not only reduce the output, but will also cause increased distortion because of the limiting action of the screen on the plate current.

What the League Is Doing

(Continued from page 29)

week before Christmas. It is made up of Senator Wallace H. White, Jr., of Maine, as chairman, Capt. S. C. Hooper, of the Navy, F.C.C. Commissioner T. A. M. Craven, F.C.C. Chief Engineer E. K. Jett, and Francis C. De Wolf, of the State Department. With the exception of Commander Craven, who will not leave until early in February, the delegation sailed early in January; it was, of course, accompanied by a corps of advisors, translators, secretaries and stenographers.

As we go to press, we learn of a belated Cairo proposal by our old friend Japan, who will be recalled as one of the most persistent enemies of amateur radio at past conferences. The latest proposal is quite the worst that country has ever advanced, however, and is certainly a lulu! On the pretext of gaining new territory for the aeronautical services, Japan would calmly wash out our 160-meter band and would strip us to a meagre 100 kilocycles in each of the 80- and 40-meter bands! At 20 meters we would be permitted 200 kilocycles, but a joker is inserted here by Japan’s suggesting that these 200 kc. be shared between amateur, fixed and mobile services (we have our present assignment at “20” on an exclusive amateur basis). Above 28-Mc. amateurs would be eliminated.

Nice people! We hasten to assure readers that this proposal is not anything to worry about unduly; although never before confronted with anything quite so drastic, even from Japan, we know from past experience that ways can be found to neutralize such proposals. Nevertheless, it furnishes an excellent example of what might very likely happen to amateur radio were it not organized, and represented at both national and international conferences by people who know from long experience just how to deal with these things.

Jett It is a real pleasure to be able to announce the appointment of Lt. E. K. Jett as Chief Engineer of the F.C.C., effective the first
IN the previous section we outlined, as rapidly as was consistent with the facts, the history of amateur frequency allocations, both internationally and here in the United States.

Now we come to the question of the forthcoming Cairo conference itself. Since this conference, like all its predecessors, will have the power to make a complete change in all the international regulations, involving even so drastic a step as the complete abolishment of frequency assignments for any particular service, it becomes a matter of great interest to us amateurs. Most amateurs, however, aside from knowing there is such a thing as an international conference and knowing it can do these things and that it meets from time to time, have very little idea how the sessions are conducted, how we amateurs, for instance, get represented and get our wishes placed before the conference group, and to what extent we participate and vote in the sessions. In this second half of our article we propose to sketch in the conference picture.

As a starter, let's take the simplest of all questions: why is the conference being held in Cairo, why is it being held in 1938, and who is entitled to participate?

It is being held in Cairo because the group which met at the Madrid conference in 1932 voted then to hold the next meeting at Cairo. Each conference customarily decides upon the location for the next. In recent years there has been a tendency to hold these in the smaller countries. The time of meeting is similarly agreed upon by the previous conference. Actually, the Cairo meeting should have been during the latter part of 1937; it was postponed to the winter of early 1938 for no other reason than the one that the participating nations didn't like the idea of going to Egypt in the summer! Postponing such a thing as an international conference and stepping as the complete abolishment of frequency assignments for any particular service, it becomes a matter of great interest to us amateurs.

Most amateurs, however, aside from knowing there is such a thing as an international conference and knowing it can do these things and that it meets from time to time, have very little idea how the sessions are conducted, how we amateurs, for instance, get represented and get our wishes placed before the conference group, and to what extent we participate and vote in the sessions. In this second half of our article we propose to sketch in the conference picture.

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At this point it is well to point out that regardless of what other agencies may participate, only governments vote. Groups such as the I.A.R.U. and the A.R.R.L. may be admitted to participation but they cannot vote. We will have more to say about voting later on.

CONFERENCE PREPARATIONS

Theoretically, the conference can draft an entirely new treaty and regulations. And by the way, since we're talking about the treaty, it might be well to get an idea what the document looks like. In its entirety, it bulks several hundred pages of normal-size type. Of this, the treaty takes up only about one-third; the other two-thirds is occupied with the regulations hitched to the treaty. The whole thing might be likened to a constitution and by-laws, the treaty being the constitution and the annexed "general radio regulations" being the by-laws. The treaty portion is of no particular concern to us, since it is concerned with such generalities as the organization and functions of the International Telecommunications Union, provisions for the ratification of the convention, approval of the regulations, relations with non-contracting governments, rules for arbitration, a section setting up the C.G.I.R. and others providing for the maintenance of the Berne Bureau, and other similar generalities. All the dirty work, from our standpoint, is contained in the regulations; it is in these that services are defined, regulations of procedure specified, frequency allocations set forth, etc. So far as Cairo is concerned, the treaty is not under discussion; it is satisfactory as it is and needs no alteration. Cairo will confine itself to a revision of the regulations.

Now it is quite true, as we have said, that the

1 A copy can be secured from the Government Printing Office, Washington, D. C., for 30 cents; ask for Department of State Conference Series No. 15, "International Radiotelegraph Conference, Madrid, 1932."
conference has the authority to junk all the previous regulations and write up an entirely new set, but from a practical standpoint it is not necessary to go to such extremes. Many of the regulations adopted at Madrid are perfectly all right even to-day and there is no sense junking those only to rewrite them in the same language. So what happens at Cairo is that everybody scans the Madrid regs, argues about such changes as this or that nation may think necessary, and finally agrees upon a final new set which, actually, may differ in only occasional items from the Madrid regs. The idea is to leave alone such regulations as may be OK "as is" and to change only those that need changing.

However, although only the regulations will be under discussion at Cairo and although the conference will revise, rather than rewrite a new set, the meeting will drag out anywhere from two-and-a-half to four months! And it would drag out even longer, were it not for a system whereby everybody had advance knowledge of what everyone else expects to revise and just how they propose to revise it. We are referring to the business of "proposals" and here is how it works, taking Cairo as an example:

The conference is scheduled for early 1938. As early as November, 1936, every nation expecting to be present is supposed to mail to the Berne Bureau, in Switzerland, a complete summary of the changes in the old regulations which it wants to suggest at Cairo. The idea is that all these "proposals" will promptly be printed by the Berne Bureau in book form and a copy sent back to each participating nation during the spring of 1937; the obvious purpose is to provide every participant with full knowledge of what to expect, to determine, in advance, who agrees with whom and to prepare arguments against such proposals as may be regarded as unfavorable.

**This Proposal Business**

Now we're going to look into this proposal business somewhat closely. It is of real concern to us, for it is in these advance proposals that we get the first indication of the attitude to be expected from our own and all other governments with respect to intentions at Cairo on amateur matters. We have already, in the July 1937 *QST*, page 22, listed the actual Cairo proposals touching on amateur matters. How did the other nations decide on them? For that matter, how did the United States go about formulating its own proposals, including amateur proposals, and what opportunity was provided for us to inject ourselves into the argument and state our views?

We'll dismiss the other nations of the world by saying that, since with most of them all communications are government monopolies, the proposals almost invariably result from conferences limited pretty strictly to government officials.

In the United States, however, radio is not a government monopoly; we do things differently. It is true that our proposals are issued in the name of the United States government and, in the last analysis, are what our government thinks best, but it is the practice of our authorities to call in representatives of all the radio interests in the country to help draft the proposals. This provides every interest an opportunity to state its own case. The A.R.R.L., representing amateur radio, was given full opportunity to participate with other agencies and to seek to have incorporated in the U. S. proposals whatever we wanted to change at Cairo. Let's see how we did it.

The proposals were due in Berne in November, 1936, you will recall. Early in the Spring of 1936 our government let it be known that it was going to inaugurate a series of meetings to formulate its Cairo proposals, and it invited everybody who had any stake in radio to come to Washington to help draft them. Anybody who had a legitimate interest in these proceedings could attend. The A.R.R.L., as usual, was present as the representative of amateur radio.

So Spring, 1936, saw several score representatives of dozens of U. S. radio interests assembling in Washington at the call of the government for the purpose of formulating proposals. The work, logically, was split up into various groups, each of which handled some specific subject or section. There would be a group studying technical matters, another doing a job on administrative details, one tackling frequency allocations, etc., with various subcommittees under these main groups when necessary. Members were appointed to these various committees and all went off to their own corners for several weeks or months, as the work might require, to do their jobs. In our case, we were interested in the group having to do with definitions and the committee on frequency assignments: the first, because we think the Madrid definition of an amateur is faulty and the second . . . well, it is hardly necessary to point out our interest in that subject! We will dismiss our participation in the definitions matter right now by saying that the amateur definition we wanted was adopted and incorporated into the formal U. S. proposals. We'll also dismiss all the other preparatory committees in which we had no interest by saying that most of them had finished their work by late Spring.

But what about the allocations committee and, specifically, the high-frequency allocations in which we have so much interest? More to the point, since the A.R.R.L. Board authorized the League's officers to make every effort to secure a widening of our amateur bands at Cairo (which meant they first had to get into the U. S. proposals), were we successful in securing the adop-

(Continued on page 88)
The possibility of using thyratron tubes to combine rectification with a keying system has intrigued more than one amateur, but the idea has never gotten very far because suitable tubes have not been readily available. Now comes an announcement from Eitel-McCullough, Inc., of a new grid-controlled mercury-vapor rectifier tube to be known as the KY21, a tube designed specifically for this purpose. The KY21 is a heavy-duty rectifier, a pair of them being capable of delivering 3000 volts at 1 ampere d.c., using a choke-input filter.

A peculiar characteristic of the mercury-vapor tube with a grid is the fact that once the tube starts conducting the grid loses control. Thus, it is possible to block off plate current provided sufficient negative bias is applied to the grid before application of plate voltage, but if the bias is afterwards reduced to the point where plate current begins to flow and the mercury ionizes, the space charge disappears and the grid has no effect. When such a tube is used as a rectifier, the alternating plate voltage of course reaches zero and becomes negative during half of the cycle, during which period the grid again assumes control. Hence it is possible to use grid control at keying speeds, with the advantages that the keying is positive and that negligible power need be broken in the actual keying circuit.

Several circuits suitable for use with the tubes are shown in Fig. 1. A fundamental arrangement is shown at the top; the battery simply represents a source of bias voltage, which may actually be furnished by a simple power pack. In this case the bias transformer secondary must be insulated from the core and primary for at least the peak power transformer voltage, which in the case of the usual choke-input supply will be about 60% higher than the d.c. output voltage. A keying relay similarly insulated must be used.

The second circuit shows a suitable bias supply using an ordinary b.c.l. power transformer and an 80 rectifier. The 2.5-volt winding (which usually is heavy enough to handle all the power necessary—about 15 watts) is used as a primary, and since it gets its power from the rectifier filament transformer, no special insulation is necessary except to see that the whole transformer is well insulated from ground. The keying relay, however, must still be insulated as before.

The lower diagram shows an all-a.c. circuit using a transformer with high-voltage insulation. The secondary is center-tapped, with its outside ends connected to the grids of the rectifier tubes. The polarity must be such that when the transformer primary is energized the induced voltage will place a negative potential on a rectifier grid at the same time that the power transformer is running the plate positive. The resistor in the center tap is to limit grid current. The lamp in series with the a.c. line limits the current flow when the primary is shorted out by the key. Alternatively, a back-contact key or relay can be used in series with the primary.

The grid voltage required to prevent plate-current flow depends upon the plate voltage employed. The tubes have a rather low mu, since the lower mu has been found to give more desirable all-around operating characteristics. At 2000 volts, about 100 volts negative on the grid is re-
Several months ago you will remember, the general exodus of Americans from Shanghai started. Many people were trying to get in touch with friends and relatives. Amateur radio came to the rescue as usual and many messages were handled between Shanghai, Manila and the United States. Around the first of November, the Liaison Officer, AARS, sent a message to XUSCR in Shanghai and requested a report of amateur radio activities. He replied immediately but it was well over a month before his letter reached the United States.

XUSCR is owned and operated by Mr. C. R. Shekury, of Bills Motors, Shanghai. Before things started popping in Shanghai, XUSCR says his schedules included K6OCL, Guam, and XU3MA, Chefoo. When traffic began pouring in at the rate of fifty per day sent, and forty received, two other stations were added; VS6AH in Hongkong and KAIAX-WLXR in the Philippines. VS6AH, being on British territory, had to get special permission from the Government to handle refugee traffic since British amateur stations are not normally permitted to handle messages. KAIAX-WLXR is an A.A.R.S. station, owned and operated by army personnel in their off-duty hours. A list of operators at KAIAX is not available so we can only credit the station with good work done in aiding the refugees from Shanghai. For a period of one month XUSCR and KAIAX worked from nine in the evening to one or two in the morning, handling over two thousand messages during the period. KAIAX went off the air but was replaced a short time later by KAIHR-WLXP, Manila, with KAIHR also standing by. KAIHR needs no introduction.

With the arrival of the Sixth Marines, Shekury says, traffic really did pick up and he averaged about one hundred messages on the hook at all times. This he hoped to clear before long.

Traffic originated at XUSCR averaged, at the time of his letter, November 14, 1937, about as follows: fifty per cent Marine, twenty-five per cent mission institutions and twenty-five per cent for the rest of the community. Received messages averaged about the same. K6OCL, Guam, handled the bulk of the traffic for the United States, with KAIHR-WLXP, Manila, with KAIHR also standing by. KAIHR needs no introduction.

Results of the Armistice Day Message competition are listed below. This year 759 amateurs copied this message broadcast on November 11th by WLM on the frequencies 3497.5 kcs and 6990 kcs.

The winner of this competition is the Fourth Corps Area, which made a total of 300 points with 100 members submitting correct copies.

<table>
<thead>
<tr>
<th>Corps Area</th>
<th>Participants</th>
<th>Handicap</th>
<th>Total Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>IV</td>
<td>100</td>
<td>3.0</td>
<td>300</td>
</tr>
<tr>
<td>IX</td>
<td>216</td>
<td>1.0</td>
<td>216</td>
</tr>
<tr>
<td>VII</td>
<td>105</td>
<td>1.8</td>
<td>189</td>
</tr>
<tr>
<td>V</td>
<td>79</td>
<td>2.0</td>
<td>158</td>
</tr>
<tr>
<td>III</td>
<td>69</td>
<td>2.1</td>
<td>145</td>
</tr>
<tr>
<td>VIII</td>
<td>33</td>
<td>2.9</td>
<td>96</td>
</tr>
<tr>
<td>II</td>
<td>77</td>
<td>1.2</td>
<td>92</td>
</tr>
<tr>
<td>VI</td>
<td>51</td>
<td>1.5</td>
<td>76</td>
</tr>
<tr>
<td>I</td>
<td>29</td>
<td>1.9</td>
<td>55</td>
</tr>
</tbody>
</table>

This message from the Chief Signal Officer of the army is a subject of annual competition between Corps Areas. The handicap factor is applied to determine the total score in order to compensate for Corps Areas having a smaller population of amateurs.
For the thirteenth consecutive year radio amateurs of the United States participated in the celebration of Navy Day on October 27, 1937, by copying a message from the Secretary of the Navy in A.R.R.L.'s annual Navy Day Receiving Competition. Letters of commendation, signed by Secretary Swanson, were offered to all operators making perfect copy of the message text.

374 operators, or 57% of the 653 participants, submitted perfect copies and each will receive one of the letters. The message, sent by NAA (Washington) and NPG (San Francisco), was copied in 45 states, the District of Columbia, Hawaii, Puerto Rico and Canada.

The Honor Roll lists all participants by Naval Districts in the order of rating within their respective Districts. Congratulations to those whose proficiency places them among the letter winners! The NAA and NPG transmissions were at approximately 20 words per minute instead of the 15 w.p.m. of previous years. A number of familiar calls are found on the Honor Roll. Among them is W5BMI, who has won a letter in the Navy Day competition for five consecutive years.

As a matter of general interest a tabulation is presented showing participants by Naval Districts, number of N.C.R. members copying the message, number of copies of NAA, NPG, etc.

Once again may we urge all participants in copying contests—do not recopy... do not guess! Copy what you hear and submit that "for better or for worse."

---E. L. B. and T. W. Y.

1937 Navy Day Honor Roll
Letter Winners

**First Naval District:** W1ABG W1AJ W1AN W1APR W1AWU W1BB W1BFT W1BIL W1BZ0 W1DCF W1DGN W1DJZ W1DUJ W1EOB W1EYA W1FAK W1F1FNY W1FFP W1FSW W1GAE W1GEN W1HCB W1HYY W1HII W1HIC W1HUK W1IMD W1ISH W1KHA W1KIN W1NP W1NS W1PQ W1RR Frank L. Butler, Donald E. Hinds, Chester L. Keene, Joseph E. Reagan.

**Third Naval District:** W1AFB W1AJC W1AMQ W1DMK W1EBT W1ES W1GKM W2AA W2AJO W2ALD W2AP0 W2AZM W2BDR W2BIX W2BJS W2CJ W2CIX W2CTQ W2CYQ W2CXY W2DJ W2DNS W2ESO W2FAR W2FEN W2GOW

---

### 1937 Navy Day Message

For many years Navy Day has been observed throughout the nation on 27 October, the birthday of Theodore Roosevelt. Likewise for many years a radio message has been broadcast on that day to our good friends the American radio amateurs, many of whom are also members of our Naval Communication Reserve. In these times of great international unrest the Navy is particularly gratified to know that its Naval Reserve has reached the highest state of efficiency and readiness for duty that has existed since the World War. The maintenance of a strong and efficient Naval Reserve will do much to strengthen our Navy and assist us in the maintenance of peace and the protection of our own citizens at home and abroad.

**Claude A. Swanson**
Secretary of the Navy

---

1. The number of N.C.R. and non-N.C.R. member participants was determined as accurately as possible by examination of copies received.
Regenerative Receiver

(Continued from page 18)

possibility of metal surfaces in contact producing a buzzing sound.

Like all receivers this one presupposes a reason­

available. These will be the Type RX21.

As compared with straight primary keying, it is

made available. These will be the Type RX21.

the cathodes of the new tubes take approxi­

quired for cut-off, with other plate voltages call­

ng for proportionately higher or lower bias.

As compared with straight primary keying, it is

said that the "tails" are considerably less with

for its elimination of key clicks with high power.

supplies, it is not considered necessary to describe

most amateurs have their own receiver power

filtered supply should of course be used for head

phone and voice reception.

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Sweep Circuit Considerations in the Television Receiver

The Design and Operation of Saw-Tooth Oscillation Generators

By Marshall P. Wilder,* W2KJL

IF THE true significance of the basic requirements in a television receiver has been grasped fully, it will be apparent that, with one important exception, there is nothing fundamentally new in a video receiver. It is true that the receiver must be bigger and better in regard to band width and phase shift but, in general, the design is an extension of well-known circuits of the past.

The important exception is in the sweep circuits which generate voltages or currents to be used in deflecting the cathode-ray beam over the surface of the screen in exact synchronism with the scanning beam used to produce the picture at the transmitter. The necessity for sweep circuits is quite new and altogether foreign to communication art. Some of us have had experience with sweep circuits in our cathode-ray oscilloscopes, but for the benefit of those to whom the words "sweep circuit" are both confusing and unfamiliar, a few lines of explanation are in order. When a beam of electrons is caused to move across a cathode-ray screen linearly with time, we are, in effect, sweeping a point of light across the screen and, as far as the eye is concerned, ruling a line. When the beam has reached the end of one line, it must return to the other side of the screen without being seen. This return movement is sometimes called the "fly-back" and is set in a modern television receiver to occupy approximately 10 per cent of the time taken to draw the line (or trace) itself. If we plot the voltage against time of such a trace we find that the voltage may rise very rapidly from zero in a short space of time and then fall off steadily to zero, rising rapidly again and falling off uniformly in a continuous sequence. Such a curve, as in Fig. 1, is called a positive saw-tooth oscillation. If the voltage falls very rapidly and then rises slowly the oscillation is called a negative saw-tooth. The generation of such oscillations is the work of the sweep circuit, two such circuits being required in the television receiver. One of these circuits generates the high-frequency saw-tooth oscillation which moves the electron beam in the horizontal direction. The second sweep circuit generates a much lower frequency and serves to move the beam (and the spot of light created by it) in the vertical direction.

Saw-tooth oscillations are produced in practice by the use of gas triodes, such as the 885, by multivibrator oscillators or by feed-back oscillators of a special type. All of these systems rely upon the charging and discharging of a condenser to produce the necessary wave shape.

The simplest but probably the most unstable form of saw-tooth oscillator is that employing a gas triode, the grid of which acts as a trigger and the cathode as a source of electrons to insure ionization of the gas at a reasonably low potential. Figure 2 shows such a circuit. The voltage "B" charges "C" to some critical value at which the grid loses control and the gas in the tube ionizes, thus shorting the condenser "C". This momentarily removes the voltage from the plate of the tube and allows the grid to regain control. This slow charging of "C" and the sudden discharge is, of course, a continuous process and results in the production of a saw-tooth voltage. A second type of saw-tooth generator makes use of a multivibrator—an arrangement of two tubes operated as a sort of resistance-coupled amplifier and provided with some means of feedback to produce oscillation. The circuit of one such saw-tooth generator, due to Bedford and Puckle, is outlined in Fig. 3. This sweep circuit employs two high-vacuum triodes, 76's for example. With the particular constants given in Fig. 3, the circuit will oscillate in the neighborhood of 400 cycles per second. By suitable modification of the val-

* 55 Kendall Ave., Maplewood, N. J.
ues in the tank circuit \( C_2, R_4 \), the circuit can be made to operate at higher or lower frequencies. The ratio of charge to discharge time can be controlled by using higher values of \( R_4 \) across lower values of \( C_1 \) to give a shorter discharge or fly-back time, or vice versa. The circuit functions in the following manner:

The operation is started by any irregularity at the grid of the tubes, say Tube No. 1. This will be amplified by both tubes and fed back to Tube No. 1 in a very much enlarged form. If this irregularity were in the positive direction, the plate current of Tube No. 1 would climb very fast, the positive voltage on the grid of Tube No. 1, insuring linearity—that is, the current does not leave the tube while C1 charges steadily through the constant current device. The voltage across C1, starting from the charged condition, will show a sudden drop as the tube breaks into oscillation, then a slow linear rise during the recharging period.

A somewhat similar sweep circuit is described in the RCA pamphlet 1801–10–37 entitled "Kinroscope 1800." This pamphlet should be studied carefully by anyone interested in more detailed information on the operation of saw-tooth oscillators of this type.

The multivibrator as shown in Fig. 3 is only part of the complete sweep unit. Though its output is in the form of a saw-tooth, we are to find that some modifications of the basic circuit and many critical adjustments will be necessary before a truly satisfactory wave-shape is had. A first problem is offered, for instance, by the fact that when a charged condenser discharges through a resistor, it does not discharge with complete linearity—that is, the current does not leave the condenser at a constant rate. The discharge is at first quite rapid and then, as the condenser approaches the discharged condition, the rate at which it discharges becomes slower. This means that the cathode-ray beam deflected across the screen by the saw-tooth voltage would not move across the screen at a uniform speed. It would move faster at first and then more slowly, resulting in a picture broadened at one side and

![Diagram](image-url)
squeezed together at the other. In order to correct this type of non-linearity, three methods may be applied. The saw-tooth voltage may be amplified by a tube which is operating on a non-linear portion of its grid characteristic, the amount of distortion so produced correcting the defect in the original wave shape. Alternatively, the current, as it discharges from the condenser, may be passed through a pentode operating on the part of its characteristic known as the "constant current portion"—a pentode so operated being one type of constant current device to which reference was made in discussing Fig. 4. A third method, developed by the writer, is quite simple and requires no tubes. It employs a high-inductance choke in series with the discharging resistor. Such a choke is indicated as \( L_i \) in Fig. 3.

In the television receiver we require two separate sweep oscillators, one to generate a frequency of 60 cycles (for the vertical sweep) and another to generate approximately 13,000 cycles (for the horizontal sweep). Circuits of the two sweep oscillators may be almost exactly the same, the difference in generated frequency resulting from the choice of values in the tank circuit \( C_2, R_6 \) of Fig. 3. The inductance of the choke used to correct the wave-shape should be approximately 2000 henrys in the low-frequency sweep and approximately 100 henrys in the high-frequency unit. The value of inductance is not critical and its d.c. resistance will not change the frequency of the tank circuit appreciably.

So far we have dealt only with the means of generating saw-tooth oscillations. We shall now consider the methods of applying them to produce the necessary deflection in the cathode-ray tube. If we are to use electrostatic deflection, the necessary voltage may be had directly from the terminals of the tank condenser in a circuit of the type shown in Fig. 3. One important difficulty with some types of cathode-ray tubes will be the so-called "trapezium" distortion. This causes a pattern, which should be a square, to appear on the screen as a keystone. An explanation of the cause of this distortion is beyond the scope of this paper, but it is readily avoided by using a push-pull arrangement such as that shown in Fig. 5. A portion of the voltage generated in the tank circuit of the second tube is obtained across the voltage divider \( R_{1a}, R_{17} \) and applied to the grid of an amplifier. The voltage in the output of this stage can be made equal in amplitude to that generated in RC tank circuit but its phase will be 180 degrees different. When these voltages are applied as indicated in Fig. 5, the deflection will be linear and any trapezium distortion will be balanced out. With this circuit it is necessary to generate only half as much voltage for complete deflection of the beam as is required if two of the deflection plates are tied back to the anode—as is often done in conventional cathode-ray tube circuits. Naturally, all four plates of the cathode-ray tube must be free before push-pull electrostatic deflection can be used.

The alternative method of applying the saw-tooth output for deflection purposes is by the use of electromagnetic deflection. This is the type of deflection most to be recommended for television reception. Although excellent pictures

---

**FIG. 5—A PUSH-PULL SWEEP CIRCUIT FOR ELECTROSTATIC DEFLECTION TOGETHER WITH THE CATHODE-RAY TUBE ARRANGEMENT**

**Constants for the High-Frequency Sweep**

- \( R_1 \): 1 megohm
- \( R_2 \): 100,000 ohms
- \( R_3 \): 1000 ohms
- \( R_4 \): 50,000 ohms
- \( R_5 \): 2000 ohms
- \( R_6 \): 1500 ohms
- \( R_7 \): 150,000 ohms
- \( R_8 \): 500,000 ohms
- \( R_9 \): 250,000 ohms
- \( R_{10} \): 250,000 ohms
- \( C_1 \): 0.02 \( \mu \)fd.
- \( C_2 \): 0.5 \( \mu \)fd.
- \( C_3 \): 0.01 \( \mu \)fd.
- \( C_4 \): 0.02 \( \mu \)fd.
- \( C_5 \): 0.002 \( \mu \)fd.
- \( C_6 \): 0.001 \( \mu \)fd.
- \( C_7 \): 0.01 \( \mu \)fd.
- \( C_8 \): 0.02 \( \mu \)fd.
- \( C_9 \): 0.005 \( \mu \)fd.
- \( C_{10} \): 0.001 \( \mu \)fd.
- \( C_{11} \): 500 \( \mu \)fd.
- \( C_{12} \): 0.1 \( \mu \)fd.
- \( C_{13} \): 0.01 \( \mu \)fd.
- \( C_{14} \): 0.02 \( \mu \)fd.
- \( C_{15} \): 0.002 \( \mu \)fd.

**Constants for Low-Frequency Sweep**

- \( R_1 \): 1 megohm
- \( R_2 \): 100,000 ohms
- \( R_3 \): 4000 ohms
- \( R_4 \): 250,000 ohms
- \( R_5 \): 2000 ohms
- \( R_6 \): 1500 ohms
- \( R_7 \): 150,000 ohms
- \( R_8 \): 500,000 ohms
- \( R_9 \): 250,000 ohms
- \( C_1 \): 0.002 \( \mu \)fd.
- \( C_2 \): 0.2 \( \mu \)fd.
- \( C_3 \): 50 \( \mu \)fd.
- \( C_4 \): 0.2 \( \mu \)fd.
- \( C_5 \): 0.01 \( \mu \)fd.
- \( C_6 \): 200 \( \mu \)fd.

**Constants for Power Supply and C.R. Tube Circuits**

- \( R_1 \): 100,000 ohms, 5-watt.
- \( R_2 \): 50,000 ohms, 2-watt.
- \( R_{1a} \): 1 megohm, 10-watt.
- \( R_{17} \): 2 megohm, 10-watt.
- \( R_9 \): 250,000 ohms, 5-watt.
- \( R_{10} \): 250,000 ohms, 5-watt.
- \( R_{11} \): 2 megohm, 1-watt.
- \( R_{12} \): 500,000 ohms, 1-watt.
- \( R_{13} \): 500,000 ohms, 1-watt.
- \( R_{14} \): 50,000 ohms, 1-watt.
- \( C_1 \): 0.5 \( \mu \)fd.
- \( C_2 \): 2 \( \mu \)fd.

**QST for**
FIG. 6.—A PAIR OF SWEEPS FOR MAGNETIC DEFLECTION TOGETHER WITH THE HIGH-VOLTAGE POWER SUPPLY AND C.R. TUBE.

The complete circuit for magnetic deflection is shown in Fig. 6. The Puckle type of multivibrator is employed followed by a third Type 76 tube which serves a double purpose: It inverts the phase and adds an impulse to the saw-tooth waveform generated by the multivibrator. It will be noted that a 6F6G tube is used as the output amplifier for the high-frequency sweep while a

Continued on page 42

February, 1938
How Would You Do It?

Suggestions on Displaying QSL Cards

In presenting Problem No. 12, little did we realize how vital the question of displaying QSL cards is to the modern amateur. His receiver tubes may burn out when he operates his transmitter, he may risk his life operating an exposed transmitter, his antenna relay may be noisy and he may catch pneumonia from draughty lead-in openings, but—by gosh!—he's extremely finicky about the way he cares for his QSL's and how he shows them off to visiting firemen! At least that's the impression we gained from the avalanche of responses to Problem No. 12.

In writing a summary of the various ideas and combinations of ideas, we have deemed it impracticable to make specific mention of the sources, in most cases, because most of the ideas were duplicated many times. The interest displayed in the problem is highly appreciated, nonetheless.

The problem resolved itself into three major portions, the first dealing with that of protecting the cards against dust, etc.; the second, of devising a suitable mounting which would prevent marring walls; and third, methods of fastening the cards to the mounting with as little damage to the cards as possible.

Cellophane was chosen as a protective covering by the majority. Some wrapped each card in cellophane, fastening it at the back with glue or Du Pont cement. Others used a large sheet to cover a group of several cards. Another scheme consisted of strips of heavy cellophane or celluloid the width of a card. Diagonal slits were cut in the cellophane strip to receive the corners of a card in a manner similar to that used in old-style photo albums. The use of adhesive photographic art corners was also suggested. In both latter cases, the cards were mounted on the cellophane strips with the faces of the cards against the cellophane. These strips, containing the cards, were suspended from the picture moulding. Still another scheme consisted of long horizontal pockets of cellophane made of a strip, somewhat wider than the height of a card, cemented at the ends and lower edge only. A series of these long pockets was mounted, one above the other on a suitable background. The cards may be inserted from the top. In a slightly modified form, both top and bottom edges were fastened and the ends left open so that a string of cards fastened together could be pulled through from end to end.

Several samples of wrapping were submitted and we tried some of our own. The chief objection to the use of cellophane seems to be that most of the inexpensive light-weight grades are affected seriously by changes in temperature and humidity. From the condition of most of the samples received, it seems very advisable to wrap cards very loosely to prevent buckling of the card when the cellophane shrinks. Ready-made envelopes in standard sizes are available at most stationery stores and were suggested by several. Perhaps the selection of a size which will fit the card loosely is the most satisfactory way of using cellophane for protection.

While we did not try the idea of a large sheet for covering a group of cards, it seems that wrinkling or bulging would still be a problem. A wrinkled or ripply surface makes it difficult to find any position from which the cards may be viewed without glare from reflected light.

To our minds, the most satisfactory method of protecting cards against soiling is that suggested by the second largest group. This consists of brushing or spraying the cards with a protective waterproof preparation. We doubt if the process would be any more tedious than that of preparing a cellophane covering. It should be less expensive, the problem of wrinkles is avoided and the cards are furnished with a permanently preserved finish which permits washing the cards, if necessary, without damage to the cards. Clear lacquer, clear shellac, French lacquer, clear varnish, map varnish, clear liquid celluloid, water glass and drawing fixer
are suggested as being satisfactory for the job. Most of these preparations produce a glossy surface. W1BYJ suggests a solution of 40 per cent clear metal lacquer and 60 per cent lacquer thinner. Two coats seemed to change the original surface of the card but little. W1BYJ coats the cards by dipping them vertically into a container of the solution, holding the card with a pin at one corner to prevent finger marks. The cards are suspended by means of the pin while drying which requires about seven minutes. He cautions against smoking or any open flame in the vicinity of the solution which, like most lacquer preparations, is highly inflammable.

W5ASD suggests a solution made by dissolving clear celluloid in airplane "dope" or by thinning down "liquid celluloid."

Care must be used with any of these solutions to provide a uniform surface when applied with a brush. Perhaps the best method of application is by means of a small atomizer or "blow" type sprayer, either of which may be obtained at little cost from art or stationery stores.

Several schemes for mounting the cards without maring the wall were suggested. Perhaps the most popular scheme of all consisted of a pair of strings, thread, small diameter wire, gummed paper strips or strips of so-called "Scotch" tape or masking tape. ("Scotch" tape may be obtained at "dime store" loose-leaf scrap books.

Another popular method is to arrange the cards in chain fashion, each card being fastened to the one above it by two small pieces of adhesive material such as those mentioned above. (See Fig. 1C.) With either of these methods, when necessary, the rows of cards may be taken down and folded into compact packs. A variation in this method involves punching four holes in each card and suspending one card from the one above it by means of small wire hooks. Others suggest sewing the cards in long strips with needle and thread. A rather novel method of linking the cards together is shown in Fig. 2. This scheme was suggested by ON4CC.

Another group preferred mounting cards in groups on backgrounds of studio board, drafting paper, wall board, plywood, cardboard, quarter board and similar material with the surface covered with colored paper, cloth or oilcloth. A suitable frame or molding was often suggested. The cards were fastened to the mounting by means of thumbbacks, Dupont cement, bits of "Scotch" tape, stamp hinges or photographic art corners. As an alternative, some suggested slitting the background material for the corners of the cards where this was practicable. W9YRF suggests a paper roller shade as a mounting.

Several others suggested albums made up from "dime store" loose-leaf scrap books.

Prize winners for this month are as follows:

First Prize: Fred Lindquist, W1BYJ

Second Prize: Miss Amy Medary, W1KRO

We wish also to thank the following for their assistance: W1GMM, GZX, IMF, INC, KSK, 2DIJ, HTV, IZQ, IZK, KOC, 3AHK, BBV, BYM, GEO, GQZ, 4EPH, JO, 5EZA, 6AOI, NAL, PGG, 7AZD, CMY, 8AVF, BFP, INK, LCO, OMM, PCN, QVR, 9EUZ, KYE, NBV, OLN, PCZ, VDG, VWO, WMP, K4KD, K7GLL, VE2IA, 3GZ, 5PW, 5UI, G6GH, E. J. Drumm.

(Continued on page 110)
A Simple 56-Mc. Transmitter with Cathode-Bias Modulation

By Everett C. Geiger,* W2FZQ, and Edward McGrath,** W2GNL

The little 56-Mc. transmitter here described is the result of a considerable period of experimentation and “bug chasing” in the search for an efficient and economical rig for local rag-chews. In it is incorporated a modernized version of “center-tap” modulation; namely, cathode-bias modulation. Here we have a companion for our old cronies, plate modulation and grid-bias modulation.

We thought the idea was good, but the performance of the finished transmitter far exceeded anything we had hoped for. It combines improved frequency stability, fair output, small modulator power and good audio quality. Without exception, all reports on quality of speech have been “crystal” and “broadcast.” Running the oscillator at 28 watts input, it is possible to modulate it fully with the output of a 56 tube.

The foregoing claims have been fully proven by over three years’ use of two rigs built to these specifications. And, incidently, W2GNL has verification of the reception of his signals in the Middle West when the “skip” was on. Consistently good results have been obtained in numerous contacts in the 1st and 3rd districts.

As shown in the diagram of Fig. 1, the radio frequency portion of the rig is a conventional TNT oscillator using the twin-triode 53. The usual values of inductance and capacitance are employed. The audio portion employs a 56 speech amplifier transformer-coupled to a 56 modulator. The modulation coupling transformer T3 is a 8:1 audio transformer with the secondary removed and 200 turns of No. 26 wire wound in its place. This forms the secondary, which must carry the cathode current, and across which the cathode bias voltage for the 53 is developed. Be sure that the grid end of this secondary is at ground potential.

The antenna coupling method is quite important. It was found that the tuned antenna tank method, as shown in the diagram, was most satisfactory, because the loading by the antenna could be more easily controlled. Accurate control of antenna loading is quite necessary for proper output and modulation of the oscillator, as outlined in the following paragraph.

When the plate and grid circuits of the oscillator are adjusted for best oscillation without load it will be found that the plate current rises instead of dipping as in the more usual oscillator circuit. This is perfectly proper, however, and at maximum there should be about 100-ma. plate current flowing. Then it is advisable to detune the plate tank condenser until the current drawn is about 90 ma. With antenna tank loosely coupled to the oscillator and tuned to resonance, the coupling should be adjusted until the plate current dips to 80 or 85 ma. Field strength tests indicate that a dip of 5 to 10 mils produces greatest signal output. With everything adjusted properly the plate current (and output current) will kick up under modulation. If it kicks down, the plate tuning should be adjusted for lower plate current.

The power supply for the oscillator is conventional and should be capable of delivering 300 volts at 100 ma. The mike used in all work with this rig is a high-quality single-button carbon type. The antenna is a half-wave vertical with single-wire feed. Other types of antennas may be used successfully.

* Glen Manor, Park Ridge, N. J.
** 235 Cypress Ave., Bronx, New York City.

QST for
The Harmonic Tank Circuit

Increased Transmitter Efficiency at Ultra-High Frequencies

By B. P. Hansen,* W9KNZ

The circuit device about to be described is the result of an effort to effect improved performance with tubes of conventional design at higher than ordinary frequencies. In its basic theory it is by no means new; in fact it represents the indecent disinterment of one of those dead things Warner recently wished buried—in his November Editorial, to be exact. It has existed for years in the familiar—to the real old timer—Tesla or Oudin coil, from which Gorgon-headed monster the suppressed ham of war days drew great streaming sparks to astonish his visitors.

A five-meter transmitter usually is operated at rather poor efficiency simply because the tank circuits must necessarily be of very small dimensions. This limitation particularly restricts the amount of inductance that can be used. The output capacitance of the tube or tubes used to excite the final tank usually limits the size of such a tank coil to two or three small turns. If we could establish some means of transferring the energy output of a tube to a tank circuit whose constants were independent of the tube constants, it might be possible to realize an improvement in the performance of our high-frequency equipment. Such an operating condition is brought about by the circuit trick under discussion.

A tank coil is constructed of such dimensions that its fundamental frequency will be relatively low. The dimensions also are chosen so that the tuning condenser used across this entire coil is of about the capacity that would be used for the much higher operating frequency that we hope to get. Instead of designing the coil with well-spaced turns, we wind the turns rather closely together to get as much distributed capacity as possible. If now the circuit is tuned to say 20 Mc., but is excited at its third harmonic or 60 Mc., it will give very much the same sort of performance that our Hertz antennas give when operated at harmonics of their fundamental frequencies. In connecting the plate of the exciting tube to this tank coil, however, we find that we must connect it at a point on the coil where the impedance of the loaded tank circuit will equal the optimum load impedance for the tube. Another way of saying the same thing: We must connect the plate of the tube to the coil very near a voltage node when the coil is considered as operating only at the desired harmonic frequency. This point is readily determined experimentally; for a third harmonic tank it will actually be close to a third of the way down from the hot end of the coil. This point found, and the plate connected, the circuit will operate nicely at its third harmonic (or any other harmonic for that matter), and the tuning effect of the tube capacity will be negligible.

Actual experiment with the device has shown that, for operation in the amateur five-meter band at least, most generally satisfactory results are obtained when the circuit does operate at the third harmonic.

The push-push doubler circuit employing the harmonic plate tank which is shown in Fig. 1 will solve quite a few problems that usually confront the operator of a five-meter station. This type doubler can be made to give performance equal to that of the same tubes working at the same output frequency as Class-C amplifiers. Since it does not depend upon excessive values of bias and excitation for its doubling action, it can actually be operated under Class-C conditions, and can therefore be properly modulated. The grids of the two tubes are in push-pull and are operating at one-half the output frequency. An actual advantage over a straight-through amplifier is gained here in that excitation requirements are more easily met

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*3800 Colfax Ave., Denver, Colo.
and the charging current flowing to the grids (that
r.f. grid current that the manufacturers mention,
in terms of amperes on their dope sheets) is con-
siderably smaller than it would be for a straight-
through amplifier. True, the plates of the tubes are
in parallel—and at 60 Mc. at that—but the
use of the harmonic tank circuit reduces that
problem to zero. No neutralization is needed. Any
ordinary tubes can be used. The one thing that
must be watched closely is the danger of stem fail-
ure due to dielectric losses. Plate dissipation, for
all ordinary triodes at least, is not a limiting fac-
tor, since the stems of nearly all conventional
triodes will soften and fail long before the plates
begin to show colour.

If the tubes do not draw the same current, as
shown by one plate running hotter than the
other, move the point "W" along the lead be-
tween the two plates until the load is equalized.
If this lead from plate to plate is made about six
or eight inches long, it will be easy to match up
any pair of tubes.

For this particular set of parts, point "X" comes
exactly four turns down from the hot end,"Y," of the coil.

R.f. chokes in all leads will reduce pickup in
nearby b.e.l. sets. They should be of such dimen-
sions that they represent about a quarter wave at
operating frequency. Excitation is supplied to
L1C1 at 30 Mc.; circuit L2C2 tunes to 20 Mc. but
operates at 60 Mc. While a nice, long arc can be
pulled from point "Y," there won't be much in
the way of fireworks at the plate leads of the tubes.
But by going on down the coil a little way
farther toward the ground end, at point "Z" will
be found another point of high voltage. The ap-
parent voltage at this point is less than at the end
of the coil, of course, due to the loading effects of
the adjacent portions of the coil, but this point
"Z" offers some interesting possibilities as a start-
ing point for regenerative feedback.

Actual performance of a typical setup using
242-A's may be enlightening. With a grid leak
R1, of 50,000 ohms and with 90 volts fixed bias,
the maximum d.c. grid current was 20 ma. Maxi-
mum plate voltage was 650 and plate current 250
ma., which represents an input of about 160
watts. A half-wave antenna coupled to this tank
showed better than 1.5 amps at its center. Un-
loaded, the off-resonance plate current would run
around 350 ma. and would dip to about 100 ma.
"on the nose." Unloaded and tuned to resonance,
a fat are a half-inch long could be pulled from the
hot end of the tank. With the input reduced to 40
watts, this outfit still puts out the strongest signal,
according to a good many reports, than any piece
of five-meter equipment had ever put over the
Denver area. The signals were reported S9-plus
in Boulder, a distance of about 40 miles over ir-
regular country. W9GBQ at Sedalia, 20 miles
away over a series of ridges, can hear some Denver
five-meter stations (average Denver input around
60 watts) when he uses a directional antenna for
receiving. The 40-watt signal from this equipment
was readable at his place on a three- or four-foot
piece of wire, while the 160-watt signal gave S9
strength on the same scrap of wire. These dis-
tances do not appear formidable to some of the
five-meter crowd who will read this, but we fel-
lows here in Colorado merely suggest that the
problems offered by this part of the country will
fill anybody's vacation with all the five-meter
headaches he will want to meet.

The failure of the author's health brought the
experimental work on this device to an abrupt halt.
However, its performance on 120 Mc. was
checked and gave promise of some interesting re-
results. As a matter of fact, the outfit performed
just about as well on 120 Mc. as it did on 60 Mc.
Only one report on the 120 Mc. signal was had,
from W9VXX of Denver, but he received it S9
plus on a superhet consisting of a converter feed-
ing a t.r.f. receiver.

For smaller tubes, care must be exercised to pre-
vent steam failures. Probably some of the larger
tubes with grid and plate leads brought through
the sides of the envelope would give much better
performance. It would be interesting to see how
some of the older large tubes would behave—the
204-A for example.

We were able to operate a pair of Taylor 825's
at the following operating values: grid leak,
50,000 ohms; grid current, 15 ma. (no more—
the stems will fail); plate volts, 500; plate current, 100
ma. Other constants were the same as for the
larger tubes. For a pair of 45's: grid leak 50,000
ohms; grid current, 12 ma. (no more); plate volts
500, plate current 60 ma.

When we hear of someone operating a pair of
45's on five meters at an input of 60 watts or so,
we have to grin; if the efficiency of the setup was
anything at all, the stems in the little bottles
would melt!

In conclusion, one experiment that was tried
might be of interest. During a contact with a local
station, and running 40 watts input to the har-
monic-tank setup, we were getting an 89 plus re-
port. The harmonic tank coil was then removed and
the input adjusted to exactly the same value as for the original setup.
The report dropped to S8 or S4. Only one con-
clusion can be drawn from such a direct comparison.

The author wishes to express his gratitude and
appreciation to W9GBQ and W9ESA for their
help in developing and testing this equipment.

Correction

In the article "A Five-Band Exciter with
Front-of-Panel Coil Changing," January, 1938,
QST, the common connection between the oscil-
lator plate coils in Fig. 1 should be grounded to
the common negative bus. The diagram shows the
coils floating.
Television Transmissions from Los Angeles

AMATEURS in the vicinity of Los Angeles are particularly fortunate in that television transmissions are available daily on a regular program basis. In this respect, the Los Angeles fellows are, as far as we can discover, more fortunate than those in any other city in the United States. Source of the transmissions is W6XAO operated by the Don Lee Broadcasting System. The station operates daily except Sundays and Holidays starting at 6:30 P.M. In addition, daylight programs are transmitted according to the following schedule: Monday, 9 to 10 A.M.; Wednesday, 11 to 12 A.M.; Saturday, 2 to 3 P.M. Special programs are transmitted frequently and are announced at the conclusion of the preceding scheduled transmission.

The vision signal is transmitted on 45 Mc., the accompanying sound on 54.3 Mc. The image is a 300-line picture with a frame repetition frequency of 24 per second. Interlacing is avoided in order to allow equally successful reception on either 50 or 60-cycle home electric power — which power frequencies are divided about fifty-fifty within the service range of the transmitter (of the order of twenty miles).

Mr. Harry R. Lubcke, Director of Television for the Don Lee System has stated that he will appreciate the cooperation of amateurs in the vicinity in checking the daily transmissions and explains that suggestions and circuit data on suitable receiving equipment are available to anyone mailing a stamped, self-addressed envelope to the Television Division, Don Lee Broadcasting System, 1076 West Seventh Street, Los Angeles.

A Statement from Hygrade-Sylvania

A RECENT advertisement of the Sylvania Radio Tube Division of the Hygrade Sylvania Corporation, which appeared in a number of radio trade publications, has been the matter of much comment. Entirely without our knowledge, intent or purpose, there appeared in this advertisement, in a semi-concealed state, certain coarse and offensive phrases.

"In this advertisement there is a cut of what purports to be a newspaper containing certain body text which was supposed to be illegible and meaningless. The rough layout of this advertisement, which was prepared by our advertising agency, Cecil, Warwick & Legler, was turned over to the S. W. Benson Studios, a commercial art firm, for finished lettering and drawing. This art firm delegated the work to a free-lance artist. As to just what happened, we cannot be certain, although we have a letter from Mr. S. W. Benson, president of the art firm, in which he assumes entire responsibility for the act that was committed. The lettering, whose ever it is, is obviously the work of an unbalanced mind or the result of a perverted sense of humor.

"No one who subsequently handled this advertisement as it went through the various stages of engraving, proving and final printing of the publications noticed that the supposedly illegible type, when placed under a magnifying glass, revealed the questionable material referred to.

"To our thousands of friends and acquaintances in the industry it is unthinkable that our company could have possibly had any conscious part in such a deplorable incident, and we hope that this explanation will make the whole situation clear in the mind of anyone whom it reaches.

"The matter has already been called to the attention of the inspector in charge of the General Post Office in New York City, who now has all the circumstances under investigation.

"We realize, in making this statement, that we may be bringing the matter to the attention of many who otherwise would not have been advised of it; however, we feel that complete candidness is called for and we feel confident that our good faith will be unquestioned and our good-will unimpaired."

HYGRADE SYLVANIA CORPORATION
B. G. Erskine
President

The Cover

WE HAVE to thank Mr. William P. Schweitzer, W2JKQ, for the photograph used up front on this issue. The shot was taken by Mr. Schweitzer during the construction of a new rotatable directive antenna at his station.

56-Mc. Transatlantic Reception of WlKH

W1KH heard by Bill Mulliss, Neerholm, Bath, Somerset, England, on Dec. 12, 1609 GMT; on 56.2 Mc. CW; report is QSA4 R7-5, slightly chirpy. Bailey says checks with log and also his note is slightly chirpy. W1KH using xtal rig, 250 watts, feeding into vertical half-wave through Collins coupler and Zepp feed. No reflectors.

All-Continent QSO Sets New Record

W4DLH and his gang of all-continent round table cohorts really went to town on January 4th. From 1318 to 1321 GT W4DLH talked to VU2CQ, VU2CQ to G5ML, G5ML to HK5AR, HK5AR to VK4JU, VK4JU to SU1SG and SU1SG completed the circuit back to W4DLH. All continents were in contact and a span of 54,100 miles had been covered in 3 minutes and 20 seconds. These contacts were made by radiotelephone on the 14-Mc. band. Tie that one!
Audio Peak Limiter for Speech Amplifiers

Automatic volume compression as a means of preventing overmodulation in 'phone transmitters has been advocated in a number of articles in recent QST issues. A rather simple and easily-installed system, involving operation only over a single stage, is shown in Fig. 1. It was worked out by M. C. Bartlett, W9JHY, and has proved to be quite satisfactory in practice, since overmodulation is practically impossible once the operating conditions are set. There is no perceptible effect on the speech quality.

A pair of 802's, operating as Class-AB amplifiers, is used to drive the Class-B grids. In W9JHY's case the driver is coupled to the Class-B input transformer through a 200-ohm line, and the audio voltage appearing across the line is applied to the primary of transformer T1, whose center-tapped secondary is connected to the plates of a 6H6 used as a full-wave rectifier. The rectified audio voltage is suitably filtered and applied as bias to the suppressors of the 802's. Thus the greater the output signal the greater the bias developed, and in turn, the lower the amplification in the 802 stage. The 6H6 cathode is given some initial bias through R6 so that the automatic control does not function until the signal reaches a predetermined level.

In connection with adjustment of the circuit, W9JHY writes:

"Adjust R1 until the two tubes draw 60 ma. (no signal), which gives about Class-AB operating conditions.

"Now, with constant tone input, measure the voltage appearing from suppressor to ground. This should be about 1 volt, on a high resistance voltmeter, when the Class-C stage is being modulated 75 per cent to 80 per cent. Then, when the lag of the R-C circuit is taken into account, the transmitter will not go over 95 per cent modulation. The setting of R6 controls the threshold bias on the 6H6, which, if being fed a high enough voltage by T1, will nicely control the gain of the 802's.

"As an indicator of modulation percentage, or rather of the operation of the compression circuit, a voltmeter (0-100 volts d.c.) can be connected from suppressor to ground, although this will make the gain-change more rapid and tend to upset the G/R ratio, which must be right. Perhaps a variable resistor at R4 might be a good idea. It is desirable to set the gain control at some point where the compression is not brought into play, since, after all, this system is only intended as a protective measure, and probably better quality will result if no compression voltage appears on the suppressor.

"If this plan is employed where the 802's are driving the Class-B stage grids directly, it stands to reason that the higher voltage which appears at the Class-B grids will necessitate a higher threshold voltage, obtainable with a potentiometer of a proportionately higher resistance at R6. With voltages of this value, an 80 rectifier could be used to advantage, in place of the 6H6.

"The transformer T2 is the only part that proved troublesome. I finally picked on an old..."
high-ratio General Radio transformer that has bumped around the junk box since the days of two-filament audions. I believe it is either 6:1 or 10:1 ratio, but almost any high-ratio transformer will work; it should develop about 150 volts audio across the secondary terminals on external peaks.

In W9JHY's speech amplifier, the 802's simply replaced a pair of 2A3's formerly used in the driver stage.

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Regeneration Control

The performance of the two-tube receiver described in the October QST, can be markedly improved by operating the screen of the detector at a constant voltage and varying the r.f. feedback as shown in Fig. 2.

The semi-variable resistor replacing the potentiometer and fixed resistor may be of almost any convenient value, but should be of such physical dimensions that the screen voltage may be easily controlled. A screen voltage of about 25 volts was found to be optimum, a higher voltage causing an annoying and persistent fringe howl.

The electrolytic condenser C6 was found unnecessary in the modified circuit, since there is no possibility of scratch from moving contacts.

The advantages of this method of controlling regeneration are: greater stability, since the detector is operating under constant conditions; noiseless control of regeneration with no moving contacts; fewer parts necessary, making for greater compactness. There is an almost imperceptible transition into and out of oscillation, with complete absence of back-lash.

This method of regeneration control may be adapted to any regenerative circuit with but minor circuit changes.

---Edmond L. Piesen, 48 Franklin Ave., Saranac Lake, N. Y.

Inexpensive Crystal Selector Switch

Although there are several types of crystal-selector switches on the market, they are relatively expensive; the simple switch assembly described here easily can be constructed from spare parts on hand in the average amateur station. The materials required are:

10 General Radio type jacks (see note below).
1 Single-gang 6-point switch (Yaxley No. 6203).
1 13/4" x 1/2" bakelite strip 1 1/2" by 5 1/2".

Note: These jacks will fit the standard pin plugs used on the plug-in type of crystal holder. If a round-type crystal holder is used which plugs into the standard 5-prong tube socket, tube-pin type jacks should be used.

The jacks are assembled on the bakelite strip as shown in Fig. 3 and are spaced 3/4" apart—standard spacing for five-prong socket. The distance between adjacent levels of jacks will depend on the thickness of the crystal holders used. The

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2 Chambers, "Modernizing the Simple Regenerative Receiver," QST, October, 1937.
34" separation shown in Fig. 3 is based on the thickness of the regular rectangular type of holder.

Fig. 4 is the schematic diagram for the wiring of the switch. All leads should be kept as short as possible, especially the wire to the crystal oscillator grid, in order to minimize the distributed capacity.

If your present transmitter is already equipped with a five-prong socket mounting for the crystal holder, this crystal selector switch can be arranged to plug into the socket by adding a 1 by 1 inch bakelite strip, equipped with two tube pins for plugging into the socket. This small bakelite strip is attached to the bottom of the switch mounting by two small brass angle brackets.

The crystal selector switch described above has been used at W2PF-WLNA for the past year and a half without any trouble. It is indispensable in changing almost instantaneously from the special Army Amateur 3497.5-ke. frequency to the 3510-ke. amateur frequency and back again, which is often required during AARS drills or in handling traffic. Adjustments of tank condensers are not usually required for frequency shifts not exceeding 20 kc.

--David Talley, W2PF

Rhombic Antenna at HH4AS

HH4AS was constructed with a view to maintaining contact with relatives living in Connecticut while the writer was on a two-year assignment with RCA Communications. It was necessary to decide whether to erect a high-power rig and pay ten cents per watt to the Government or to use low power with a beam antenna. The latter was decided upon.

As a preliminary experiment a very small transmitter was made using crystal on 7 Mc. into a 41 which doubled to 14 Mc., with a 79 receiving tube in the final. Power output was three watts. This flea-power rig was connected to a half-wave doublet and experiments started. During this month a station was located (W1GCX) who lived only a mile from the writer's relatives, W1GCX fortunately is a splendid operator, but it was necessary to give him a readable signal at all times if we were to keep a Haitian circuit open.

After much wandering around the nearby fields looking for space, a "V" antenna was decided upon. This "V" was two wavelengths on each leg, with an angle of 95 degrees at its apex. Feeder's were matched to the antenna through a quarter-wave stub. With this "V" HH4AS began putting in commercial signals to W1GCX, and schedules were kept faithfully with 100 per cent success. However, after a visit to the A.T. & T. phone station in Haiti and observing operations with the rhombic, the idea persisted that I could fold one wave on each leg of my "V" and, with a resistor in the center, form a rhombic with very little trouble. I had never seen reports on a one-wave rhombic, but experiments would prove or disprove its efficiency. This was done a short time ago, and on the first night I got reports of 579, 589, 569 from Hartford, and stations along the center line without solicitation commented on my signal strength increase. The W1GCX-HH4AS circuit is operating as well as most commercial circuits. Very seldom do I have to furnish an RQ. On several occasions I have received reports of 599 in Ottawa. The general layout is shown in Fig. 5.

My purpose in writing this is to try and show that one-wave rhombics are easy to construct and have decidedly unidirectional qualities. Hams with rhombic minds need not wait until they find space for three and four waves on each leg to get an efficient signal squirter. For verification, stations north of Haiti may hear what five watts sounds like with a one-wave rhombic and judge for themselves whether it is worth the trouble. HH4AS is on every night at 8 P.M. on 14,400 kc. and now uses one 6L6 in the final with an output of 5-6 watts.

--L. F. Sherwood, Supt., RCA Communications, Inc., Port Au Prince, Haiti

FB7 Receiver Changes

Here are some suggestions from G. N. Du- gonis, W3COZ, for slight changes in FB7 and FBX receivers which will make operating more convenient and possibly effect some improvement in performance. He writes: "These changes, although not radical, will be beneficial. First, the beat oscillator control is inside the case, and it is annoying to have to lift the lid to make a change in the pitch of the signal. The circuit of Fig. 6 shows how to eliminate this. A 50-µµfd. variable condenser is connected from the cathode of the beat oscillator to ground. The best place to put this extra control is in place of the b.o. switch. Be sure the lead is in a well-grounded shield. To stop the b.o. for phone reception, bend

(Continued on page 110)
Devoted to the interests and activities of the

INTERNATIONAL AMATEUR RADIO UNION

Headquarters Society: The American Radio Relay League, West Hartford, Conn.

American Radio Relay League
Associazione Radiotelegrafo Italiana
Canadian Section A.R.R.L.
Deutscher Amateur- Sender- und- Empfangs- Verein
Experimental Radio Society of Egypt
Fédération Hertzienne Belge
Irish Transmitters Society
JAPAN

A.R.U. NEWS

Conducted by Byron Goodman

Calendar:

The December copy of the biannual Union Calendar is being transmitted to the member-societies as this is being written. Three new societies have been unanimously voted into the Union: the Réseau Luxembourgois des Amateurs d'Ondes Courtes (R.L.), Luxembourg, the Experimental Radio Society of Egypt (E.R.S.E.), Egypt, and the Associazione Amatori Romani de Unde Scure (A.A.R.U.S.), Roumania. Speaking on behalf of the other members of the Union, the Headquarters extends these new members a cordial welcome and hearty good wishes. By unanimous consent, the Fédération des Emetteurs Belges (F.E.B.) is declared to be the member-society of the Union for Belgium. This is the result of a request by the Réseau Belge, since the F.E.B. represents a combination of the R.B. and the Flemish-speaking Vlaamsche Radio Bond. The Union now totals 32 member-societies.

A proposal by the R.E.F. to add another delegate to the Cairo Conference was voted down, and the delegation consists of Messrs. K. B. Warner, Arthur E. Watts, and Paul M. Segal. They will be assisted by members of the Experimental Radio Society of Egypt. Mr. Warner, as Secretary of the Union, is named chairman of the delegation. The delegation is instructed to endeavor to obtain additional frequencies and other privileges to as great an extent as circumstances will permit, without endangering present frequencies and regulations. Messrs. Warner and Segal are on route for Cairo at the time of writing; they will meet Mr. Watts in Cairo.

It is possible that the I.A.R.U. delegation will not be the only amateur representation at Cairo.

There is a possibility that a member of the R.C.V. will be appointed to the official delegation from Venezuela.

A clarification of the QSL-card forwarding policy was effected by the adoption of an amendment to Miscellaneous Rule No. 3 which reads: “Member-societies shall agree to accept QSL cards addressed to non-members of the national society, provided that such non-members collect or pay for the reforwarding of the cards to them.” Prior to this, some societies had been reluctant to forward cards for non-members, and the amendment will insure delivery in those countries.

Proposal No. 35, to prohibit relationships between member-societies and rival, competitive or dissenting societies within the territory of other member-societies, was adopted by an almost unanimous majority.

Two new societies have been proposed for membership: the Esti Raadio Amatööride Ühing (Estonia), and the Radio Club de Cuba (Cuba).

Some discussion resulted from the proposal by the W.I.A. to hold each year six large international continental contests. Several of the societies are strongly in favor of such a move, feeling that if each continent is given a chance to run their own DX contest each year, under the auspices of one or two of the member-societies of that continent, a much better all-around arrangement will result. When more societies have been heard from, it will be possible to formulate a majority opinion, and it is quite possible that some such system of handling DX contests will be used during 1939 and afterwards.

Further discussion on the systems of signal-reporting resulted in a more-or-less general ac-
ceptance of the present scale. Discussion seems to center on the "T" portion of the system, several societies feeling that it is not an accurate index to the quality of one's signal. For example, the S.A.R.R.L. suggests a "T" system reduced to B, G, and X, standing for bad, good, and crystal, respectively. Thus a signal report would be 57X, 46G, etc. If a detailed report of the sender's note is asked for after having received a "B" note report, then some scale such as the one suggested by the D.A.S.D. could be used.

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Australia:

The W.I.A. informs us that their amateur convention will be held at Sydney on April 12-18, 1938. This date corresponds with the World Radio Convention, being held from April 4th to April 14th, under the auspices of the I.R.E. (Australia), and the whole thing is part of the celebrations associated with the 150th anniversary of Australia. Many overseas engineers are expected to attend the radio convention, and all amateurs will be more than welcome.

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South Africa:

After March 1, 1938, all call signs in the Union of South Africa will be confined to the ZS group, and the groups ZT and ZU will no longer be used for amateur call signs. New ZS calls have been issued to amateurs whose call signs commenced with ZU or ZT, but they cannot be used until March, 1938. The change has been brought about by the S.A.R.R.L. as a result of representations made to the Postmaster General, wherein it was pointed out that it is desirable to differentiate between amateur call signs and all other call signs. ZS3 will still be the prefix for Southwest Africa.

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QSL:

Corrections in the QSL Bureau list of October, 1937, are given below:

Australia: Ray Jones, 23 Landale Street, Boxhill, Victoria.

Austria: Willy Blaschek, O.V.S.V., Bahngasse 29, Klosterneuberg.

Italy: A.R.I., Viale Bianca Maria 24, Milan.

New Zealand: N.Z.A.R.T., Box 489, Wellington.

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Awards:

For those of you who like to add certificates to the wall, we list two new awards.

The Wireless Institute of Australia offers a W.A.S. (Worked All States) award, with the following rules:

1. Applicants must be financial members of W.I.A.

2. The following are considered as states: VK2, VK3, VK4, VK5, VK6, VK7, VK8 and VK9.

3. QSL cards must show clearly that any six states have been worked on each of any four bands.

4. The 24 cards must be forwarded to the Divisional Secretary for perusal and he will notify Federal Headquarters of the decision of his council on the suitability of the presented cards. On the receipt of this advice FHQ will mail the certificate direct to the applicant.

This award should be worth working for, since it is not easy for someone outside of Australia to work six districts on four different bands.

The WBCN (Worked British Commonwealth of Nations) award, offered by the S.A.R.R.L., has practically the same rules as WBE, with the exception that the applicant must be a member of the S.A.R.R.L. (For details of the WBE award, see page 50, March, 1937 QST). Also, all contacts must have been affected after Jan. 1, 1937.

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Sweep Circuit Considerations

(Continued from page 41)

6C5 proves adequate for the low frequency. The amplitude available from these circuits and their linearity make them completely suited for the television receiver. They are very "sure-fire" in operation and do not require any special transformers in the pulse-generating portion. In circuits of this type a sharp negative pulse can be obtained from the plate of the second tube—a pulse which may be applied to the grid of the cathode-ray tube to bias it negative during return traces. The connection is shown in Fig. 3. This is a highly desirable feature for some work as it removes the return trace from the pattern and allows the ratios of trace to fly-back time to be much lower without marring the pattern by diagonal lines. It is not necessary to use this pulse when receiving television pictures, of course, as special pulses of the proper amplitude and phase are transmitted for this purpose in the television signal itself. Incidentally, this type of sweep circuit has been used by the writer to generate sweep frequencies as high as 6 megacycles.

It is suggested that the experimenter work first with the basic circuit of Fig. 3 before proceeding to the construction of the complete sweep circuit. Without a thorough understanding of their operation, the adjustment for proper amplitude and complete linearity is an extremely difficult procedure. But the circuits, in spite of the large number of tubes used, are actually inexpensive to build and completely satisfactory in their operation.

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In the discussion of Fig. 7 in Mr. Wilder's article in the January issue, several obvious errors were made (by the printer!) in referring to the RC circuit $R_{13}$, $C_5$. The resistor was described incorrectly in several places on page 33 as $R_5$ while the condenser was miscalled $C_5$. Also, the $R_{10}$ mentioned in line 8 on the right column of the same page should have been $R_{14}$. Sorry!
OPERATING NEWS
Conducted by the Communications Department

F. E. Handy, Communications Manager
E. L. Battey, Asst. Communications Manager

THE opening period of A.R.R.L.'s Tenth International Contest, March 5th, will mark a decade of growing interest in international tests. The first was held in May 1927, the second held in February 1928, and in latter years all have been scheduled in March. The earliest contest resembling in any fashion to-day's product followed first general transatlantic and transpacific working by three or four years. Participation? A success from the start, more hams have taken part with every passing year, with but one or two exceptions. From 180 logs in its first season the "ninth" brought us 1391 telegraph and 376 radiotelephone logs. This is indicative of even much wider participation, since large success and larger scores tend to reduce the number of logs that come from men with limited time who are just taking a crack at some of the elusive DX that always comes out of hiding for the fracas.

The DX highlight of the year is matched in its W-VE appeal only by the Sweepstakes. Changes in rules have become increasingly rare of late years, the DX competition holding to the form of exchange proved most efficient in bearing vital station reports and contest identification. This stability in system of working is, of course, vital and important in ensuring that all amateurs understand fully and quickly how to take part. Other amateur societies have adopted several points of the system used in our March activity, in recent years in devising popular contests along parallel lines, no mean compliment in itself. Disqualifications based on competent observation have been made from the start, to insure necessary adherence to government regulations and enforce sportsmanship in so far as practicable. The problem of supervision increasing with greater participation, we are asking Uncle Sam to assist in this policing effort this year through every one of his several monitoring stations.

This portion of the long-term solar cycle is calculated to give excellent DX transmission conditions. Radio weather is, of course, like terrestrial weather more or less unpredictable at times. But the favorable seasonal factors, and the tested rules for this activity that make for enjoyment and success, are all along customary lines.

Ten years of DX contests is a lot, in anyone's life. With curiosity and interest we dig back in the QST file and note the participants in the early DX affairs. We wonder how many hams who take part in this one will be taking part in their tenth? Probably not many, but a few we hope! At least one or two calls in the early lists ring familiar—and the pages fairly glow with the listings of DX records of past years. A.R.R.L. strives constantly to bring success and enjoyment to its members in their pursuit of amateur radio. The tests held in March have to be announced a month early so the announcement can reach amateurs on the other side of the globe in time. The auspices are right. The plans are announced. May we wish each participant a good measure of success in this activity dedicated to the DX group! There may be only one c.w. or 'phone winner for your Section or continent—but every ham who works some DX and reports his work is sure of personal pleasure, and is adding his accomplishment to the history of amateur radio.

Speed! How fast can the human voice span the globe? From Coral Cables, Florida, just as we go to press, comes a report that Official 'Phone Station W4DLH, with VU2CQ, G5ML, HK5AR, VK4JU and SU1KG set up a new all-continent round table, January 4th, beating the past record for completing such a get-together by making it in just three minutes and twenty seconds!

Speaking of shattering records, some were broken in the A. R. R. L. Sweepstakes. Sixteen operators topped last year's high of 403 contacts. All 70 League Sections were worked by W6MVK (c.w.) of the San Joaquin Valley, who made 469 QSO's, 96,180 points. All 70 Sections were also worked by W6ITH O.P.S., East Bay Section, with 343 QSO's, 48,020 points. Here are the stations that appear to have topped last year's highest score:

W6MVK W8BYM W9TYF W5KC
W3BES W9FFU W9IU W1RY
W2IOF W9RQM W4YC W9RSO
W1EZ W8OFN W8DOD W9VKF

They are each likely to prove Section winners, and more power to them. When claimed scores are checked, all winners can be announced. The above stations are not, strictly speaking, in competition with each other at all, each striving for separate Section and club awards. Stations in different Sections have different transmission condi-

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tions, different “accessibility” to other Sections and different problems in getting out. Work between remote Sections, therefore, cannot be accurately compared by scores. Note that both stations to achieve honor in working 70 Sections were on the west coast, and “just!” made P. I. to get under the wire. At last something that is proved to be done with greater ease from the coast? We refuse to say it until definite check of the licensed station distribution has been made and our records of issuing W.A.S. tickets to all have been consulted. Hi.

—F. E. H.

Try 56-Mc. DX!

DON'T forget that M.R.A.C.-A.R.R.L. Trophy that is offered for the first certified U. S. A. intercontinental two-way work on the 56-60 Mc. band. Work over great circle distances in excess of 2000 miles counts. See page 35 of July 1937 QST for details. The time is near, we think, when someone will lay claim to that first DX trophy.

Speaking of coast-to-coast and possible transoceanc work on 56 Mc., it is interesting to note that recent Bustan measurements of layer height and a tabulation of normal incidence critical frequency as taken at Washington at noon give promise, in analyzing weekly records, that this is the logical season to try for new records. In the winter the F-layer critical frequencies in the daytime exceed any values found in the summer. A broad diurnal maximum occurs centered at about 1:30 p.m. local time. Early December measurements indicated a maximum useful frequency (for F-layer transmission) of 38,700 and 48,000 kc. The measurements released for December 22nd indicated 51,000 kc., as the maximum useful. A trifling extension of the condition indicated on this date should permit long distance 56-Mc. work.

The possibilities for 2500- or 3000-mile success are even greater than for 2000-mile work. So we suggest that at the time when the sun is at the zenith, attempts to establish coast to coast communication utilizing 56-60 Mc. frequencies should be well worthwhile. The best time might well be 1:30 p.m. EST, 12:30 p.m. CST, 11:30 A.M. MST, 10:30 A.M. PST, or two hours before and after this time, for serious workers to break through to a new 56-Mc. DX record!

A class in Amateur Radio will be conducted at Crane Evening School, Jackson & Oakley Blvds., Chicago, starting early in February.—Room 301, 7:45-9:45 p.m., Tuesday and Thursday. Code and theory will be covered.

Briefs

The Naval Communication Reserve, Third Naval District, is conducting a series of sixteen weekly broadcasts over station WNYC, New York. The first of these Sunday afternoon broadcasts was on January 9th; the time is 2:15 p.m. EST. Every amateur will find the series interesting, whether an N.C.R. member or not.

A. W1LEZ heard a very loud “110-meter ‘phone” harmonic on 3725 kc. He listened to see what call was signed. In his own words:—“You could have blown me over with a rephyr when he said, . . . This is W9— operating portable in Grand Island, Nebraska.”

And then there is the fellow who wants to know if a “QSL” (a colored one) from Grand Island counts for Nebraska towards W.A.S.

A. W9DDZ, Steamboat Springs, Colo., is conducting code practice on 1875.5 kc. on Tuesdays from 5:30 to 5:50 p.m. MST.

QRR Work in Oklahoma

ONCE more did amateur radio play an important part in an emergency. Once more were the amateurs of Oklahoma given an opportunity to demonstrate their ability to be of great assistance. Another achievement can be chalked up for Amateur Radio. The occasion was one of those midwestern dust storms, with wires covered with ice and power and communication by land wire disrupted. On December 12th, Oklahomans arose to beheld a cloudy, misty sky, with the ceiling some 200 feet and visibility less than a half mile. By Monday morning, the 13th, the mist had changed to a steady drizzle of rain and the wind had changed to the north, bringing the temperature down to the freezing point. By M.C.E. formation became heavy and landwire communication began to falter. At this time, Harold Hartman, W5QL, got a rig on 3.5-Mc. c.w. and established contact with W5CWL of Enid, who was using 3.5-Mc., phone. Since the Oklahoma Gas and Electric Company leased telephone line failed at this time, these two stations maintained contact throughout the night.

Since W5CWL was not accustomed to working c.w., it was decided matters would be facilitated by use of phone at both ends. Oklahoma’s P. A. M., Jerry Sears, W5AIR, volunteered his services. W5AIR went on the air at 8:00 a.m., Tuesday, with W5QL doing the most of the operating, and was on continuously until midnight, Wednesday. Communication was maintained with W5CWL, and a portable self-powered outfit was loaded on a truck and sent to El Reno, where it was operated as a portable by W5CJI. Contact was first established with W5EFV at Alva. These three stations worked through the day handling traffic for O.G. & E. W5CEZ was out hurriedly constructing a new antenna when he was called by the O. G. & E. Ponca City plant, stating that their telephone line had gone out and they wanted to get in touch with Oklahoma City. An antenna was gotten up to replace the one broken down with ice, and contact was established with W5AIR. Contact between W5CJI and W5EFV in Enid, was also established, as well as with W5DTU and W5CWA in Oklahoma City. At this time W5CJI came on the air at Enid and relieved W5CWL to let him get some rest. More operators were pressed into service at W5AIR. In addition to W5AIR and W5QL, W5AR and W5CJI assumed reduced roll at W5AIR. Two operators stayed on the job at W5AIR all the time, one at the transmitter and one at the telephone. W5AIR maintained communication with W5CJI, W5CJI and W5CWL until midnight, Tuesday, when the operators were able to maintain contact with W5CWB throughout the night. W5CJI and W5CJI got a rig on 1.75-Mc. ‘phone and cleared some important traffic with W5DEW while skip was still on 3.5-Mc. Since it was possible to get through to Ponca City from Oklahoma City, telephone, W5CEZ, W5CJI and W5EFV turned in at midnight and resumed again at 6 A.M. On Wednesday the rain had ceased. It warmed up around noon, ice began to fall and troubles increased. Ponca City failed to contact El Reno and Enid at noon, but was restored around 4 P.M. At this time there were as many as 44 towns in the vicinity of Enid and El Reno that were without means of communication, and many were without power. Enid was completely isolated except for contact by radio. Contact was maintained all day Wednesday and through the evening up to midnight between Oklahoma City, El Reno, Enid, Ponca City and Alva. W5AIR had been on the air continuously since 8 A.M. the day before, with two operators on duty all the time.

Radio contacts were resumed Thursday morning and continued throughout until 9 P.M. The O. G. & E. got their leased line in operation from Ponca City to Oklahoma City, and were able to get through on a toll line once an hour to Enid. W5AIR, CXU, CEB, and EEF secured their watches and turned in for some badly needed rest. W5CEZ and W5CJI were assumed until 11 P.M. during the most of the night. Communication between Enid and Oklahoma City coming by radio between Enid and Ponca City, and by telephone from Ponca City to Oklahoma City. At 11 P.M. these two stations were advised that no further necessity for radio communication existed.
Approximately 200 messages were handled for the O.G. & E., as well as a number of personal messages from men out with repair crews to their families at home. Much credit is due W5QL for his work in organizing the radio set-up and for the manner in which he stuck to the job of operating, since the weather prevented W5YI from operating all by himself, and he did splendidly. W5QL, AIR, CUX, AKB, CJC, CEB and CWL put in some long hours of operating. W5CEZ, GFT, QVA and EON spent many long hours of watching and listening in, functioning when needed.

---Carter L. Simpson, W1THZ, S.G.M., Oklahoma

Susquehanna Emergency Net

The Susquehanna Emergency Net membership is now complete and includes the Susquehanna River, Chenango River, Chemung River, the Juniata River and their tributaries. The primary purpose of the net is to furnish communications to cities and towns along these watersheds should any disastrous floods occur, resulting in the loss of normal communications.

It is hoped that the S.E.N. will prove to be a contribution to the general safety of all against the perils of devastating floods such as have occurred in the past. The readiness of this net to serve has an important bearing upon the work of the American Red Cross because the S.E.N. not only backs up the systematic reporting of river stages, but also can act as an official channel of communication between the heads of the local chapters and the headquarters in Washington.

Interconnected electric companies have a vast system of land and carrier communications that may be of great value during disasters. Information relative to the progress of future floods will be thus transmitted. Also, when telephone and telegraph fail, these sections will be patched up either by amateur radio or by privately owned communications circuits. The utility companies will, of course, use their grapevine of telephone circuits as a second line of defense and amateur radio as a last resort, because the utility operators are conversant with their requirements. On the other hand, the amateur radio circuit can be worked for normal relief, etc., having the utility circuits as a second line of defense.

It will be impossible for the Weather Bureau to make forecasts of river stages at various points along the river unless data pertaining to rainfall and river stages are received from index points along the river promptly. From these data, the Weather Bureau will be able to follow future floods and make more accurate estimates. Unfortunately, when a flood is forming, the normal communications systems may become burdened with various types of traffic which delays these reports. To preclude this situation, photographs of easily identifiable structures or buildings in the flooded area were made. These photographs were marked with a scale by which gauge heights could be ascertained. A series of these photographs will be made available to the amateur and other responsible persons in each locality. From these photographs, it will be possible to get stage readings after the river leaves its bounds. With the data collected and curves of the 1938 flood passage, fairly accurate estimates can be made of the flood progress.

Key stations in the various localities are being instructed to make their services known to their local relief agencies. The American Red Cross headquarters at Washington has also instructed their relief administrators in the localities of this service.

The S.E.N. operates on a frequency of 3910 kc., about 75 per cent "phone, the remainder c.w. All stations appointed for this work were chosen for their past experience, availability during disasters and their location to the centers they serve. Serious thought was given to power supplies at such points where past experience has shown that utilities have failed. Where there is not a reasonable margin of safety from loss of power, the key stations have built emergency transmitters and receivers; some to operate from batteries and others from gasoline engine-driven alternators and, in one instance, there is available a steam engine. Following is a list of key stations by call: W8DHO, W8CHU, W8MFD, W8AYG, W8CVS, W8CIA, W8MAH, W8SLM, W8QJP, W8DEC, W8V1, W8BKT, W3WX, W8UR. Where possible, alternate stations have been appointed: W8CNA, W8EQQ, W8AVK, W8CEX and alternate control station W8AVX. A supporting membership, which takes no part in the drills but has come forward offering service during disasters by doing patrol duty and to relieve the net of traffic, is as follows: W2BZK, W2LV, W2FJU, W3QV, W3BEI, W3ADM, W3ELM, W3BEC, W3FER and W8GWH.

The first drill took place on November 28, 1937, at 8:00 A.M., and required but twenty-eight (28) minutes, with only two stations not reporting. After official business, the net was turned over to the key stations, resulting in a round table of general discussions. It is the purpose of the net to operate bi-weekly on Sundays at 8:00 A.M. until after the spring floods; drills will then be reduced to once a month to keep the net active.

---Chan. G. Landis, W8UA

1.75-Mc. DX Tests

A preliminary report on the 1.75-Mc. DX Tests held on each week-end during December and January lists contacts between W1BB and G2DQ, G2FL and G6SQ. Contacts between G2PL and W1BB were on December 11th and December 18th. W1BB worked G2DQ and G6SQ on the week-end December 18th-19th. G2PL has heard G3GCK, W3DAE, W2ON and W3EMT (believed to be W3EMM). G6SQ heard W3GCK and W2ON. W1EZ heard G2PL, G6SQ and G2DQ. W1BB lists the following W participants in the tests: W1IXX, W1LY, W9FOC, W2EEX, W1EZ, W2ENQ, W8BMS, W2HO, W1BMW, W3GLV and W2DUE.

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The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in October QST (page 50): W1AXL, W4EBZ, W5GCTM, W8HCS, W9DEA, W9S6L, W9YWE, VE2HI, VE2HT.

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PRIZES FOR BEST ARTICLES

The article by Mr. Eric Adams, VE3ALG, wins the C.D. article contest this month. Each month we print the most interesting and valuable article received marked "for the C.D. contest." Contributions may be on any phase of amateur operating or communication activity (DX, 'phone, traffic, rag-chewing, clubs, fraternalism, etc.) which adds constructively to amateur organization work. Prize winners may select a $15 bound Handbook, QST Bicentennial Emblem, 620 cards, a TSX report, or any combination of A.R.R.L. supplies of equivalent value. Try your luck. Send your contribution today!

Does This Mean You? By Eric Adams, VE3ALG*

THERE are among the many operators frequenting the ham bands today those who produce much gnashing of teeth on the part of other operators. We have the fellow who sends a series of badly distorted CQ's for two minutes solid and then, after signing once in an equally sloppy fashion, stands by to look over the band. Another common curse is the lid of many frequencies who, with his rig for at least twenty minutes, quite ignoring the number three, the amateur who preaches a good listening monitor seldom lies.

Trans-Pacific and Other DX Schedules

The following data will aid in routing traffic to Hawaii, P. i., Guam, Alaska, Canal Zone, etc.

W6CUU, Beverly Hills, Calif., schedules KAIHR daily except Saturday and Sunday at 7:00 A.M. PST. ... W6IOX, Santa Barbara, Calif., schedules K6OGD and K6NFX daily at 1:00 A.M. PST. ... W7DUE, Portland, Oregon, schedules KAIHR. ... W7NE, W6GXM and W6ETL each schedule K6GCD/WDLB and KAIHR/WLKP on A.A.R.L. channels. ... W7FPN, Aberdeen, Wash., schedules K6OHX three days per week. ... W6LNS schedules KAIHR daily except Sunday. ... W6UJ3 schedules KAIHR. ... K6NFX connects daily with K6GCD, K6CLL and KAIHR. ... W6DE, Los Angeles, schedules K6OHX daily. ... W6TH6 schedules KAIHE on 14-Mc. phone. ... W7FYK, Longview, Wash., W6DH, Los Angeles, Calif., and W7EQB, Astoria, Ore., schedule K7FSX, Seward, Alaska. ... W6RFC, Oakland, Calif., schedules K6GCD and K6GCI long standing with Alaska. ... W7GMG, Bellingham, Wash., and W6PCK, Los Angeles, also schedule Alaska. ... W7EBO, Los Angeles, schedules XU8AG at 4:30 A.M. PST, daily, and KAI8L at 5:00 A.M. PST, Wednesday and Sunday. ... W6FWJ, San Diego, schedules K6GCL. ... W6TH6 schedules KAIHE on 14-Mc. phone.

One of the most important parts of this drive must be the adoption of the policy of giving honest signal reports (and this refers to both notes and modulation). We must recognize the dilemma in which an operator finds himself when the majority of the fellows he works say "TI9" and on almost negligible percentage say "TO" (or whatever the true report happens to be). Who is he to believe? He usually comes along with the majority. We will never win the battle against bad notes and overmodulation until we all take pains to give accurate reports. And, of course, we must practice what we preach.
and works as follows. O4A-US is the station of the Carnegie Institute Magnetic Observatory at Huacayao, Peru. Considerable traffic is handled between Peru and the Institute in Washington, D.C. Leaving Peru at 3:00 p.m. EST, traffic reaches W4PL at 5:30 p.m. CST, and goes to W3CIZ (the Washington delivery station) at 4:00 a.m. the next morning. 14 Mc. is used from O4A-US to W4PL and then 3.5 Mc. or cross-band 7/3.5 Mc. to W3CIZ. Schedules are daily except Sunday. This circuit is known as the Southern branch of the "Hit and Bounce Trunk Lines"... the traffic hits a station and bounces right along to the next without delay!

The western branch of the "Hit and Bounce Trunk" consists of W3CIZ-W4PL-W5MN-W61OX-K6GKN-K6NXD-W6LBB. W61OX meets the K6 stations at 3:00 a.m. CST. At 5:00 a.m. CST, using 7 Mc., he contacts W4PL. Also listening to are W5MN and W3CIZ, but their rigs are on 3.5 Mc. W4PL copies all messages. Those for the Southwest are sent first, and then W4PL, working cross-band, gives W5MN his fills if needed. Then W61OX puts through those that go to the eastern areas, and W4PL fills the gaps for W3CIZ. Lastly come those for the Southern States. Fire Prevention Week has become an event of International importance. For the past three years radio amateurs throughout the world have played an important part in the observance of this important event. 1936's observance was aided by the amateurs through station W61XHP, owned by the late Paul Potter, when Fire Chief Ralph J. Scott of the Los Angeles Fire Department exchanged greetings and methods of fire prevention with Fire Department Chiefs and Civic Executives in Buenos Aires, Argentina; Chasaran, Chile; Sao Paulo, Brazil, and Birmingham, England, through a relay from Pittsburgh, Pa. Again, in 1937 during Fire Prevention Week, Chief Scott compared notes on a nation-wide hookup of amateurs arranged by Henry Harris, W6LQ, and composed of W5CUD, W2UHQ, W4AKY, W9FJ, W9USJ and W9WE.

The scene at W6MYO, A.R.R.L. Official Phone Station, Los Angeles, during Fire Prevention Week demonstration on October 6, 1937. Seated, left to right: Fire Commissioner Edward W. Lewis and Deputy Chief Bert M. Blake of the Los Angeles Fire Department. Standing: E. E. Wyatt, Jr., of Los Angeles Junior Chamber of Commerce, were present at W6MYO. R. H. Morse, W5GKQ, of Dallas, Texas, had present at his station Chief Sidney Hanson and Fire Marshal L. M. Funk of the Dallas Fire Department. Fire Chief Springer of Texarkana, Texas, was present at W5BEK. Frank Martin, Texarkana, Bill Seymour, K6NQZ, Hilo, Hawaii, had at his station Fire Chief Johnson Kahil of Hilo and Deputy Sheriff Peter N. Pakels of Hawaii County.

Due to the hook-up arranged by O.P.S. W6MYO, these different Fire Department Executives were able to successfully discuss matters of mutual interest and benefit to each other in their never-ending fight against destruction by fire. A large number of listeners have reported reception of this demonstration to W6MYO. Special QSL's will be sent to all those who have sent in reports.

"Don M. Draper, W6GXM, S.C.M. Los Angeles"

During the month of May W6OML had the interesting experience of operating a 56-Mc. portable-mobile rig aboard a large purse-seiner, the Pop Ernest, which transported the Monterey Sea Scouts from Monterey to Santa Cruz to attend the Sea Scout Regatta. Communication was maintained with W6NTU, W6COO and W6JRU in Monterey. Amateur radio received good publicity from this work; parents of the Scouts thought it an excellent safety measure.

Fire Prevention Week

The week in October which contains October 9th, the anniversary of the great Chicago fire, is annually proclaimed "National Fire Prevention Week" in the United States. Fire Prevention Week has become an event of International importance. For the past three years radio amateurs throughout the world have played an important part in the observance of this important event. 1936's observance was aided by the amateurs through station W61XHP, owned by the late Paul Potter, when Fire Chief Ralph J. Scott of the Los Angeles Fire Department exchanged greetings and methods of fire prevention with Fire Department Chiefs and Civic Executives in Buenos Aires, Argentina; Chasaran, Chile; Sao Paulo, Brazil, and Birmingham, England, through a relay from Pittsburgh, Pa.

1937's Fire Prevention Week was observed with the aid of radio amateurs on October 6th with Official Phone Station, W6MYO, owned by E. E. (Red) Wyatt, Jr., of Los Angeles.

New W.A.S. Members

Worked All States Club membership now totals 414. The "WAS" award has been made to amateurs in every state except Nevada! This is rather singular since Nevada is one of the most difficult states for W.A.S. aspirants to get. It should be a simple matter to make the club in Nevada. Who will be the first Nevadan! W.A.S.?

The following have qualified for the club since August 4, 1937: W1GBF (No. 349) W7TLF-W5BP XE2C, CM2OP, CO2EP, W3GY, CO2JJ and OE3AH. The Communications Department as proof of contacts with the organization of a rag chewers' net operating on a spot frequency of 3.512 kc. Meetings are held each Friday at midnight (or morning) 14 Mc. is used from OA4U to W4PL and then 3.5-Mc. or cross-band 7/3.5 Mc. to W3CIZ. Contacts may be exchanged greetings and methods of fire prevention with Fire Department Chiefs and Civic Executives in Buenos Aires, Argentina; Chasaran, Chile; Sao Paulo, Brazil, and Birmingham, England, through a relay from Pittsburgh, Pa. Again, in 1938 during Fire Prevention Week, Chief Scott compared notes on a nation-wide hookup of amateurs arranged by Henry Harris, W6LQ, and composed of W5CUD, W2UHQ, W4AKY, W9FJ, W9USJ and W9WE.

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Angeles acting as key station, Fire Commissioner Edward W. Adams, Deputy Chief Bert M. Blake and Captain Orville J. Emory of the Los Angeles Fire Department, and William Pierce, Jr., President of the Los Angeles Junior Chamber of Commerce, were present at W6MYO. R. H. Morse, W5GKQ, of Dallas, Texas, had present at his station Chief Sidney Hanson and Fire Marshal L. M. Funk of the Dallas Fire Department. Fire Chief Springer of Texarkana, Texas, was present at W5BEK. Frank Martin, Texarkana, Bill Seymour, K6NQZ, Hilo, Hawaii, had at his station Fire Chief Johnson Kahil of Hilo and Deputy Sheriff Peter N. Pakels of Hawaii County.

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How's DX?

How:
The revised list of countries run last month in the L.A.R.U. News seems to have met with the general approval of all concerned. We are pleased to hear it, and to those who were pleased to hear it, but not to those who were written asking about some small island or place that was omitted, we say that only countries that have or had active amateurs were included, as well as some larger countries that were included because of their political importance. If and when some of the omitted places break into ham radio, they will be added. Then too, islands are usually counted as groups, so don't write in asking to list every little island in the Leeward or Windward group or something like that. Naturally, the list has to be drawn somewhere.

Where:
Well, maybe you aren't interested in adding Tristan da Cunha to your list, but if you were the smart thing to do would be to look around on 40 and 20 for ZU9AB. A Norwegian expedition, we only know that any reports on them would be greatly appreciated by the N.R.R.L. and A.R.R.L. We are pleased to hear it, and to those who have or had active amateurs were included, as well as some larger countries that were included because of their political importance. If and when some of the omitted places break into ham radio, they will be added. Then too, islands are usually counted as groups, so don't write in asking to list every little island in the Leeward or Windward group or something like that. Naturally, the list has to be drawn somewhere.

For example, we ran some measurements with the crystal there was a reduction in noise of 15 db, the same as the noise would be with the filter in the receiver. But if you know by now that C3 is an additional prefix in England but not a new country. Also, South Africans will be using ZS only, after March. For that South Africa contact, look for ZS9F (14,080 kc.) on phone or cw.

When:
We're really starting the New Year right. Instead of having only a few 20-meter stations to tell you about, we have reports this month of DX on every one of the popular bands. We hope it's a sign of the times. W1EZ reports W5Q, Q2P, and G2DQ on about 1700 kc., coming through around 12:30 A.M. E.S.T. W1T3B got 6Z from G2DQ when he worked him. How's for a few more taking a crack at 160-meter DX?

For example, W2VU worked HB5AS, HB5CE, HB9AK, and heard HA6L. For those who have used the dipole on 80 for the W1's and W2's, but some of the Vib's and ZL's the W2's work? We'd like to hear about them. For example, W1VU worked HB5AS, HB5CE, HB9AK, and heard HA6L. Then, W3AGV worked IT7KM (3598 kc.) for the T's first 30-meter W. D4ORT (3510 kc.) was also worked. W4TS took a look at 80 and worked HA2F, G2WSF, HB5AS, DAXH, and heard a flock of others, including SM6WI. W1EPE heard HH11EL (3475 kc.) working G2DQ one morning around 4 A.M. W2JHB worked D3CEH (3888 kc., T9). To top it all, W1EZ heard ZL4ABU (3600 kc.) one morning at 6. Which makes it seem as though 80 has some possibilities.

The lads did themselves proud in reporting some of their 7-Mc. efforts, and we find that there really is stuff on the band. One of the most consistent signals on the band is IE2G (7300 kc., T7). Then there's YV1AK (7030 kc., T9) reported by W1EZ; HA2F, US2K, and US2YH at 7120 kc., reported by W33FU and U2NEF, HB5L, VP7NC, and E14Z, worked by W3VJS. W2SDP and down for a few hours and worked a mess of Europeans and ZL2BD, ZL2UY, K6OPL, K7CDF, ZL3FF, and heard FASPF (7005 kc.) on 7-Mc. efforts, and we find that there really is stuff on the band. One of the most consistent signals on the band is IE2G (7300 kc., T7). Then there's YV1AK (7030 kc., T9). W2's, but how about some of the VK's and ZL'a the W6's have reports this month of.

For example, we ran some measurements with the crystal there was a reduction in noise of 15 db, the same as the noise would be with the filter in the receiver. But if you know by now that C3 is an additional prefix in England but not a new country. Also, South Africans will be using ZS only, after March. For that South Africa contact, look for ZS9F (14,080 kc.) on phone or cw.

58 QST for
with Granville Lindley, chief electrician of Commander Byrd's last expedition. They plan to be on from Pikescan after March 1, on 14,346 and 7245 kc. Dunno the call yet, but probably FTIC. . . . . W6NRE doesn't agree with WSOMM's figure of 10 miles/mile on L75, and has him topped with a 10-watt QSO with W9JNQ, figuring up to 120 m.p.w. . . . . K7GLD, at Shegoog Creek, is a real Belfast, and a fine operator . . . . W4PL and W4AM asked OQ5AE weekly, but complain of the W's swishing across with their ECO's, trying to attract the QO's attention. Frankly, it's a lousy practice, and some of them might show a little more consideration. The thing to do is course to be careful to refrain from answering "Test BERU" calls. This courtesy will be appreciated by all B.E. amateurs.

The Second Annual Dinner Meeting of the Westlake Amateur Radio Association will be held February 19th (6:00 p.m.) at Guild Hall, opposite the Union Terminal, Cleveland, Ohio. An excellent program is offered, consisting of talks by technical authorities, motion pictures of interest to radio operators and entertainment. The principal speaker will be Dr. J. R. Martin, Professor of Electrical Communication, Case School of Applied Science, Cleveland. All amateurs are invited to attend. The price will be $1.50, including dinner and entire program. Reservations should be made at least one week in advance to facilitate dinner arrangements. Apply to Harold J. Tune, W8LZ, 1287 Giel Avenue, Lakewood, Ohio.

DX Century Club

We welcome six new members to the DX Century Club this month—W1LZ, W1TS, W2GW, W2GTZ, HB9J and F8RJ. Congratulations to each! With the appearance of the new list of countries (Jan. 25th), nearly everyone on the 75-or-more-countries list has advanced several countries. Changes in relative positions among members of the club are noted. W8CRA now leads the list with 118. We rather suspect, however, that the Contest will send new members on the way now that the new list is out! G2ZQ advanced eight countries, now placing third with 114.

The following have submitted proof of contacts with 75-or-more countries; thirteen of them are members of the DX Century Club. Check over your confirmations in accordance with the list in January QST and send them in just as soon as you can show 75 or more. When sending in your confirmations, please accompany them with a list of claimed countries and stations representing each country to aid in checking and for future reference after your confirmations have been returned to you. Please send postage to cover the return of your confirmations.

You can't hang around on the end of 20 very long without running into CE4AD, the station of Luis Adalberto Brito R.

The rig shown above is part of self-excited '10's in parallel, but the new one will be c.c. on 14,082 kc. with an 804 in the final. In two years, CE4AD has worked over 2300 W's.

give the boys a chance to clear their traffic and then go after him . . . . W9KGE, who used to use W9ALV but now, deserves a fate worse than he gets. Just when we think DX has been fair around here he drops in with a worked-list a mile long, including H81BJ, FBAC, CR7AW, OX2QY, HC2MR, VP4CF, U66M, FY8AC, HI9I, ZB3A, VP6FO, and K1AAG. On 40, U9AV, LUSDB, LUSLA, and a bunch of Europeans . . . . W8CMIH doesn't believe the legend that his neck of the woods (Port Huron, Mich.) is n.g. for DX. In 39 days he worked 165 DX contacts in 41 countries, and shows no sign of weakening. . . . . As unobtrusively as possible, W5KC gets in his deadly licks by calling ZS2AC without luck, tunes over the band and finds that ZS6EQ is carrying on calmly informing us that the latest there are VS4CS, and with Granville Lindley, chief electrician of Commander Byrd's last expedition. They plan to be on from Pikescan after March 1, on 14,346 and 7245 kc. Dunno the call yet, but probably FTIC. . . . . W6NRE doesn't agree with WSOMM's figure of 10 miles/mile on L75, and has him topped with a 10-watt QSO with W9JNQ, figuring up to 120 m.p.w. . . . . K7GLD, at Shegoog Creek, is a real Belfast, and a fine operator . . . . W4PL and W4AM asked OQ5AE weekly, but complain of the W's swishing across with their ECO's, trying to attract the QO's attention. Frankly, it's a lousy practice, and some of them might show a little more consideration. The thing to do is course to be careful to refrain from answering "Test BERU" calls. This courtesy will be appreciated by all B.E. amateurs.

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MEMBERS, DX CENTURY CLUB

Frank Lucas, W8CRA........... 118
H. A. Maxwell Whyte, G6WY........... 116
John Hunter, W6MST........... 104
Douglas H. Borden, W1BUX........... 112
Jefferson Borden IV, W1TW........... 110
Henry Y. Sasaki, W6CGW........... 108
Clark C. Bodkin, W1ZS........... 105
Harry G. Burnett, W1LZ........... 104
Don H. Mix, W1ZT........... 103
Walter H. Bostwick, W2GW........... 101
Reece O. Strock, W2GTZ........... 101
Guy Grossin, F8RJ........... 100
Jean Lips, HB9J........... 100

The following have submitted proof of contacts with 75-or-more Different Countries:

E16F........... 93 W9ADN........... 83
W2BRA........... 90 W8QQF........... 82
W1DF........... 89 W2CYS........... 81
W1WV........... 89 G5QY........... 80
W9EF........... 89 W4CCH........... 79
W1ZI........... 88 G2DZ........... 78
W8OLE........... 88 W1JPE........... 77
W6FZL........... 88 W6APD........... 77
W3BES........... 86 W3EPR........... 77
W6GAL........... 86 W3UR........... 77
W1DUK........... 84 W9KG........... 77
W8JMP........... 84 W4AJX........... 76
W8SKG........... 84 W8BVN........... 75
W2BE........... 83 W8UM........... 75
W2GVZ........... 83 W9UM........... 75

The B.E.R.U. Contest will be held on February weekends. This affair is for British Empire stations only. W's are

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ELECTION NOTICES

To all A.R.R.L. Members residing in the Sections listed below: 

(The list gives the Sections, closing date for receipt of nominating petitions for Section Manager, the name of the present incumbent and the date of expiration of his term of office.) This notice supersedes previous notices.

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 notice, the closing dates for receipt of nominating petitions are set aside, at the dates given hereafter, in the absence of nominating petitions from Members of a Section, the incumbent continues to hold his official position and carry on the work of the Section subject, of course, to the filing of nominating petitions, as provided in our Constitution and By-Laws, electing the following officers for the term of office stated.

Due to resignations in the Iowa, Kentucky and Hawaii Sections, nominating petitions are required for the election of Section Communications Managers in these Sections, and the closing date for receipt of nominating petitions at A.R.R.L. Headquarters is hereby specified as noon, Tuesday, February 16, 1938.

ELECTION RESULTS

Valid petitions nominating a single candidate as Section Manager must be filed in a numbered Section of the American Radio Relay League, in accordance with our Constitution and By-Laws, electing the following officials, the term of whose office begins December 1, 1937.

--- F. B. Hendy, Communications Manager

PETITION FORMS

Valid petitions nominating a single candidate as Section Manager, canvassing not less than 500 or more than 1000 members, must be addressed to the Canadian General Manager, 340 Station Activities on page 104. Valid petitions nominating a single candidate for Section Manager must be addressed to Canadian General Manager, Alex. I. Alt, 100 Loring Ave., St. Lambert, Quebec, December 16, 1937. Such petitions must be filed at the Headquarters office of the League in West Hartford, Conn., by noon of the closing date specified above, for receipt of nominating petitions.

In Canadian sections nominating petitions for Section Managers must be addressed to Canadian General Manager, Alex. 1. Alt, 100 Loring Ave., St. Lambert, Quebec, December 16, 1937. Such petitions must be filed at the Headquarters office of the League in West Hartford, Conn., by noon of the closing date specified above, for receipt of nominating petitions.

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--- F. B. Hendy, Communications Manager

Station Activities on page 104
Sharpening the Signal

4022 No. 13 St., Milwaukee, Wis.

Editor, QST:

A letter about sideband limitation from W1BWS got me thinking. Here’s what I think:

1. The higher tones, generating sidebands farther from the carrier frequency, cause most of the trouble.

2. The low tones, whose sidebands are quite close to the carrier frequency, do not broaden the signal much.

3. Poor quality is caused more by distortion and harmonics than by low-range frequency response.

4. High distortion and harmonic content cause the signal to splash around and mess things up more than high-range response does.

Therefore a low-pass filter would serve the purpose as well as a band-pass, and at the same time would keep the signal more natural sounding. It would be simpler, too.

But we could probably dispense with the filter altogether, if enough fellows would cooperate by forgetting high-range frequency response and concentrating on eliminating distortion. This would mean considerable saving on microphones and transformers too. If cooperation is lacking we can try filters later.

—Keith Hayes, W9ZGD

Past and Present

3800 Colfax Ave., Denver, Col.

Editor, QST:

This is by way of reply to your editorial in QST for November. I hope that it will be taken by you in the same open spirit I felt toward your editorial. You said some pretty sharp things and so shall I.

Your second paragraph wonders if we don’t hang on to dead things long after they should have been buried. I think not. I think the trouble with the young squirt element, be his age sixteen or sixty, is not enough background. He has been plunged right into immediate enjoyment of the game without having had to pass through years of experience and learning to tolerate and respect the rights of the other fellow.

I still think that the fellow who never wound miles of wire on three or four large Quaker Oats tubes in order to hear old POZ has missed something that he will never be able to buy with all his chromium-plated modern junk. Remembering back over the years, I find that one of the deepest sources of enjoyment that I get out of this game comes from contrasting the old game with the new — old equipment with modern.

Strangely enough, the older some of our ideas and equipment are, the more actually modern they turn out to be, to the fellow who refuses to do as you suggest—forget the past. If we must quote names and dates and places, it might startle some of the boys to know that the very first demonstrations of radio transmission, by old Heinrich Hertz himself, were carried on in what is now called the “ultra-short” wave region. As for the equipment, I still find use for an old 45-plate Murdock moulded “mud” variable condenser in spite of its losses and age. It turned out to be indispensable in a recent study of super-regenerative receivers I made.

And that mention of super-regeneration gives me a chance to throw your own words back at you. In your editorial in QST for July, 1922, you gave a description and a discussion of super-regeneration that still stands as a source of inspiration and information to many of us. In spite of what are now apparent as a few technical faults, it is still a good piece of writing although it is more than 15 years old. In it you stated a challenge which I do not believe has ever been answered. It is found on page 8 where you say, “There is no reason why the very weak signal of an amateur station across the continent may not be fed into a 250-watt power tube and a quarter kilowatt of signal-modulated output made available if desired.” “If desired,” indeed! Has anybody done it? Has anybody of the thousands of greenhorns who have broken into the game first as five-meter bootleggers and later as phonograph-playing pests on the air ever so much as read that article? Not on your life. They have no attics or basements full of the accumulations of years. They start from scratch with their heads filled, perhaps, with new ideas about impedance matching and beam antennas, but they don’t know the difference between decrement and electrose. If they need a variable condenser they buy one, new and shiny. They don’t have to cut up a couple of different sized tomato cans to make a clumsy makeshift to do the job.

There’s another point that rubs a lot of us pretty raw. It is true that a lot of dust accumulates on the junk in my basement. But when I
need some little gadget for some dirty little job that no shiny modern product will fit, I can usually find it or the junkin' down in that junk heap. And when, as is always the case with me, the family budget won't permit the purchase of equipment for a new experiment or piece of gear, I go down into that mess and dig out enough junk to work over into something that will do. I'm a poor man like a lot of other hams. Your attitude in this respect is hardly in good form, to my way of thinking, because you fellows that have headquarters have clean, modern parts to use for any job that comes up, whether it be along the line of developing something for ham radio, which is your job, or for flying model airplanes which certainly isn't. You don't have to worry about every penny—W1AW doesn't have to close down for an indefinite period because just one 866 goes out. But a lot of us fellows do have to contend with problems of this sort. Those of us who do, have a feeling that we ought to be telling you who, in this game of ours, is getting soft.

I agree that the average xtal-controlled transmitter is far too complicated. I agree that we keep on doing things the same way, year after year—that is, most of us do. But there are a few who not only remember the lessons of the past but who try continually to build upon them. Through all the scant half century that we have fighting, men have as yet to learn how to live together without fighting. Through all the scant half century that we have had radio we have yet to exhaust the possibilities opened up by the work of the very first workers in our field. If our minds are filled with moss-covered theory and our conduct with rust filled practices, let it be said to our shame that we have been poor stewards of the talents that have been entrusted to us—that we have buried them in the ground when we should have kept them polished with activity to the glory of God and for the happiness of our fellow men.

—B. P. Hansen, W9KNZ

### Anti-Television Club

34 Pennsylvania Ave., Port Jervis, N. Y.

Editor, QST:

**What kind of a scheme is this that you are trying to get up now?**

Why all the sudden publicity on television? Can't you see that the commercial is trying to take off a piece, if not all, of our ultra-high frequency bands?

Any ham who develops the use of television on the ultrahighs is but a traitor to the cause. Let's get together on this thing and nip it in the bud! I elect myself, W2GTW, as Number 1 member of the Anti-Television Club. All you hams that have any comment on this opinion write in and express yourself. If you want to join the club let me know. I think that the majority of the hams are opposed to this newfangled project and want it put up with.

We need all of this radio spectrum that we can get our hands on and can't afford to lose even a kilocycle right now.

—John McKinney, Jr., W6GTW

Editor's Note.—Of course, it has not occurred to W2GTW that there is not possible for amateurs to claim such accomplishments as opening up the short- and ultrashort waves to public occupancy, not to mention numerous other technical contributions, we would probably now not have our kilocycles to lose. Or that television can be just another such accomplishment to add to our record.

### Two Watts Max

Hildunghasaken, Ranch Atalinahe, Colp Creek, Oregon

Editor, QST:

I know, I haven't worked any ZS's or VK's, but I want to tell you a few of the things behind the two watts here at W7FBZ.

I operate sparsmodically, whenever the "A" battery will hold up. The darn thing won't take more than half a charge, and even that requires two days of motherly attention to the gasoline motor which runs the old makes-unknown generator which gets as hot as on old '10 with 1600 on the plate I used to own. This gas motor really belongs to the washing machine, but I use it every day except Monday, so it's really part of my power supply.

The rig is a 6L6, Tri-tet, working 3270 kc. and 7140 kc. with the same coils; I just short out the cathode cell and re-tune. The antenna is an end-fed Hets, 133 ft. long and supported by a 60 ft. cedar pole, purloined from the hill back of the house. (The station is located on a ranch in the Calapooya Mountains, 40 miles SE of Eugene, Oregon.)

The receiver is a 30 and a 19 two-stage.

On 80 the input is 1.8 watts and on 40 2.0 watts. The darn rig puts out more on its harmonic.

Well, as I started to say, I've not worked any ZS's or VK's, but I did work a W6—W3GVE—with an S8 sig in Washington! This was on 7140. Any night—if I stay up long enough—I can hear VP6, VK, K6, ZL, J's etc.; and any night—if I stay up late enough—I can work both coasts. All of which shows that 2 watts can do just about what a W6 kw. will, and without half the QRM. I forgot to mention that the "A" battery runs a worn-out auto vibrator (cost $5) with a hot 150 v. at 20 ma. on the 6L6, about half of which I use, holding the rest in reserve when I get a good loud VK that seems like he won't answer—which he doesn't.

—D. von Raydelt Drenner, W7FHZ

### Stamps, Again

St. Pauls Rectory, Dera Creek, N.S.W.

Editor, QST:

I am an old timer, having been at radio since 1917 (old Army spark rigs in the A.I.F., Palestine and Egypt) and have made hosts of friends through radio. Your QSL's are sometimes received by me of which shows that hams are interested in stamps. I am a collector of all British Colonial and U.S. Pictorials. Strange, but out of the 1500 W9's I've contacted only a few are stamp fellows. Send a sample few with your requests for VK stamps though please don't ask for too many over 5/- in value. EII

—The Rev. Wilber Brooke, VK8BE

Chaplain Mission Mental Hospital

### Deadwood

Whiting, Indiana

Editor, QST:

Some time ago W8RFG expressed curiosity as to what the F.C.C. would do about the scarcity of W9 calls after W9ZZZ was reached. The editor answered that they would not start over with W9AAAA. Assuming that Mr. Editor knew whereof he spoke, then what? Well, that time has come and we. The F.C.C. went back to the front and passed out the W9CQ calls and now I believe the W9Q calls are being gobbled up. But then what? Will future applicants find it necessary to stand in line, waiting for someone to die so his call may be passed on? Let's hope not! How is it possible to keep right on giving out calls till doomsday and never resort to four letter calls. Oh, they can't, eh? Well, I say they can! OK then, here's how.

Start a new system of renewing licenses. Things are far too easy now. Just dash over to Hank's house at the end of three years, work three guys and send it in. Nothing to it. I wonder how many of these fellows are just weeds—dead timber—excuse baggage? Hundreds of the calls now outstanding are absolutely idle, haven't been used for years! Just coddles of these gents haven't even got a transmitter or receiver, couldn't possibly pass the Class B exam, don't even know the code and don't give a whoop! So what? OK, Mr. F.C.C. here's what. The next Jubilee that applies for renewal can just send in the old log along with his ticket! Well, then, if that's too much, submit the log for the past year, or if that is too much, for any six months during the life of the present license. And are you going to be surprised when you find just how many of these lads aren't keeping a log at all, or only about ¾ of the QSO's are logged, or the log fails to show all information required by law!

(Continued on page 64)
SINCE their first appearance about two years ago, 6L6's have found wide use in amateur circuits for crystal oscillators, doublers and the like. Their characteristics make them quite suitable for such purposes. This, of course, is an old story now. In these applications they require some neutralization, because the shielding between grid and plate is not adequate for the purposes described. This is also an old story, judging from the number of amateurs who have written us asking for a special 6L6 neutralizing condenser. That is why we are writing this page.

To be perfectly frank, there is no need to buy neutralizing condensers for 6L6's. The required capacity is only about 6 mmf. and can be easily obtained by some simple method such as twisting two pieces of insulated bus together. As a guide, two pieces of No. 14 bus 4½ inches long, each covered with spaghetti for its whole length, were found to have a capacity of 6.4 mmf. when twisted together lightly. Untwisted and parallel, but touching, the capacity was 4.2 mmf. Spaced ½ inch apart, the capacity was 1.9 mmf.

We found that this suggestion did not satisfy many of our customers, even though it did work. We aim to please, so we set out to make a regular, bona-fide neutralizing condenser specially for 6L6's. Obviously nothing expensive or pretentious was in order, and we searched our memories for methods once used in similar cases. Back in the dear dead days when we were busy making Browning-Drake kits, and nearly everyone else was busy wiring them, a device known as a “penny” was often used. This was a small copper disk facing part of the coil winding, and adjusted in or out by a screw. The coil itself served as one plate. This gadget gave noble service once, and in fact is still used in modified form. We were tempted to dust it off and use it again, but somehow one copper disk and a screw does not look like much of a condenser, and we feared that it would have no more appeal than the bus wire and spaghetti.

Another old device consisted of two heavy bus wires end to end, covered with spaghetti, and provided with a sliding sleeve for adjustment. This seemed to have more promise. Brought up to date and adapted to 6L6's, it takes the form shown above. The “frame” of the condenser is practically an R-100 choke without a winding; in other words an Isolantite tube with metal caps and pig-tails at each end. The cap at one end is extended to cover a little more than half the Isolantite tube. The other cap supports a screw which can be advanced down the inside of the tube for capacity adjustment. The whole thing is light enough to be supported by the pig-tails quite safely.

As a matter of fact, it is a very nice little condenser, neat, convenient, and inexpensive. We are almost tempted to urge you to buy them instead of using bus wire, pennies or whatnot.

JAMES MILLEN
There are 38 types of YAXLEY Jacks, Extension Jacks and Plugs

The illustrations show but two items in this famous Yaxley line.

Yaxley Jacks are made in four models—the new “X” type incorporating a special dust protector; the standard Yaxley Long Frame type; the Junior (in which the springs are parallel to the panel for compactness); and the Midget.

A variety of spring combinations are available for practically any application, and special models can be furnished on order.

Ask your distributor to show you.

P. R. MALLORY & CO., Inc.
INDIANAPOLIS  INDIANA
Cable Address—PEMALLO

A Low-Cost 100-Watt Transmitter
(Continued from page 16)

since at these frequencies the oscillator has its own plate coil, $L_2$. The plate, or primary, windings are not on the coil forms themselves but are self-supporting coils fitting inside the coil form, movable with respect to the secondary so that the coupling can be varied. A 1-inch mandrel, a small sheet of paper and some Duke cement are needed for the construction of these coils. The paper is wrapped around the mandrel to keep the wire from sticking to it when the cement is applied. The required number of turns of wire is then wound around and cemented. When dry, the coil is slipped from the mandrel and the leads connected to the appropriate pins inside the six-prong form. Care should be taken to leave the leads long enough to permit sliding the coil up and down once the ends have been soldered to the prongs, so that the coupling can be adjusted for optimum power transfer. The leads for the 3.5-Mc. plate coil go to the prongs numbered 3 and 4. Both the 7- and 14-Mc. plate coils are wired to prongs numbered 2 and 4.

The grid coils, wound on the outsides of the six-prong forms, also are close wound with No. 20 d.s.c. wire. The pin connections are the same for all three grid windings, the ends going to Pins 1 and 5 and the center tap to No. 6.

Hammarlund TCP-5 transmitting forms are used for the final coils. These forms have a diameter of 2\(\frac{1}{4}\) inches and a winding length of 3\(\frac{3}{4}\) inches. A three-turn double-spaced link is wound in the center of each form. The link ends are connected to two of the prongs and thence to the two terminal strips at the rear edge of the base. After the links have been completed the center-tapped plate windings may be put on. Winding data are given in the coil table. In each case half of the stated number of turns is wound on each side of the link with the whole winding, including the link, spaced out to the length specified. No. 16 enamelled wire is used for all final-amplifier coils.

TUNING AND ADJUSTMENT

After a crystal has been selected and the various voltages are available the tuning procedure is as follows: For 3.5-Mc. output, the 3.5-Mc. coil is plugged in the $L_2$ socket, and the meter plug in $J_2$. (Since there is no coil in the $L_2$ socket at this frequency, oscillator plate current cannot flow through $J_1$). With condensers $C_1$ and $C_2$ set at about half capacity, apply voltage and close the key. The oscillator tube should draw approximately 100 ma. $C_1$ and $C_2$ are rotated until resonance is reached, indicated by a dip in current to the vicinity of 20 or 25 ma. $C_1$ may...
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The HALLICRAFTERS have done it again. The New Sky Challenger II is another real advance in amateur radio reception, an absolute knock-out of a receiver with several striking new features, at a sensational new low price. It has the Infinite Image Rejector, that eliminates image interference, performing the same function as 10 or more exclusive pre-selectors.

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You'll find it has the same Spiral Band Spread System that is used on the Super Skyrider, so that you can really spread out the bands. You'll find razor-sharp selectivity, better sensitivity and a dozen other features, all at a new low price that makes this receiver an outstanding value in amateur radio equipment.

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$77.00 LESS SPEAKER
LESS CRYSTAL
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FEATURES
* 9 Tubes
* 1000° Spiral Band Spread
* Full Coverage 38 MC to 540 KC (7.9 to 545 meters)
* "S" Meter Terminals

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be left at minimum capacity for practically all crystals; the lower the capacity the less the feedback and the lower the crystal current.

The meter is now shifted to the amplifier grid circuit, J3, and the grid current noted. Very likely the current will be small because the coupling between the two coils probably is not optimum. Coupling between the two circuits is controlled by the position of the plate coil with respect to the grid winding, so the plate winding should be moved up and down inside the form (with simultaneous retuning of C2 and C3) until a grid current of about 75 ma. is obtained. To prevent the possibility of a 400-volt shock, move the coil with a small stick or else shut off the plate voltage when touching it. When the correct coupling has been secured, a few drops of Duco cement between the plate winding and the form will prevent handling or jarring from shifting the winding.

Neutralizing the final is the next job. With a neon bulb held against the plate of one of the 809's, the tank condenser C4 is rotated until the bulb glows. This is the resonance point. C5 and C6 are now turned simultaneously until all indication of r.f. at the plates disappears. Condenser C7 should be readjusted from time to time to bring the tank circuit back into resonance, since the neutralizing adjustments will change the original resonance point slightly. Neutralization can be checked by watching the grid current while C4 is rotated; there will be only a very slight flicker on the meter, or none at all, when C4 passes through resonance if the amplifier is properly neutralized. Once completed, the neutralization will hold for all bands, so this adjustment need not be repeated.

For 7-Mc. output, use the 3.5-Mc. coil in the oscillator plate circuit at L2, and the 7-Mc. coil in the doubler circuit at L3. With the meter plug in J1, C3 is tuned to resonance, again indicated by minimum plate current. The meter is then shifted to J3, the amplifier grid circuit, and C2 adjusted for maximum grid current. Here again the plate coil must be correctly coupled to the grid winding, requiring the same treatment as the 3.5-Mc. L2 coil. When a grid current of 70 ma. has been secured the doubler plate current should be checked (meter plug in J2) to determine if this tube is correctly loaded.

For 14-Mc. output, the second-harmonic output of the oscillator drives the doubler, therefore the 7-Mc. coil is used at L3. At L2, the 14-Mc. 6-prong coil is used. On 14 Mc. the doubler output is not as high as on 7 Mc., hence the grid current will be lower—in the vicinity of 50 ma. This is still ample to drive the 809's satisfactorily. For maximum excitation, it may be desirable to increase the setting of C1, although the crystal current is lower when C1 is at minimum. The adjustment should be made with the amplifier delivering power to a load, and appreciable capacity should not be used at C1 unless a worth-while increase in output results.

On all three bands, the final-stage tuning procedure is the same. With maximum excitation,
The new Sky Challenger II is a good buy at its price. Completely modern, with the new Hallicrafters Infinite Image Rejector that wipes out image interference, the 1000° Spiral Band Spread, not to mention its many other exclusive features and mechanical improvements, the Sky Challenger II offers an entirely new standard of performance in communications receivers.

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You can enjoy the superior performance of a Sky Challenger II while you pay for it by payments arranged to suit you with only 6% interest charge. I finance my own paper so I can sell to you with less interest cost and less red tape and bother. Write today, let me send you complete information on the Sky Challenger II and other receivers and my liberal time payment plan.

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NEW INFINITE IMAGE REJECTOR
Wipes out all image interference completely. It's brand new and exclusive with the Sky Challenger II, a genuine advance in amateur reception.

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The Sky Challenger II has the same 1000° Spiral Band Spread that was the sensation of the amateur world when first introduced on the Super Skyrider. Offers the maximum usable band spread on any band.

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Sensitivity and Selectivity are both better than ever before, and it has been refined mechanically into the "smoothest" operating receiver you've ever seen.

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Gentlemen:
Please rush me complete Hallicrafters dope and copy of Tydings' 1938 Service men's Amateur Catalog.

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LOOK AT THIS RECEIVER!

LOOK AT THE PRICE!

It's entirely beyond our understanding how Hallicrafters can put so much real value in a communications receiver for so little money. The Sky Challenger II is a fine communications receiver, precision-built, with selectivity and sensitivity far above average and fine all-around performance. If this were all it had, it would be a bargain at its price!

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You can be assured of personal, intelligent service by experienced amateurs when you deal with Radio Shack!

SKY CHALLENGER II

But, look, it's got the NEW Hallicrafters Infinite Image Rejector, used on the Sky Challenger II for the first time on any receiver. You know what you would pay for enough pre-selection to cut out image interference on the 10 and 20 meter bands. This new patented Image Rejector does this job, does it perfectly and it's part of the receiver.

Then there's the famous Hallicrafters 1000° Spiral Band Spread System, until now used exclusively on the SUPER SKYRIDER. It, too, is included on the New Sky Challenger II. These two features alone put the Sky Challenger II in a class by itself among communications receivers. Come in to see it today, or write at once for complete details.

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SKY
CHALLENGER II

with the
NEW INFINITE IMAGE REJECTOR

Again, Hallicrafters ring the bell with a new, and different, communications receiver, with several new exclusive features,* better all around performance and greater mechanical perfection — all at a new low price! The Sky Challenger II has the new Hallicrafters Infinite Image Rejector that wipes out image interference and the same 1090° Spiral Band Spread System used on the SUPER SKY RIDER, two advanced developments that are ordinarily found only on much higher priced receivers.

With finer performance and numerous structural and mechanical refinements, the Sky Challenger II lives up to every Hallicrafters tradition. See the Sky Challenger II at our store today or write for complete details.

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* 9 Tubes
* Infinite Image Rejector
* 1090° Band Spread
* New Recessed Tuning Dial
* 38 MC to 540 KC (7.9 to 545 Meters)
* Iron Core I F
* "G" Motor
* Terminals
* Doublet or Marcon Antenna

Determined the location of the 100-kc. 'phone segment was more difficult. It was obvious that it ought to be harmonically-related to a 14-Mc. assignment, in which the Latins are nearly as much interested. Obviously the Rio agreement opening 14,000-14,300 to 'phone would not do; obviously a band of this world-wide effect should not have more than half its width devoted to 'phone. It was rather plain that it should be that half in which the W-VE amateurs are already established: 14,100 to 14,300 in which the Canadians operate, containing in its center our W allocation. The VE amateurs are accustomed to working in a band twice as wide as the W one, but avoiding the W's in the center and generally regarding their assignment as 50 kc. on either side of the W's. To the Latin amateurs this was a new idea and they did not like it in two slices. Of course it would have been much more desirable if it could have been arranged so that the Latins and the Canadians, say, could have had 100 kc. in one continuous range, while the U.S.A. had another 100. But unless more than half of the 14-Mc. band were opened to 'phone, which everyone admitted was undesirable, this would have involved moving either U.S.A. or Canadian 'phones on behalf of Latin stations not yet established. It was a very difficult question, as the 'phone matter always is. But finally it became apparent to everybody that the only solution was for the Latin 14-Mc. 'phones to use the same frequencies as the Canadians, and thus the place in the 7-Mc. band for the 'phone segment became indicated as the subharmonic of 14,100-14,300, or 7050 to 7150 kc. But in order to prevent 'phones from overflowing more than half of the 14-Mc. band and in order to displace the Rio figures with a new agreement providing, in effect, two separate slices of 50 kc. each for the Latins, it was necessary for the representatives of the United States administration to agree that this country, temporarily at least, will not expand its 14-Mc. 'phone allocations into the territory the Latins are to occupy, and it did pledge itself not to do so before the first of 1940 at the earliest. The relations of these two bands are shown perhaps a little clearer in the diagram.

Incidentally, it is probable that the action of the Habana conference permanently locates the 'phone sub-bands in the middle portion of the general bands, and eliminates further speculation about the movement of the 'phone sub-bands to one end or the other of the 14-Mc. band.

THIRD-PARTY TRAFFIC

While the 'phone matter was the most important one, the most interesting was a decision by the governments to permit international handling of the third-party "unimportant" traffic. Our readers will remember that the handling of international messages emanating from third parties is forbidden by the current world regulations unless special provisions to the contrary have been made by interested administrations. We have such arrangements already with Canada, Chile and Peru, but these individual arrangements are but laboriously negotiated. Months ago it occurred to the
THE SUPER SKYRIDER
THE SKY CHIEF
THE SKY CHALLENGER
THE ULTRA SKYRIDER
THE SKY BUDDY
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THE NEW Hallicrafter Infinite
IMAGE REJECTOR CIRCUIT
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You'll get a new kick out of the 10 and 20 meter bands when you work them with the NEW SKY CHALLENGER II. How many times have you had a QSO on these bands go sour due to Image QRMI? That's a thing of the past with the new Hallicrafters Image Rejector, as you'll find out the first time you operate the New Sky Challenger II. For this new circuit will give you better image rejection than 10 expensive stages of pre-selection, and it's built right into the New Sky Challenger II, an integral part of the receiver.

You'll find the same 1000° Spiral Band Spread System used in the SUPER SKYRIDER, to really spread out the bands for you. You'll find new and better selectivity and sensitivity — refinements throughout the entire receiver and — all at a price you would gladly pay for an ordinary receiver. Get the complete dope on the New Sky Challenger II. Mail the coupon today!

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Don't wait for better reception. Buy your Sky Challenger II on payments that you'll scarcely miss every month. Write today for full particulars on the HINDS & EDGARTON Easy Payment Plan.

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Say You Saw It in QST — It Identifies You and Helps QST
THESE two "fellows" are really going to town in a big way—and why shouldn't they? Amateurs, the world over, appreciate their superior characteristics and full dependability.

For the 80- and 160-meter bands, the LD2 unit is outstanding in its high activity, full dependability and its drift of less than 4 cycles/Mc./°C. You'll find at least one of these units in almost any ham shack you may visit.

40- and 20-meter crystals have been pioneered by Bliley. The 40-meter LD2 unit needs no introduction, yet the new B5 unit for 40 meters, which replaces it, is even better. With greater activity and 35% more R.F. current carrying capacity, it leaves little to ask for at such a reasonable price. For 20-meters, the new B5 unit brings greater frequency stability to the high frequency bands at a new lost cost.

Hop on the Bliley Band-Wagon—get an LD2 or B5 unit from your regular distributor. Bliley Electric Company, Erie, Pa.

GOING PLACES

Doing Things

THERE two "fellows" are really going to town in a big way—and why shouldn't they? Amateurs, the world over, appreciate their superior characteristics and full dependability.

For the 80- and 160-meter bands, the LD2 unit is outstanding in its high activity, full dependability and its drift of less than 4 cycles/Mc./°C. You'll find at least one of these units in almost any ham shack you may visit.

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Hop on the Bliley Band-Wagon—get an LD2 or B5 unit from your regular distributor. Bliley Electric Company, Erie, Pa.

BLILEY CRYSTALS

A.R.R.L. that this might be made an item in the regional arrangement of Habana, so through the efforts of the League the subject was proposed by the United States government for consideration there. A formal document was introduced, explaining the proposal, and suggesting a multilateral agreement. When the subject came up for consideration in subcommittee, it was expertly presented by Mr. Gross of the U.S.A. delegation. Probably the subject is not of vast practical importance, but it has great significance as a symbol of high idealism. Any amateur is aware of that vast potential ability of amateur radio to improve international understanding through the contacts between amateurs. We all know the appreciation that our contacts give us of the ideals and aspirations of other peoples. There would undoubtedly be great improvement in Pan-American understanding if this "international visiting" by amateurs could be expanded to embrace communications on behalf of third parties. That was the idea: that all the American nations agree mutually, by one clause in their treaty, to set aside the Madrid restriction and demonstrate in the New World a new sympathy and understanding between peoples.

It has been adopted! The governments of Mexico and Venezuela regret that their basic laws prohibit them from accepting the idea, and it is intimated that the same situation prevails in the Argentine. But all the other countries, so far as we are aware, embrace the project: and it is our understanding that on July 1st the list of countries with whom we are permitted to interchange traffic as we do now with Canada, Chile and Peru will be greatly expanded. It was beautiful to see the administrations represented at Habana seize upon that idea—there was something tremendously significant about it. It was not necessary for the United States to battle on behalf of its proposal. That was done by numerous other delegations who were sincerely fired with zeal for the project and who laced into the few recalcitrants, so that it was accepted in subcommittee by eleven votes to none, with three abstentions. The final language provided an "out" for those countries whose internal regulations prohibit such international exchange, so that everybody was able to sign the document without reservations. The provision reads as follows:

WHEREAS, the General Radio Regulations annexed to the International Telecommunication Convention of Madrid provide that unless modified by special arrangements between interested countries amateur stations are forbidden to transmit international communications emanating from third persons; and

WHEREAS, it is apparent that the community of interest of the peoples of all the Americas would be fostered by encouraging the exchange, by amateur stations, without charge, of friendly messages emanating from our citizens;

Be it resolved, by the Inter-American Radio Conference, that:

In the interest of close and friendly contacts between the peoples of the Americas, the administrations of the contracting countries whose internal legislation permits it agree that amateur radio stations in their respective countries and possessions may internationally exchange messages emanating from third parties; provided, however, that such messages shall be of a character that would not normally be sent by any other existing means of electrical communication and
WANTED!

By every ham in the world

Do You Know Any of These Men?

They are the Thordarson Engineers—All full-fledged “Hams” who have compiled this

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No. 344-C

4th Edition

THORDARSON ELECTRIC MFG. CO.

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Some amateurs seem to be confused by the type numbers used on CARDWELL condensers. These designations are necessary and tell the complete story on any individual condenser.

CARDWELL has available a mimeo sheet, "Key to Cardwell Type Numbers," to interpret these seemingly incoherent letters and figures.

If you do not have a CARDWELL catalog No. 40 with its valuable voltage breakdown chart, L.C. chart for designing tank circuits and a chart for determining peak voltages across tank condensers — get one now — free — at your dealers or write direct to CARDWELL.

While on the subject of CARDWELL condensers, let us again bring to your attention our new ADN* and BDN* disc neutralizers; remembering that the NA series of neutralizers still offers the convenience of a compact 180 degree variable for those tubes for which the capacity ratings of the NA series are correct. A constant voltage rating is of course an obvious advantage of this type.


ADN (top left). Capacity range: 5 to 4 Mfd. Net to amateurs: $1.80
BDN (top right). Capacity range: 9 to 12 Mfd. Net to amateurs: $3.00
NA-16-NS (left). Capacity range: 7 to 16 Mfd. Net to amateurs: $3.00

Inexpensive Coaxial R.F. Line

(Continued from page 36)

for higher efficiency since no soldering is required to connect the center conductor wire from 14-foot lengths into the required footage. Of course before any tubing was put on we had soldered the center conductor of the end seal to the center conductor of the line, and the first piece of tubing on the wire was made fast to the end seal with gas-tight fittings. In our particular case spark plugs (Y-4 Champions) were used for end seals. As they are threaded for %-inch threads it was easy to tap and cut one of the brass fittings in such a way as to allow the small plug to be coupled. However, as it is rather a ticklish job to take out the spark plug’s center conductor without cracking the porcelain, we suggest procuring end seals now made available by several manufacturers. Simply ask for an end seal for a %-inch outside diameter concentric or coaxial line.

With gas-tight fittings of the type commonly used on gas lines in automobiles and refrigerator units, it is not necessary to sweat joints — heretofore the customary method of connecting sections on which no compensation may be directly or indirectly paid.

For the success of our efforts at Habana much credit must be given to the understanding work of the amateur s.s.c.; to the U.S.A. delegation, particularly to Mr. Gross, who was outstanding and indefatigable in his efforts on our part; to Dr. Nicolas G. de Mendoza and to Mr. Catá of the Cuban delegation. But for this successful outcome we are perhaps chiefly indebted to the fine ham spirit of the Cuban amateurs, who were splendidly cooperative and willing to "let live" as well as live.

I met many of the Cuban amateurs, whose organization, Radio Club de Cuba, has its headquarters in Habana. They are the same swell gang that one meets in amateur circles anywhere in the world. Shortly after I arrived they gave me a reception, and a few weeks later they tendered a luncheon in honor of OM Tudela, OA-4Z, and myself. They have some pretty stations and they possess the true ham spirit. There are about 225 licensed amateurs in Cuba and about 300 members of the R.C.C. As one collateral result of my visit there, we have had the pleasure of receiving an application from the R.C.C. to become the Cuban member of the I.A.R.U. and we hope that, before many months, the name of the Radio Club de Cuba will be appearing each month in the masthead of the I.A.R.U. section of QST.

Brief

W2HNN had an odd operating experience recently on 7 Mc.—it seemed nigh impossible for him to raise the stations he called, although he did work somebody after each call! First he called WSQZB and was answered by WSMWY, who lives near QZB. Later in the day he called W8KFV and, on listening for KFV’s reply, was called by W8EWT. Then, to top it off, after calling W8BBW and standing by, back comes W8KFV. All the calls were made in the usual manner and W2HNN found it quite surprising to hear entirely different stations pop up and work him each time. In none of the cases did the station actually called come back!
Many famous trade-marks identify the leading test instruments used in radio service laboratories. These trade-marks give us confidence in the stamina, precision, and dependability of this equipment. We use them with confidence in the accuracy of the delicate measurements they indicate.

But underneath the trade-mark—inside the box—lies the reason for their satisfactory service—good workmanship—quality materials. It is significant, therefore, that Burgess Batteries are chosen to power practically all the better known, modern radio test equipment. When you renew cells in your test equipment, buy Burgess for continued accurate performance, just as the manufacturer intended. Use Burgess Batteries in all your experimental work for the same reason. They give the greatest efficiency—lowest cost.

BURGESS BATTERY COMPANY
Freeport
Illinois

Say You Saw It in QST — It Identifies You and Helps QST
of tubing in coaxial lines. In sweating such joints solder often would leak into the line and cause shorts or arc-overs. Don’t solder the line together if you want trouble-free operation.

RIGHT ANGLE JOINTS

Assuming that the line is completed as far as the wall or window where it is to be brought into the transmitter, perhaps it is necessary to make a sharp bend to make a neat installation. Being brass tubing, the line refuses to bend, so now you use a right-angle coaxial joint, Fig. 2. This joint, believe it or not, maintains the 75-ohm impedance even though the center conductor is bent at a 90-degree angle.

These joints are made of brass stock 3/8 inch thick by 1 inch wide. Two squares of this stock 1 inch to the side are clamped in a vise and drilled and tapped for whatever thread size you have available, one section being drilled and the other tapped so that when screws are inserted and tightened the two blocks will fit together snugly. This must be an accurate job, and we would suggest you have it done by a local machine shop unless you are well equipped to do it. Next, place the two sections in a vise and drill, accurately, 5/8-inch holes through two sides halfway through the two sections. You then have two 3/8-inch holes drilled at a 90-degree angle to each other, meeting in the center of the two sectional blocks of brass. Now coat the inside surfaces between the blocks with Duco cement, bend the wire accurately so it does not touch either wall of the right-angle hole, insert the 3/8-inch brass tubing into each hole about 1/4 inch and tighten up the four screws holding the two brass sections together.

PREVENTING MOISTURE CONDENSATION

An end seal must be used at both ends of the line. Outlet and inlet fittings and a 0-80 pound pressure gauge should also be mounted in the line if it is to be filled with nitrogen gas. However, we have had no occasion to use gas in our line,
35T

THE WORLD'S MOST NOTABLE AMATEURS USE EIMAC TUBES BECAUSE...

1. Tantalum plates and grids fabricated and exhausted by an exclusive Eimac process.
2. Complete severe exhaust; "getter" entirely eliminated.
3. No internal insulators to break down under excessive heat.
4. Vertical bar grid, with high insulation, low capacity support.
5. Improved thoriated tungsten filament having unusual thermionic efficiencies with a special support assembly.
6. Lowest interelectrode capacities for equal power rating or capabilities.
7. Unconditionally guaranteed against gas.

YOU CAN GET THESE TUBES AT YOUR DEALERS TODAY

W6QD Herb Becker renowned authority on DX work whose articles are widely read. Continually on the air... uses Eimac Tubes.


W4DHZ Dave Evans won first place in 1936 and fourth place in 1937 DX contests. One of the best known East Coast Hams. An ardent Eimac fan.

W6CUH Charlie Perrine... an Eimac user. Everybody knows of his exploits in technical and DX fields. His ideas have revolutionized amateur radio.

W6CXW Henry Sasaki won second place in the 1937 DX contest. Has been using Eimac tubes for over three years. One of the most consistent West Coast signals.

GSBY Hilton L. O’Heffernan is one of the better known English amateurs. Was the first English station to be heard across the Atlantic on 5 meters. G5BY used Eimac Tubes.

VK2NO Don Knock holds the world's DX record for 5 meters. Confirmed report of his 5 meter signals being heard in Wales. Another Eimac triumph.

[We could fill a book with names of enthusiastic Eimac users, but space does not permit.]

Eimac's record breaking success in attracting radio's outstanding Hams from all over the world is something more than mere luck. The owners, executives and workers (every one) in the Eimac shops, are "Hams"; all young people; all vitally alive and enthusiastic about tube performance as a personal hobby. They talk your language and feel your problems. It is their pride and glory to s-t-r-e-t-c-h tube performance far in excess of normal ratings. No wonder Eimac tubes are in such demand by the outstanding DX Hams throughout the world... no wonder, too, that the rank beginner who starts with Eimac soon outstrips many oldtimers, who continue with outmoded rigs.
For Best Results—
Use Jefferson Transformers

Those who have had widest radio experience with receivers, transmit-
ters, amplifiers—know that the transformers used make a big dif-
ference—as Ted Covern confirms.

Jefferson Transformers have be-
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State ..............................................

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

and it has been lying six inches underground now
for three months. Gas is used in these lines when
they are installed for broadcast stations, but we
know of many ultra-high-frequency police in-
stallations that have been operating perfectly for
many months without gas.

The purpose of the gas (nitrogen drawn off
through oil) is to give the line a greater voltage-
breakdown factor between center and outer con-
ductor, and also to keep out water and prevent
condensation within the line. The average pres-
sure maintained should be in the vicinity of 25
pounds.

A much easier system\(^2\) to use for clearing out
condensation (if you ever do get any—we haven't
yet) is to fill a Mason jar not quite full of calcium
chloride. Push a brass or copper tube down
through a rubber stopper almost to the bottom of
the jar. Then put another brass tube through the
stopper so it just projects on the other side.
This is bent over and similarly connected to a
second Mason jar filled with cotton batting, as
shown in Fig. 4. This tubing goes to the bottom
of the second jar. A third tube goes down through
the stopper of this jar to the top of the cotton bat-
ing and is then connected to the line. The first
tube is connected to a bicycle pump and air
is pumped into the first jar through the calcium
chloride out into the next jar up through the cot-
ton batting and out through a hose to the coaxial
line. You then have air free of moisture content
pumped into the line’s inlet valve and out
through the outlet valve near the end of the line.
Any moisture in the line will be dried up.

Thus, you have a workable coaxial line. Any
amateur can build it. Except for the coaxial
joints, which were made in a local ham’s machine
shop (W2FL) no tools are required other than
those ordinarily found in any amateur station,
plus a couple of wrenches out of the “flivver’s” tool
kit.

COUPLING TO ANTENNA AND TRANSMITTER

Since we were mainly interested in ‘phone, the
antenna with which the line is used was designed
with three-band ‘phone operation in mind. It
consists of a half-wave on 75 meters fed in the
center with the coaxial line. Each side of center
(which is supported by a 40-foot pole) insulators
are inserted to give the required half-wave flat
tops for both 20 and 10 meters. Jumpers are
connected across these for 75-meter operation
and are removed for either 20- or 10-meter opera-
tion simply by letting down both ends of the an-
tenna, which is suspended on pulleys. A ladder of
cross arms on the center pole allows us to go
about halfway up the pole and either connect or
disconnect the jumpers for whatever half-wave
antenna we choose to use. This antenna system
really works well on 75, 20 and 10.

Coping the coaxial line to the antenna is
simple. Merely anchor each section of the antenna
to the pole and run flexible copper braid or soft-
drawn copper wire leads neatly from the end seal
connections at the end of the coaxial line. One side
of the flat top is soldered to the brass tube, the

\(^2\) Thanks to W2DAC, chemist on the job.
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Supervisor of Radio
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inner conductor going to the opposite half. No fanning is necessary.

Coupling to the transmitter is likewise easy; use a coupling coil at the cold end of the tank inductance or, in the case of push-pull stages, at the center of the inductance. Tune the final stage to resonance before coupling the coaxial line, then connect your coupling coil to the line and vary the number of turns until the proper amount of plate current is drawn by the tube or tubes.

You can't beat this type of line when it only figures a fraction over 10 cents per foot to construct!

28-Mc. Preselector
(Continued from page 85)

CONNECTIONS

Heater and "B"-voltages for the preselector may be obtained from the receiver except in the case of a.c.-d.c. receivers, where special provision must be made for heater current. The B+ leads of the preselectors themselves are well by-passed, as shown in Figs. 3 and 6, and it should always be possible to connect the lead to some part of the receiver power supply where it will not introduce feedback or make additional filtering necessary.

Connections between preselector and receiver might appear to be extremely simple; actually this is the most critical point of the installation. The various photographs clearly show one lead of the output link grounded to the chassis and the high side completely shielded by means of flexible wire braid. This braid must be solidly grounded to the receiver chassis and it is sometimes necessary to select the grounding point with considerable care in order to avoid oscillation. To put it another way, the chassis of both preselector and receiver must be at exactly the same r.f. potential, and this potential should, of course, be as close as possible to zero.

The difficulty arises from the fact that the various B+ circuits and grid returns of the receiver are not sufficiently filtered for operation at fairly high gain levels and consequently a certain amount of r.f. potential is present on the chassis, speaker leads, a.c. cord, etc. Without the preselector, these potentials would do no harm, since the gain of the receiver is down at ten meters, but with the high-gain preselector connected, the potentials are sufficient to cause feedback and oscillation in the added r.f. circuits, even though the preselector itself is perfectly filtered. The most bothersome feedback occurs between the speaker leads (connected directly to the B+ circuits) and the antenna lead-in or feeders near the preselector input. In addition to bonding the two chassis, as mentioned above, it may be necessary to by-pass the various speaker leads and a.c. cord with 0.001-µf. mica condensers. In particularly stubborn cases, the plate return leads of the first detector, high frequency oscillator, and r.f. stage (if any) of the
THROUGHOUT the world, amateurs and professionals proudly proclaim the superiority of their transmitters using great parts by Hammarlund that insure such quality transmission. Each of these items has a host of distinctive features that hit a new high in standards of design. For instance, the "N-20" (illustrated above, center) one of the newest additions to the Hammarlund transmitting condenser family, is an ideal heavy duty high voltage neutralizing condenser with many new features, such as, micrometer adjustment with a heavy finely threaded machine screw; heavy round edged aluminum plates, polished on all surfaces, and a special lock for permanent adjustment. A stop is provided to prevent all possibility of shorting. Insulation is B-100 isolantite. Like the "N-10" this condenser has been also designed for horizontal adjustment, with a 2-hole mounting. Its capacity range is from 2 to 20 mmf. with an air gap range of from ½" to 2". The plates are 4" in diameter.

The "MTCD" (shown at right) is another recent development that provides the high operating efficiency demanded by critical amateurs and professionals. Designed for universal mounting, it can be mounted on a panel flat, on a chassis with either side up on its edge, thus fitting any possible arrangement of parts. Heavy aluminum plates are accurately wedged into deep slots in supporting bars. An accurately machined stainless steel shaft fitted to a long bronze front bearing mounted on a Beryllium cushion disc provides a free floating action for consistently smooth operation and perfect bearing. Isolantite insulation and silver plated Beryllium contact wipers assure lowest losses and lowest series resistance. Available in a number of convenient sizes from 20 mmf. to 265 mmf. with a wide variety of operating voltages from 1000 to 5500 volts.

The Hammarlund "MCDX" (at left) is well-known to the amateur who builds and operates quality ultra-high frequency transmitters. It is the accepted standard for tuning ultra-high frequency transmitters where a well insulated split stator condenser is required. Its design is such that the inductance with which it is used can be soldered directly to the terminals eliminating further support. A new split type rear bearing and noiseless wiping contact assure smooth, quiet operation. Cadmium plated non-corrosive soldered brass plates are used. Available with midline or semi-circular plates with a maximum capacity of 31 mmf.

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receiver will require additional filtering. Often times a 0.1-µfd. condenser connected from one side of the first detector heater to chassis will do the trick.

At 28 megacycles electrostatic shielding between the antenna primary and the first tuned circuit does not appear to be particularly helpful in reducing such feedback. This may be due to the fact that complete shielding of this type is very difficult to obtain at these frequencies, the situation being further complicated by the presence of electromagnetic or inductive feedback from standing waves on the various external leads.

ALIGNMENT

The amateur who has not previously constructed equipment of this type may hesitate to do so, because he feels that the circuits will be difficult to gang properly or that the added tuning control will make tuning too complicated. Neither of these objections is valid. Since the preselector covers only a narrow range of frequencies and tuning of all circuits is the same, it is necessary to make the secondary windings of the coils only approximately identical. For instance, in building the single-stage unit the coils were space-wound by eye on a half-inch form and were merely adjusted so that the overall dimensions were the same, as nearly as could be judged by holding the coils side by side. The coils should, of course, be mounted symmetrically with respect to the shielding, although here again dimensions are not critical.

In the absence of feedback discussed above, alignment of the preselector circuits is absurdly simple. Merely tune the receiver to the high frequency end of the band with the various gain controls advanced sufficiently to make background noise plainly audible, then starting at the preselector output circuit and working back toward the antenna adjust the trimmer condensers for maximum background noise. No signal is necessary and the antenna need not be connected. To check ganging, tune the receiver to the low-frequency end of the band and swing the preselector dial until the background noise peaks up; then check the trimmer adjustments to see that all circuits are exactly in tune. The antenna should now be connected and the input-circuit trimmer checked again. If it requires readjustment, the antenna coupling is too tight and the primary should be backed away from the secondary or one of the turns removed. If the link-circuit coupling between the preselector output and the receiver is too tight, the output-circuit trimmer will tune very broadly or will, in extreme cases, have a double peak. Best coupling will generally be obtained when the output-circuit trimmer adjustment is only very slightly broader than that of the grid-circuit trimmers.

After the preliminary work has been done and the combination is set to go, the preselector can always be kept in step with the receiver by the background-noise peak and there is no possibility, therefore, of missing weak signals because the preselector is out of tune.
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- Max. plate ma-150
- Max. pl. volts-2000
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"Custom-Built" Performance at Low Cost

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For maximum performance at minimum cost...use RCA RadiO TUBES.

Listen to "Magic Key of RCA" Sundays, 2-3 p.m., E.S.T., on NBC Blue Network.

The "QSL Forty"
(Continued from page 87)

it accurately. You can then turn out the bakelite strips in short order. When drilling a strip, back it up with a piece of steel so that the point only of the drill shows through the bakelite, then run the drill through from the back, thus avoiding bad breaking out between holes.

The 40-meter coil in the photograph has two strips 2½ inches long, one being ¾ inch wide, the other ¾ inch wide, each with 22 holes. Make up a coil on a tin can or a bottle so that it will spring to 2½-inch diameter. Feed this through the strips till you have 15 turns for the plate coil and 6 turns for the coupling coil. The 15 turns "use up" 16 holes in the bottom strip and 15 holes in the top strip. The 6 turns use 6 holes in the bottom strip and 7 holes in the top strip. Note that $L_1$ and $L_2$ are not one continuous coil. To steady the floppy coil while a drop of Duco cement is put into each hole, roll up some heavy paper, thrust it through the coil and let it unroll till it holds things snugly. The little aluminum brackets with the banana plugs are shown clearly, and should be fitted before threading the coil. For larger coils use three strips instead of two. Bend the ends of $L_4$ into little loops for handy connection to the leads from the antenna feeders.

POWER SUPPLY

Any power supply which will deliver 450 volts, loaded, at not less than 200 ma. will operate the rig. Use a 20,000-ohm voltage divider of 50 watts rating, and set the slider so as to get about 350 volts, loaded, for the screen. The power supply diagrammed in Fig. 3 is satisfactory and inexpensive. If a transformer with a 6.3-volt tap, which is now available, is used the rheostat in the 7½ volt circuit may be omitted. A 5-and-10-cent store porcelain base d.p.s.t. switch is in the high-voltage leads so that the 83 may warm up before the voltage is thrown on by closing the switch. This may be mounted above the power supply chassis on four small feed-throughs, the long studs of which replace the screws holding the switch.
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Large, sturdy GRAPHITE ANODE with lead out of top. High quality insulating material throughout. Heavy four-way supports. Thoriated tungsten filament, and low loss ceramic base.

RATINGS CLASS C TELEGRAPHY

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
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<tr>
<td>DC Plate Voltage</td>
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<tr>
<td>DC Plate Current</td>
<td>155 Max. MA.</td>
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<td>Amplification Factor</td>
<td>27.5</td>
</tr>
<tr>
<td>Mutual Conductance</td>
<td>6000 Umhos.</td>
</tr>
</tbody>
</table>

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Fittings

For the transmitter you need two Amphenol steatite sockets, 5-prong for the crystal and power and one octal for the tube. Use two Birnbach jack feed-throughs No. 478-J and banana plugs for the coils, and one feed-through No. 458 for the insulated key binding post. For the power supply use one steatite 4-prong socket for the 83 tube and six No. 458 feed-throughs for the choke and condenser and for mounting the porcelain-base switch. It may be necessary to grind the edges of the feed-throughs for the switch, depending on the jaw spacing of the latter.

When installing the pilot bulb socket be sure that the correct terminal is grounded or else the bulb will not be in circuit.

Antennas—Coupling

I don't know of any "best rule" about this. My own antennas are 80-meter, half-wave Zepps, about 40 feet up. At W8QBW the feeders are about 55 feet long and at W8QDK these are about 44 feet long, both tuning parallel on 40 and 80 meters. The r.f. antenna meter on 80 reads about 1.3 amperes and on 40 about 0.6 amperes, the difference being due to the location of current loops.

Band Changing

This is a matter of a moment only. Lift out the coil and crystal, replace with the ones desired and tune up. Anyhow this "instantaneous band change" idea is the bunk and not worth the complications and expense it involves.

The rig has been run, key-down, for an hour at a time, on a 25-watt Mazda dummy, 100-ma. plate current, and seems to like it. This will shed some light on using it as a continuously-running exciter. When used in this way, however, better reduce the screen voltage as much as possible and still get the 25 watts output.

Results from this or any other transmitter depend largely on reasonable operation. If you hear a half dozen stations just about your frequency, then you will be merely a part of the QRM and the chances for a QSO rather slim. If you have a very good receiver you will do better calling CQ than answering calls. Should any one of the many listening hams answer, you are pretty sure to hear him and a QSO result. If your receiver is not much good, then answer the other fellow's CQ. You know you can hear him and if he hears you and chooses to answer, again a QSO results. At least this seems to check with common experience.

Strays

In making up coils with turns threaded through strips of bakelite, sometimes trouble is encountered in making the strips stay put while the Duco cement is being applied. If a roll of heavy paper is thrust axially through the coil and allowed to unroll, it will hold things snug. The strips may then be spaced and cemented without slipping.

-W8QBW

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No heat's too high for Speer Graphite Anodes. Even at 3400° F., far beyond the melting point of glass . . . far above any temperature to which any anode will be operated, graphite still does not melt or even soften . . . does not crack or distort. Though graphite stands extreme temperature, it operates at lower temperatures than any metal anode because it dissipates heat more readily.

For example, a tube with a tantalum anode will get red hot when dissipating 14 watts, a molybdenum anode at 16 watts, a tungsten anode at 20 watts and a carbon anode at 70 watts.

This means that when you buy tubes with Speer Graphite Anodes, the plates will run cooler, and will not melt, soften, crack or warp. Speer Graphite Anodes stand heavier overloads and last longer.

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Standard Frequency Transmissions

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STANDARD FREQUENCY SCHEDULES

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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 W6XK is “O”; and that of W6XN is “M.”
- 1 minute — Statement of frequency in kilocycles and announcement of next frequency.
- 2 minutes — Time allowed to change to next frequency.


W6XX: Don Lee Broadcasting System, Los Angeles, Calif., Frank M. Kennedy in charge.

WWV Schedules

EACH Tuesday, Wednesday and Friday (except legal holidays), the National Bureau of Standards station, WWV, transmits with a power of 20 kw. on three carrier frequencies as follows:

1000 to 11:30 A.M., E.S.T., on 5000 kc.; noon to 1:30 P.M., E.S.T., on 10,000 kc.; 2:00 to 3:30 P.M., E.S.T., on 20,000 kc. The Tuesday and Friday transmissions are unmodulated c.w. except for 1-second standard-time intervals consisting of short pulses with 1000-cycle modulation. On the Wednesday transmissions, the carrier is modulated 30% with a standard audio frequency of 1000 c.p.s. The standard musical pitch A = 440 c.p.s. is also transmitted from 4:00 P.M. to 2:00 A.M., E.S.T., daily except Saturdays and Sundays, on a carrier frequency of 5000 kc., power 1 kw., 100% modulation. The accuracy of the frequencies of the WWV transmissions is better than 1 part in 5,000,000.

Cairo

(Continued from page 82)
Modern receiver designs employ ceramic insulation in an increasing number of applications. Hammarlund’s “Super-Pro”, an excellent example of up-to-date design, uses Isolantite* liberally.

Greater precision in dimensions, high mechanical strength, and low electrical losses are factors which make Isolantite insulation the choice of the leading manufacturers of both amateur and commercial radio equipment.

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Everywhere amateurs interested in ultra-high frequencies are using the Western Electric 316A. Read its features—you'll want to build a transmitter around it.

It's designed specially for use in circuits at frequencies up to 750 mc. It delivers 6.5 watts at 500 mc.

Important features producing higher efficiency are: absence of conventional glass press; close electrode spacings, reducing time of electronic transit; short heavy leads; low inter-electrode capacities.

Upper frequency limit ........... 750 mc.
Nominal power at 500 mc .......... 6.5 watts
Maximum plate voltage ....... 450 volts
Maximum plate dissipation ... 30 watts
Maximum plate current ....... 80 ma.
Filament voltage ............. 2 volts
Filament current ........... 3.65 amps.

The booklet enclosed with each 316A gives typical circuit details and complete operating instructions. For full information on this and other Western Electric tubes for amateur use, consult your dealer—or write Graybar Electric, Graybar Building, New York.

Western Electric
BROADCASTING EQUIPMENT
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U. S. proposals; the United States, therefore, is not proposing any increase of amateur territory at Cairo.

Now for the story: we go back to June, 1936; the allocations committee still has not met. The reason? That the F.C.C. had announced it would hold an entirely separate hearing at Washington, for the advertised purpose of securing data which would enable it to make domestic assignments in the still-unassigned ultra-high frequencies. Now, at first hand it may seem there is very little connection between Cairo proposals for the high frequencies and a domestic hearing on ultra-high frequencies; we assure you, however, that there was a very close connection! We say the "advertised" purpose of the F.C.C. hearing was ultra-high-frequency matters. Actually, it was far more than this. You see, the matter of short-wave allocations is an extremely difficult and controversial subject. Just about every radio interest in the country had been making loud noises ever since Madrid as to their respective needs for more territory. As the F.C.C. saw it, it might very well happen that the Cairo preparatory group would become so hopelessly bogged down on this subject that it would be found necessary to turn the whole thing over to the government agencies for decision, and in this case the F.C.C. would have a major share of the responsibility. Before the Commission found itself in any such delicate position, it wanted to have accurate knowledge of the actual needs of each service; this June hearing was an ingenious solution to the problem. Each user of radio who showed up at the "ultra-high" hearing was going to have to prove not only his case for u.h.f. assignments but, in addition, his case for what he wanted in the normal short-wave spectrum. Indeed, more than that, he was going to have to establish his reasons for keeping what he already had! As an F.C.C. official stated shortly before the hearing (he cannot be quoted since his remarks were off the record) it was a case of putting it right up to each service to scratch down and prove its right to the air, as of the present time. With particular respect to us amateurs, for instance, we had to justify ourselves in terms of present day accomplishments; ancient history and past triumphs, while interesting, were not going to be good enough.

So at this point we see everybody dropping all immediate thought of Cairo preparatory work and, instead, going to work like the very dickens to make a bang-up case for themselves at the F.C.C. June hearing. The League's job for the amateur at this hearing was the now well-known "Presentation for the Amateur Service," a document of some 20,000 words and thirteen charts, a copy of which was sent to every A.R.R.L. affiliated club last year and which is still available to individual members at fifty cents a copy. (If you've never seen this job, you should!) In this we made out the very best case we could for the amateur, for fair assignments in the u.h.f. spectrum when such assignments were made by the F.C.C. in this country and, furthermore, for
These A.C. solenoid relays are ideal for remote control of transmitters, for control of crystal ovens, and for any general remote control application except for keying. THESE RELAYS WILL NOT OPERATE IN KEYING SERVICE. Silver-to-silver double-break contacts are used throughout.

The maximum contact rating is 10 amp. at 220 v. or 3 amp. at 550 v. The relay coils are wound for 115 volts 60 cycle alternating current. Relays for other voltages can be supplied on special order. Use coupon below.

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our dire need for more territory at 3.5 and 7 Mc. We included the specific plea that our 3.5-Mc. band should go from 3500-4500 kc. and that our 7-Mc. band should go from 7000-7500 kc., if amateur needs were adequately to be served. It should not be assumed that we hoped for some sort of favorable recommendation by the F.C.C. on these points; the hearing resulted in no recommendations or findings by the Commission with respect to such matters. It merely "heard" the various services, noting the information against possible future need. (It is true that the u.h.f. portion of the testimony was subsequently used in formulating a set of domestic u.h.f. assignments in the Fall of 1937.)

With the June hearing out of the way, we now go back to the allocations group of the Cairo preparatory committee. A meeting of this committee was called; and now, at last, we are right down to bedrock! If amateurs were to get more frequencies at Cairo, it was just about essential that the United States, at least, should propose them; if increases were to appear in the U. S. proposals, they had first to be adopted by the committee on allocations of the main Cairo preparatory committee.

So here we are at the first meeting of the allocations committee; the question is what proposals, if any, are to be made for change in the Madrid table of high-frequency allocations. It is a big moment for us. The meeting is open. Any proposals for changes? "Yes indeed!"—the League immediately proposes a widening of the amateur 3.5 and 7-Mc. bands to the figures suggested by us at the June hearing; and for the reasons given then. The matter came to a vote—and, with one exception, every single radio interest present at the meeting (commercial, government, Army and Navy) voted against it; our own vote and that of the representative of the Department of State were the only ones in favor. We were turned down flat.

Now, right here we want to make a most important point: that turn-down by the allocations group was not in any sense a discrimination against us as amateurs. We mean this: it is not to be assumed from that vote against us that our request for more space was denied whereas other services were granted all or part of their requests for more space. The fact is that no service secured so much as a single additional kilocycle. Not one. The outcome of the committee's deliberations was that not a single change of any kind was proposed for any service in the territory above 1715 kc. In other words, the attitude of the United States with respect to the Cairo table of allocations in the short-wave spectrum is to maintain the present Madrid assignments intact.

Why?

Merely this: by the time the June hearing was over and by the time of the preparatory meetings, it had become the unanimous feeling among the representatives of practically every radio interest in the country that the only way to avoid a hopeless snarl on high-frequency assignments at
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1938 HALLICRAFTER
Super Sky Rider

ONLY $23 DOWN and $9.02 monthly for 12 months (or $11.33 monthly for 9 months) ... buys this 1938 Super Sky Rider complete with tubes, crystal and speaker. CASH PRICE: $123

THOUSANDS SOLD — but we still have a few of these well known makes
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We started with 10,000 and are now sold down to a limited stock of the four capacities listed below. ALL WITH NEWARK MARKS. Guaranteed at rated voltages. No more at these amazing low prices when these are gone. Get your order in TODAY and be sure!

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<td>8 mfd., 1500 V, DC</td>
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<td>4.4 mfd., 1000 V, DC</td>
<td>5 x 3 1/4 x 1 3/4, 1 1/4 lb.</td>
<td>$2.75</td>
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Newark's Easy Payment Plan permits you to enjoy these receivers now on small monthly payments that you hardly miss. We can supply any amateur receiver you want. We ship 10 days after receiving down payment. Order today direct from this ad.

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Cairo was to hold out for the status quo and maintain it, if humanly possible to do so. It was not a question of merit; everybody knows that certain services in this country urgently need more space than they now have; it is quite possible, too, that most everybody would be found in pretty general agreement on the fact that some people have too much. But that is not the point. The point is that the entire spectrum is already assigned "full up" under the Madrid table; any increase in the space to one service must inevitably result in a decrease in space to others. Were the problem confined to this country we might iron things out, nevertheless, but the problem is not confined to this country at Cairo; it involves every nation in the world. Just what would happen if a general re-shuffling of the short-wave table took place at Cairo no one knows. But everybody here agrees, from intimate experience with past conferences, that such a thing is to be avoided as far as possible. There are entirely too many foreign interests itching to jump into just such a situation with all sorts of complicating requests and demands. Somebody would be sure to lose and, with the matter beyond our control, nobody wants it to be themselves who get short-changed. The U. S. view, then, is to stick to what we have, if we can.

When these recommendations reached the main preparatory committee, however, A.R.R.L. filed a minority report disagreeing with the allocations committee findings, and appealing for our requested extensions of space. We were turned down by the main committee, which reaffirmed the allocations group recommendations in every particular. From the main preparatory committee, the U. S. proposals (now in complete form but not yet "final") went to the government for study; specifically, to the F.C.C. and a group of representatives of government radio interests known as the Interdepartmental Radio Advisory Committee. At the direction of the League's Board, we made an appeal for the granting of our frequency-band increases to this group, which reaffirmed the allocations group recommendations in every particular. From the main preparatory committee, the U. S. proposals (now having the approval of the F.C.C. and I.R.A.C.) went to the government for final approval, we made an appeal there. We were eventually advised that our plea could not be granted. The State Department then transmitted the proposals to Berne in the name of the U. S. government.

The complete book of proposals of all the nations was then issued by the Berne Bureau in April of this year and, as we've already mentioned, extracts of those portions affecting us amateurs were printed in the July 1937 issue of QST. Since they are matters of record we will not repeat them here. During the Fall of 1937 the groups represented in the preparatory committee meetings met again at Washington to
Once again Taylor, “More Watts Per Dollar,” smashes through for the Amateur!! As usual Taylor leads the way, offering lower priced, higher quality Amateur Transmitting Tubes. The sensational price slash on the four tubes listed above is proof of Taylor's unceasing fight to bring “Hams” everywhere the benefit of “More Watts Per Dollar.” Each of these tubes has proven its right to sales leadership. Long life, dependable service, value-plus prices and Taylor's irrevocable guarantee of satisfaction have brought the Amateur a new idea in transmitting tube values. Taylor “More Watts Per Dollar” now SAVES YOU MORE MONEY. There's a reason for Taylor leadership — You will find that reason in RESULTS.

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On or before February 1st, Taylor Tubes will announce a new tube in the low price field that will give you a new conception of “More Watts Per Dollar.” Watch for the announcement in this magazine. ASK your Parts Distributor for the facts.

Taylor Tubes are sold only through leading Amateur Parts Distributors.
As usual, where dependability is vital, UNITED tubes are on the job. This time it is the UNITED 905's in the MacGregor Expedition transmitter. Through the New York Times receiver, in the heart of Manhattan, we hear from Greenland:

"Excellent success with UNITED Electronics 905 and 966 tubes under very adverse conditions. Handled over 1000 messages to date and had several NBC broadcasts with splendid success. Season's Greetings."

Capt. C. J. MacGregor and A. G. Sayre

If your dealer does not stock UNITED tubes, your order will be cheerfully handled by the factory, and all the more power to you.

Type 905 is interchangeable with Type 805 — Price $13.50.

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study all these proposals. We are not concerned with this, however, since the result has been to reaffirm the U. S. stand on matters affecting us.

THE CAIRO CONFERENCE

We’re finally ready to follow our fortunes across the Atlantic to the Cairo conference itself. Presumably, this conference will behave very much as did the two previous, the Madrid, 1932, affair and the gathering at Washington in 1927; readers who are particularly interested in a detailed treatment of these meetings are referred to the February, 1933, and January, 1928, issues of QST respectively, for complete stories.

The last step to be made on this side of the water in connection with U. S. participation at Cairo is the appointment of the U. S. government delegation. As we write, in early November, no announcement of the make-up of this delegation has been made; it is customary to wait until the last month or so before this is done. The delegation will consist of government people—usually four or five men. With them will go a corps of technical advisors, translators, clerks and stenographers to a total of perhaps twenty-five people. Also from the United States will go some twenty to thirty representatives of the various private interests in this country. Among these latter will be the League’s two representatives, jointly representing the A.R.R.L. and the I.A.R.U. At Cairo, our group will join with similar delegations and representatives from 75 or 80 different nationalities, a total of many hundreds of dignitaries, large and small.

At Cairo, the first thing is the holding of the opening plenary meeting—a plenary meeting being a full meeting of the whole conference group. At this meeting, representatives from the host nation (Egypt, in this case) will greet the delegates. Then the delegates will rule on the other than the government delegations; our own participation (ARRL-IARU) will not be a question here, however, since we had arranged to have the question circulated in advance and have already been notified of admittance, by the Egyptian government. Then committees will be formed, chairmen for them elected, decisions made as to which nations may wish to participate in the workings of which committees and the work parcelled out by topics, after which the plenary session will adjourn and let the committees go to it. What happens thereafter is best described, briefly, by a paragraph incorporated in the article on the Madrid Conference by Secretary Warner, which we quote:

"The conference spent the first week getting organized, adopting internal rules, appointing committees and bureaus and assigning subjects to its five main committees—and in the organization meetings of the committees to divide themselves into subcommittees and parcel out the work. The second week things started moving, with some real talk in subcommittees, countless people shooting off un-

2 The I.A.R.U. delegation will also include the representatives of other member-societies.
BAND-SWITCH
Quick change from one frequency to another, with really low-loss efficiency, is easy with Ohmite Band-Switches.

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Ohmite Rheostats make tubes last longer — permit exact adjustment of filament voltage for long life and peak performance.

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Ohmite "Brown Devils" are extra-sturdy vitreous-enamelled resistors that will stand up under extreme humidity. 10 and 20 watt sizes.

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Voltage-divider construction is easy, convenient, flexible with Ohmite "Multivolt" tapped units. Wide range of resistance and wattage ratings available.

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NEW "PITC" RIG
Pitcairn Island, romantic scene of "Mutiny on the Bounty," a tiny dot in the Pacific thousands of miles from nowhere, will soon have its first really efficient radio transmitter. Seldom visited by passing ships, "PITC" will rely exclusively on this transmitter for outside contact. Since components must not fail, even under adverse tropical conditions, OHMITE Resistors, Rheostats, and Band-Switches were the choice of the designing engineers. You may not have to depend on radio alone for vital contacts with the outside world — but you can depend on the proper Ohmite units to solve your radio resistance problems once and for all — surely, economically, conveniently. Do the job right with Ohmite!

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The modern Ohmite "Daylight" factory where every facility is provided for the production of high quality rheostats and resistors under rigid laboratory standards — assuring consistent uniformity and dependability in every unit as well as prompt, accurate service on stock and special orders.
THE SCOPE OF THE BOOKLET

"BUILDING AN AMATEUR RADIO TELEPHONE TRANSMITTER"

This booklet is addressed primarily to readers who have at least read our companion booklet, "How to Become a Radio Amateur," and have, perhaps, built a simple telegraph transmitter and receiver, have received their license, have acquired some skill and experience as a code operator, and who now feel the urge to explore the possibilities of radio telephony. These people should find this booklet the exact answer to their needs.

Absolutely the first requisite in either building or operating a 'phone transmitter is a solid understanding of what we are attempting to do when we accomplish voice transmission. Understanding the functions of the various parts, we shall avoid difficulties. The saddest thing in amateur radio is a 'phone amateur who does not understand the operation of his apparatus. The book begins, therefore, with a discussion of the principles involved and makes every effort to make this discussion perfectly clear so that the reader can easily make it a part of his own knowledge. It then goes on to the actual construction and operation of an inexpensive but efficient 'phone transmitter.

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AMERICAN RADIO RELAY LEAGUE
West Hartford, Connecticut
Did you read the editorial in December issue of QST relative to ultra high frequency operation and the great importance attached to the 5-meter band? Television interests, with their millions invested, immediately bordering the low frequency side, and the government occupying the immediate range beyond 60 megacycles!

Yes! It's going to be important to play the game according to the rules! Very important!

RME as one of the leaders in amateur communication equipment is "placing the first long-range gun" in the interest of 5-meter operation by introducing the

510X FREQUENCY EXPANDER

What Is It?

— A specially designed unit to be used in conjunction with your present receiver, especially the RME-69, in order to expand the range for real operation on 5 meters. You must know whether you are in or out of the band! Consequently, the tuning range of the 510X is continuous from 27.8 megacycles to 70 megacycles. (You will note it covers 5 and 10 meter amateur bands.)

What Does It Do?

— Provides an over-all sensitivity of better than one microvolt when used in conjunction with any modern receiver such as the 69 . . . features excellent stability, complete shielding, calibrated dial, finger-tip tuning control mechanism, and incorporates its own power supply . . . meets all requirements for 5-meter operation in a manner never before provided.

Why the 510X Expander?

— With your present superhet as a basic double IF receiver, the 510X Expander gives you an excellent U.H.F. instrument at a nominal cost without having to invest in expensive ultra-high-frequency-designed supers. RME thus gives to the radio amateur and the 5-meter enthusiast and experimenter the lowest cost, highest over-all sensitive, calibrated method of working 5-meters ever offered. The new unit will be ready for delivery during the early part of February.

LITERATURE IS AVAILABLE ON REQUEST

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Great War, countries such as Germany were still major powers but had lost their colonies in the War. What to do? We seem to recall that at Washington Germany was arbitrarily allowed six votes, even though she didn’t have the colonies—but that doesn’t end the trouble; the voting question got squabbled over all over again at Madrid. Well, it’s about time we put an end to this by saying what, perhaps, we should have at the start—that as a matter of actual practice, hardly any question is ever submitted to vote! And that statement goes for everything right up to and including the plenary sessions themselves! The way things work, nobody would think of putting a matter to vote until the sentiment has been thoroughly determined and hashed out and everybody lined up—and when that is done no voting is necessary. Consequently, it is almost never resorted to; decisions are made in terms of the obvious consensus of opinion, and that ends the matter.

We’ve been asked how far into the u.h.f. spectrum the Cairo conference will make assignments: the existing Madrid table does not go above 30,000 kc. for general assignments. Of course, the answer to this one will be more apparent in a couple of months. However, it is quite possible that Cairo will go fairly well up into the u.h.f.’s—perhaps as high as 100 Mc. This subject is logically one for regional agreement rather than world-wide agreement, but Cairo may go into it simply because of such things as consideration of air-navigation aids, etc., which should be uniform over the world from an equipment standpoint.

So far, we’ve not said anything about our prospects at Cairo; we have purposely avoided discussion of this point, as a matter of fact. After all, it is rather pointless to speculate on the outcome; we’ll know it soon enough. However, it is probably safe to say that the chances of our acquiring any additional territory are virtually zero; they’d be bad enough, in the face of world opinion against it, even if the U. S. were committed wholeheartedly to such expansion—and as we have pointed out, the U. S. is not proposing any such expansion. Can we keep our present frequencies? Well... the chances are just about as good (and bad) as they were prior to the Madrid conference in 1932. We kept them at Madrid. It is not going to be easy sailing, however, any more than it was there. Inspections of the foreign proposals should indicate that. Most of our trouble will likely be with the low-frequency bands at 80 and 160 meters, just as at Madrid; this territory is earnestly desired by most foreign countries for all sorts of mobile and other services. So far, the shared-band principle...
which applies to these low frequencies has enabled us to come through OK so far as this country and Canada are concerned; we can only hope for a continuance. Lately, there appears to be excellent likelihood of trouble at 7 Mc., due to the demands of short-wave broadcasting and aviation for greater assignments in this territory. If the conference goes into the u.h.f., we might very likely have difficulty with our five-meter and other such bands because of the pressure of television, were it not that here again the subject is probably one for regional agreements.

That, we think, just about winds up the story. It has been impossible, obviously, to touch on the hundreds of details and "angles" with respect to legislative history and interpretation, and international conferences. Interested students on these subjects are invited to ask for details, or further references. However, we hope the average amateur has a more complete picture of the situation and an improved understanding of what is behind the makings of legislative history.

As of the time of the appearance of this second half of the article, the Cairo conference will be in session (barring emergency postponement because of international complications not now foreseeable) with the prospect of lasting until May, at least. However, look for an article on the complete story of the conference from Secretary Warner, along about the June or July issue of QST. Needless to say, we all hope the news will be good!

As a matter of interest, wherever we have "shared" bands with other services under the international table, we have always secured such bands exclusively to ourselves under our own U.S. laws and in the subsequent North American regional agreement.

New Receiving Power Amplifier Tube

A new 250-volt power tube, suitable for Class-B applications and as a dynamic-coupled power amplifier, has been announced by RCA-Radiotron. Designated as the type 6AC5G, it is an octal-based high-µ triode with heater taking 6.3 volts at 0.4 amp. In Class-B, a pair of the tubes will deliver an audio output of 8 watts with 250 plate volts, using a load resistance (plate to plate) of 10,000 ohms. In this application it works with zero bias, the plate current for a pair of tubes without excitation being 5 milliamperes.

As a dynamic-coupled power amplifier (circuit similar to that contained in the 6B5 type tube) with a 76 driver, an output of 3.7 watts can be obtained with 10% distortion.

The 6AC5G has an amplification factor of 125, transconductance 3400 micromhos at 13 volts positive grid bias.

Quotation from a newspaper description of a radio system installed by a Southern fire department. "The receiver has built a 'noise squelcher' circuit which eliminates static. The only noise is that of a broadcast."
TEMCO
AGAIN SHOWS THE WAY IN MODERN TRANSMITTER DESIGN!

In a specialized industry where the announcement of new developments constantly taxes the ingenuity of the most exacting radio research laboratories, the continued supremacy of TEMCO Transmitters has been a highlight of 1937. Again for 1938, the same skilled hands and engineering foresight which originally conceived this famous line, have created two new transmitters—the "350A" and "50".

The 350A is an entirely new transmitter, being similar to the original 350 in only one respect—that of power classification. It incorporates many advanced features which make it the most modern unit of its power in the field.

**All New Beam Tubes in the RF Circuit.**
Crystal Holders Accommodating 4 Crystals with Front of Panel Change-over.

**Multi-Frequency Band Switching up to Final Amplifier.**
250 Watts Output.
Peak Limiting Speech Amplifier, with Two Channel Mixer.

**Variable Link Output Circuit.**
No Neutralization.
Zero Bias Modulator Tubes.

The new TEMCO "50" has been developed only after months of research in an effort to produce a low power, reasonably priced transmitter embodying modern features which would be in keeping with the high standards for performance and quality which distinguish TEMCO Transmitters of higher power rating.

Both models will be ready for delivery about March 1st. We predict that these, too, will be highlights of the New Year. We invite your inquiries for complete technical data.

Transmitter Equipment Manufacturing Co., Inc.
130 CEDAR STREET • NEW YORK, N.Y.
Designers and Manufacturers of Radio Transmitting and Accessory Equipment

Say You Saw It in QST — It Identifies You and Helps QST
ROANOKE DIVISION

NORTH CAROLINA SECTION—SCM, H. S. Carter, W4OG—Your S.C.M. wants to thank the gang for the nice Christmas cards, and to extend best wishes for 1938. DX is doing good work on 14 Mc. with a pair of '10s, DLX and DNR, for W.G.T. The Kings Mountain gang is 51 per cent A.R.R.L. members now. FB, gang, DOQ is putting up new antenna. DOQ awaits UI card for W.A.C. CEI took part in the SB Contest, UTC visited CEI, ANU has already united 3 A.M., and is to get a new phone. Net going on 3.6 Mc. Give him your support, fellows. ANG/WLMC has started out with a bang; he led the State in traffic the first month to report in N. C. He is Chief Radio Aide in A.A.R.S. now. DZ8 is getting out well on 14-Mc. information and to the 'phone. Congratulations, OM, ESO had a good time in the State. ESB is on 1.75 Mc. with increased power. CPT made his 24th consecutive monthly report for the Wilmington gang. Your S.C.M. congratulates you on your fine work, EC is building a new rig. Santa Claus brought CFR a pair of '01's.

Department of Terrestrial Waves.

SOUTH CAROLINA—SCM, Ted Ferguson, W4BQE—Our W.W.K. thanks the gang for the nice Christmas cards, and to extend best wishes for 1938. DX is doing good work on 14 Mc. with a pair of '10s, DLX and DNR, for W.G.T. The Kings Mountain gang is 51 per cent A.R.R.L. members now. FB, gang, DOQ is putting up new antenna. DOQ awaits UI card for W.A.C. CEI took part in the SB Contest, UTC visited CEI, ANU has already united 3 A.M., and is to get a new phone. Net going on 3.6 Mc. Give him your support, fellows. ANG/WLMC has started out with a bang; he led the State in traffic the first month to report in N. C. He is Chief Radio Aide in A.A.R.S. now. DZ8 is getting out well on 14-Mc. information and to the 'phone. Congratulations, OM, ESO had a good time in the State. ESB is on 1.75 Mc. with increased power. CPT made his 24th consecutive monthly report for the Wilmington gang. Your S.C.M. congratulates you on your fine work, EC is building a new rig. Santa Claus brought CFR a pair of '01's.

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pointed out as follows: HXE—Lawrence; KBQ—Haverhill; JFY—New Bedford, A 55-Mc. Emergency Net along the Massachusetts Peninsular Telephone Company that have not sent recommendations for an Emergency Co-ordinator in their community to W1BEF are urged to do so at once. The entire Section should be organized as soon as possible, as emergency giving is giving way. HIX leads Section in traffic again. AKS has new 7-Mc. skyhook. III, IWC, JCK, AKS and EPE make B.P.L. this month. Nice getting, guys. EPE heard HISL far on 3.5 Mc. KMY is new Ass't Emergency Coordinator. JMS just completed a 5-Mc. 52-125. JNF moved to Lynn. DMF rebuilt high-voltage power supply. The entire Section extends its sympathy to INA in the loss of his mother. FCR is active on "Nutz Net." BMX is building a rig on 17 Mc. with antenna absent for two weeks. IN gets out FB on 56 Mc. KMY believes in 89 super-regen. receiver. OQ has new rotary tube and what can be done to bring some dead "Baking Tubes," giving the boys the dope on what happens to them back to life. ALP is rebuilding 56-Mc. receiver and rig. "Who was the gong for describing HXE's 12-foot gong last month? (shuda been 12 INCHES). KXN is new ham in Squantum. The N. H. Class of 1937 gave Mr. Mel Graham, Cooper and Henry of N.E. Tel. and Tel. described, with the aid of slides and talks, how radio was used in conjunction with world-wide telephone service. BVL spoke to the fellows on "Signaling and Transmitter Ing." giving the boys the dope on what happens to an overloaded tube and what can be done to bring some dead "Baking Tubes," giving the boys the dope on what happens to them back to life. ALP is rebuilding 56-Mc. receiver and rig. "Gong for describing HXE's 12-foot gong last month? (shuda been 12 INCHES). KXN is new ham in Squantum. The N. H. Class of 1937 gave Mr. Mel Graham, Cooper and Henry of N.E. Tel. and Tel. described, with the aid of slides and talks, how radio was used in conjunction with world-wide telephone service. BVL spoke to the fellows on "Signaling and Transmitter Ing.""
Any way you wish... you can check Stancor and the answer is always the same—"It's quality that counts."

Sometimes Stancors cost a few cents more than other transformers of the same characteristics... BUT THEY'RE WORTH IT.

NOTE

CHECK THESE POINTS AGAINST THE FIELD •

1. Cores of highest grade, laminated silicon steel. ✔
2. Windings checked after each operation. ✔
3. Positive vacuum impregnation with special equipment. ✔
4. Triple tested on dummy loads for perfect performance. ✔
5. The most modern factory in the industry. ✔
6. Finest appearance. ✔
    Newest finishes. ✔
    Embossed nameplates, concealed connections. ✔

Then You'll BUY STANCOR

STANDARD TRANSFORMER CORPORATION
850 BLACKHAWK STREET • CHICAGO

A.R.R.L. QSL Bureau

For the convenience of its members, the League maintains a QSL-card forwarding system which operates through volunteer "District QSL Managers" in each of the nine United States and five Canadian districts. In order to secure such foreign cards as may be received for you, send your district manager a standard No. 8 stamped envelope. If you have reason to expect a considerable number of cards, put on an extra stamp so that it has a total of six-cents postage. Your own name and address go in the customary place on the face, and your station call should be printed prominently in the upper left-hand corner.

W1—J. T. Steiger, W1BGY, 35 Call Street, Willimansett, Mass.
W2—H. W. Yahnel, W2SN, Lake Ave., Hel¬metta, N. J.
W3—R. E. Macomber, W3CZE, 418 10th St., N. W., Washington, D. C.
W4—G. W. Hoke, W4DYB, 328 Mell Ave., N. E., Atlanta, Ga.
W6—D. Cason Mast, W6KHV, 423 East E St., Ontario, Calif.
W7—Frank E. Pratt, W7DXZ, 5023 So. Ferry St., Tacoma, Wash.
W8—F. W. Allen, W8GER, 324 Richmond Ave., Dayton, Ohio.
VE1—J. E. Roue, VE1FB, 94 Spring Garden Rd., Halifax, N. S.
VE2—C. W. Skarsdell, VE2DR, 236 Elm Ave., Westmount, P. Q.
VE3—Bert Knowles, VE3QB, Lanark, Ont.
VE4—George Behrends, VE4RO, 186 Oakdean Blvd., St. James, Winnipeg, Manitoba.
VE5—E. H. Cooper, VE5EC, 2024 Carnarvon St., Victoria, B. C.
K4—F. McCown, K4RJ, Family Court 7, San¬
turce, Puerto Rico.
K5—Norman F. Miller, K5AF, 15th Air Base
    Squadron, Albrook Field, Canal Zone.
K6—James F. Pa, K6LBH, 1416 D Lunalilo St.,
    Honolulu, T. H.
K7—Leo E. Osterman, K7ENA, Customhouse,
    Wiranglell, Alaska.
KA—George L. Rickard, KA1GR, P. O. Box
    849, Manila, P. I.

Brief

When is a QSO? When one lasts all day long it is certainly worthy of mention! On Armistice Day, 1937, W5BEH of Galveston, Texas, strolled over to the local club station, W5DIG (Galveston Amateur Radio Club), for a QSO or two. At 8:35 A.M. W5FXS of Beaumont, Texas, was raised. After two hours of rag chewing the subject turned to record QSO’s. It was decided to stick to the controls as long as possible. It turned into an all-day party at W5DIG, with various club members taking turns. On the Beaumont end W5FXS rode the key unaided. The contact ended after a solid eight hours and thirty-five minutes! At W5DIG the following participated in the contact: W5FWE, W5FOY, W9RYQ, W5BEH and W5AUX.

Speaking of long QSO’s, the longest continuous rag chew on record is one that took place between W7YW and W7HD on January 26th-26th, 1935—20 hours, 2 minutes!
¡Queridos Señores!

La edición 1938 del "THE RADIO AMATEUR'S HANDBOOK" se puede ahora conseguir en lengua española traducido por la Revista Telegráfica de Buenos Aires, Argentina, reconocida como la más antigua establecida y la más importante publicación de literatura de Radio en Sudamérica.

El "Handbook" (libro manual) está reconocido como el libro modelo en su clase. El por tanto tiempo esperado y sugestionado libro manual (Handbook) estamos seguros que su edición en español encontrará una acogida extraordinaria. Ha sido cuidadosa y escrupulosamente traducido. Ha sido impreso en una imprenta que está reconocida como la mejor de Sudamérica.

Nosotros estamos orgullosos del hecho que la Revista Telegráfica haya producido este trabajo y estamos seguros al mismo tiempo que es una contribución notable para la literatura técnica en la lengua española.


AMERICAN RADIO RELAY LEAGUE
ATLANTIC DIVISION

EASTERN PENNSYLVANIA—SCM, Jack Morgan, W3QP—R.M.’s: 3AKB, 3AGN, 8ASW; P.A.M.: 8EOZ. Call and frequency charts locating each O.R.S. of this Section have been mailed to each O.R.S. and to neighboring S.C.M.’s to help speed up deliveries throughout the Section. Route your traffic via O.R.S. listed on this chart. 3AKB, 3AGN, 8ASW and FLA were all scratched by Christmas traffic. 3AKB hooked a ZL during Christmas. 3AKB, EDU, EMl, EWJ, QP, 8ASW and FLA were all swamped by Christmas traffic. 3AKB hooked a ZL during Christmas. 3AKB, EDU, EMl, EWJ, QP, 8ASW and FLA were all swamped by Christmas traffic. Route your traffic via O.R.S. listed on this chart.

Traffic: W3GWY 115 JTT 10 JQE 15 CSE 252 (WLNM 104) BJO 136 PLA 118 FCG 125 DHT 54 QMR 28 CGU 8 DSS 32 ABN 18 PVW 4 CIX 31.


Traffic: W3BYR 138 JTT 10 JQE 15 CSE 252 (WLNW 104) BJO 136 PLA 118 FCG 125 DHT 54 QMR 28 CGU 8 DSS 32 ABN 18 PVW 4 CIX 31.

HUDSON DIVISION

EASTERN NEW YORK—SCM, Robert E. Haight, W2LU—W2EQQ schedules 0088 daily. LJU is active with N.C.R. Congratulates to GTW and the YF on arrival of Jr. YL opr born Dec. 9th. KXF, new Port Jervis ham is on 3.5 Mc. KXF worked lots of VK/ZL’s. Traffic: 3BG D worked lots of VK/ZL’s. Traffic is better sport. 3GJY joined A.A.R.S. 3QP during Christmas traffic. Traffic: W8BYR 338 EFM 256 (WLNJ 128) ZI 197 QL 56 BEI 21 DNJ 16 GWW 10 AEA 7 EFM 8 ZL 4 BGP 3.

Traffic: W3GQ 115 JTT 10 JQE 15 CSE 252 (WLNW 104) BJO 136 PLA 118 FCG 125 DHT 54 QMR 28 CGU 8 DSS 32 ABN 18 PVW 4 CIX 31.

Traffic: W8BYR 338 EFM 256 (WLNJ 128) ZI 197 QL 56 BEI 21 DNJ 16 GWW 10 AEA 7 EFM 8 ZL 4 BGP 3.

Traffic: W3GQ 115 JTT 10 JQE 15 CSE 252 (WLNW 104) BJO 136 PLA 118 FCG 125 DHT 54 QMR 28 CGU 8 DSS 32 ABN 18 PVW 4 CIX 31.
A New Thrill
FOR THE AMATEUR

ASTATIC's New Acorn Model T-3 Microphone "has what it takes" to thrill the ham as well as those engaged in public address, recording and broadcast circles. Exclusive design swivel mount permits convenient positioning of microphone head and prevents cable breakage. Interchangeable plug and socket connector makes possible quick change to desk or floor standard. Neatly designed. Full year guarantee.

LIST PRICE $25.00
Write for Literature

COMPACT —
HALF AS LONG for their airgaps and capacities, these A & B condensers will make your transmitter more efficient than ever. May be had with neutralizing condensers and plug-in coil mounting built-in. Shown is model ABC5625.

Write for bulletin

HOWOULD YOUDU IT?
(Continued from page 45)
F. K. Foster, Bertram Green, E. P. Haines, Jr., Frank Kasal, C. D. MacLauchlan, Julius Ozick, H. E. Rice, Jr., F. P. Vasquez and Vincent Whaley.

Rules for the Problem Contest are repeated below:
1. Solutions must be mailed to reach West Hartford before the 20th of the publication month of the issue in which the problem has appeared. (For instance, solutions of problem given in the April issue must arrive at QST before April 20th.) They must be addressed to the Problem Contest Editor, QST, West Hartford, Conn.
2. Manuscripts must not be longer than 1000 words, written in ink or typewritten, with double spacing, on one side of the sheet. Diagrams and sketches may be in pencil, but must be neat and legible.
3. All solutions submitted become the property of QST, available for publication in the magazine.
4. The editors of QST will serve as judges. Their decision will be final.

Prizes of $5 worth of A.R.R.L. station supplies or publications will be given to the author of the solution considered best each month, $2.50 worth of supplies to the author of the solution adjudged second best. The winners have the privilege, of course, of stating the supplies preferred.

Hints and Kinks
(Continued from page 60)
the tip of one rotary plate of the condenser so that when turned to maximum capacity it shorts.

"An audio gain control is a useful addition to the set. A 500,000-ohm volume control can be mounted in place of the other toggle switch ("B" on-off). It can be connected across (or replace) the grid resistor in the 2A5 stage. The B switch can be mounted on the control.

"In the high-frequency oscillator, a 57 tube often will give better results than the 24A. It is hard to get a 24A which does not put a.c. modulation on signals on 14 and 48 Mc.; the 35 and 58 also seem to have this characteristic. The suppressor of the 57 should be grounded; all other

FIG. 6—"REMOTE CONTROL" OF BEAT OSCILLATOR FREQUENCY FOR FB7 AND FBX RECEIVERS
Condenser C is 50 µfd. maximum.
These are the condensers which you see so often in illustrations of outstanding transmitters, and hear so much about in articles describing high-performance gear. They have an enviable record for efficient, dependable operation, for conservative operation, for ability to stand punishment. You do not have to "ask the man who owns one"; he will want to tell you anyway.

NATIONAL COMPANY, INC., MALDEN, MASS.

GORDON NAME PLATES

A complete line of 122 evaluating, chromium plated name plates for Transmitter, Sound and Test equipment. Available in two sizes. Write for listing and low prices.

GORDON SPECIALTIES COMPANY
440 S. Dearborn Street • Chicago, Illinois

Radio Operator’s Course
Telegraphy— Telephony— Aviation

PORT ARTHUR COLLEGE has been teaching Radio for twenty-eight years, and during this time it has never been our policy to guarantee positions to prospective students, directly or indirectly. We believe it wisdom at this time, however, to go on record in our QST advertising to say that it is impossible for us to even come near to supplying the demand for Radio Operators received by our Employment Department. We do not mean by this that all students who enroll will automatically secure positions. The demand is for graduates — good men who deserve and are qualified to hold positions. The graduates of our Radio School, so far as we know or can learn, are employed 100%.

It is possible for every student who enters the P. A. C. Radio School and completes the course in keeping with our standards to receive employment as a Radio Operator for our station K P A C at the transmitter, in the control room, as trans radio press operator, or announcer, and not only earn more money than he pays for the training but to also continue his training as a post-graduate student in advanced work and prepare himself to secure and hold operating positions in the upper bracket of broadcasting, marine work, announcing, or airways.

Port Arthur College advertises primarily to Radio Amateurs and the training is too technical for the average student who has not selected Radio as his life work. We know the opportunities for positions and advancement are unlimited for men who are interested in Radio and who plan to make this their career and are willing to make the sacrifice and effort necessary to master our training. P. A. C. maintains strict collegiate rank — only high school or college graduates are eligible for enrollment.

If interested in details about Radio Course, write for bulletin R

PORT ARTHUR COLLEGE • PORT ARTHUR (World-known port) TEXAS

Say You Saw It in QST — It Identifies You and Helps QST 111
Gerry Sayre, of the Mac Gregor Arctic Expedition, Greenland, is producing unprecedented clear signals heard the world over. He is using Ward Leonard Plaque Resistors as terminating resistors in his Rhombic Antenna.

W.L. Plaque Resistors are non-inductive and non-capacitive. Circular 507 gives full data.

WARD LEONARD RADIO SPECIALTIES

WARD LEONARD ELECTRIC COMPANY
41 South Street, Mount Vernon, New York

Please send me Circular 507.

Name ........................................
Street ......................................
City ......................................... State ....
Call Signal ...................................

Neon Oscillation in Regulated Plate Supplies

TROUBLE is sometimes experienced with an audio oscillation set up by the neon bulb in regulated plate supplies using the bulb to obtain cathode drop for the regulator tube. One method of curing such an oscillation was described in November QST. Now comes W4AHP with the suggestion that reversing the connections to the neon bulb often will cure the trouble. We’ve tried it in one supply and found that it does help to a considerable extent, although there may still be a tendency to oscillate when the supply is loaded to such an extent that the regulator is close to the point where control is lost. At any rate, it’s an easy thing to try.

The characteristics of the circuit into which the supply is working have a considerable influence on these neon-bulb oscillations. The same supply, for instance, will give no trouble on one receiver, but will sometimes howl on another. Any suggestions the gang may have for complete cures will be welcome.

"Regulated Plate Supplies," Hints and Kinks, November, 1937, QST.

Scratch-Paper Feeder

W. CASTNER, W1IE, has a kink which should appeal to those who want their scribbling paper handy but not all over the operating table. The idea is simplicity itself—just a small box of about the dimensions shown in Fig. 6, containing a roll of adding machine paper. W1IE puts the gadget behind his receiver, with the strip of paper pulled out underneath where it is always close at hand. When a section gets filled up with notes it is first folded over so the other side can be used and finally torn off.

Briefs

If you like to chew the rag, watch for those stations signing “RCC” after their calls. This sign-off indicates membership in the Rag Chewers’ Club, that group of fellows who are pledged enemies of the “QRU CUL” type of contact. There are now over 1900 active R.C.C. members.

W6NGT, operating 56 Mc. on Pilot Peak in the Sierra Nevada Mts., near Yosemite, elevation 6115 feet, worked W60AB on Mt. Diablo, a distance of 130 miles airline. He also worked W6UF on Mt. Hamilton, 100 miles distant.
SOCKETS

National Socket Types include a model for every tube commonly used by amateurs, from acorns to transmitting pentodes. All have low losses. All have dependable trouble-free contacts that keep filaments up to rating and signal circuits noise-free. All are convenient to use — witness the copper acorn socket with built-in by-pass condensers, and the general purpose receiving types that can be rotated to the best wiring position and locked there in their metal mounts. Complete listings and prices are given in the Catalogue. National Company, Inc., Malden, Mass.

NATIONAL

AN ELEPHANT IN A RADIO AD?

Yes . . . because an elephant never forgets ... and WE never forget that to hold your good will we must be on the job every minute. Thousands of "hams" and engineers waited on each month, and never a complaint of shabby merchandise or shabby service! Get the habit of calling on us when in the district ... and keep our catalog handy.

TERMINAL Radio Corporation
80 Cortlandt Street, New York, N. Y.

TELEPHONE • BARCLAY 7-0622
**From Angle**

**Universal Mounting**

**DYKANOL TRANSMITTING CAPACITORS Type TJ-U**

**FULL DETAILS AT YOUR DEALER**

---

**What do you make of this?** W9EC badly needed a Mississippi card for W.A.S., so he mailed a certain W5 a self-addressed postal, all made out for the QSO in question and requiring only a few blanks to be filled in by the W5. He got the card back all right... but in exactly the same condition that he sent it—none of the blanks had been filled in! Cooperation?

---

**What the League Is Doing**

(Continued from page 81)

of this year. Lt. Jett, who has been acting chief engineer since Commander T. A. M. Craven was appointed to a commissionership last fall, has long been regarded as the logical selection for the post he now occupies. Forty-four years old, he has been on the staff of the F.C.C. (and its predecessor the F.R.C.) since 1929, has had extensive experience in radio with the Navy—and has been an amateur in former years. As reported in a previous section, he has been appointed as one of the delegates of the United States to the Cairo Conference. Such gatherings are by no means new to him, however; he has just recently returned from the Habana conference, where he was the principal technical advisor to the American delegation, he was a delegate to the C.C.I.R. meeting at Bucharest last May, and has attended a number of previous North American radio conferences.

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**DX Contest Announcement**

(Continued from page 30)

In counting up your total contest time, please be fair and honest. What constitutes "contest operating hours"? Not hours keeping local skeds within the U.S.A. and Canada. Not time spent in local rag chews, swapping DX results. You listen for DX with the ability to call DX stations if, as, and when, you hear them, that time counts, whether you do any calling or working or not. The whole period is to be charged against "contest operating time," not just the time after you started transmitting!

**AWARDS**

A striking bronze medallion award will be given: (1) Two in each remotely located country—to one c.w. winner, and one phone winner. In either contest section, all hams in the one territory 5 and 7 defined in the official country list compete for an award. (2) Two medallions in each of the 67 A.R.R.L. Sections, mainland U.S.A. and Canada, one to the telegraph, and one to the voice-operated station winner.

---

**CLUB PARTICIPATION**

To encourage local participation, additional certificate awards (besides the A.R.R.L. Section awards) will be made through each club where three or more individual club members, or new local hams invited by such a club, take part. For a club to rate a c.w. winner's certificate awarded on behalf of the club group, at least three reports from c.w. club-member (First Period) participants must be sent to Hq. Similarly, a club 'phone winner's certificate will be issued only when three 'phone (Second Period) entries mentioning the club have been received. Reports must be made direct to A.R.R.L., West Hartford, mentioning the name of the club, to be eligible for the affiliated-club-award. Entrants
WANT SPEED . . .
and Professional Technique?

GET CANDLER TRAINING

The Exclusive Sound System
That Produces Champions!

It takes more than merely the sending and receiving of code to become a skilled radio telegraph operator. The New CANDLER SYSTEM teaches you quickly the technique of Fast, Accurate telegraphing by simplifying the same world-famous principle that has trained many of the outstanding telegraphers and champions during the past 25 years. If you are sincere in your desire to be a skilled operator, find out how easily and inexpensively your ambitions can be realized — right in your own home! Mail the coupon and get all the surprising facts.

MAIL COUPON TODAY FOR FREE BOOK

CANDLER SYSTEM CO.
Dept. Q-2
ASHEVILLE, N. C., U. S. A.

NEW HOLDER DESIGN
15 SECONDS TO INSTALL CRYSTAL
For All Bands
GREATER STABILITY
Plugs in 5 prong tube socket
Beautiful Appearance

MODEL AH HOLDER $1.00 At your dealer or direct
HIPOWER LOW DRIFT CRYSTALS:
within 10 kc. or Choice of stock
AH-10, 1700-2500 kc. bands $3.35
AH-10, 7000-13000 kc. bands 3.90
WRITE FOR NEW LITERATURE

Hipower “Low Drift” Broadcast and Commercial
Crystals Are Approved by F.C.C.
Hipower Crystal Co., 2035 Charleston St., Chicago

ADVANCED ENGINEERING
PRECISION MANUFACTURE
PERFECT RECEPTION

Ken-Rad Radio Tubes
KEN-RAD TUBE & LAMP CORPORATION - OWENSBORO, KY.
Makers of Ken-Rad Radio Tubes and Ken-Rad Electric Light Bulbs
NEW PRICES
ON THE FOLLOWING TAYLOR TUBES

<table>
<thead>
<tr>
<th>Tube</th>
<th>Old Price</th>
<th>New Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>T-20</td>
<td>$2.25</td>
<td>$2.25</td>
</tr>
<tr>
<td>T-55</td>
<td>$7.00</td>
<td>$8.00</td>
</tr>
</tbody>
</table>

We carry a complete line of TAYLOR, RAYTHEON, EIMAC, AMPEREX and RCA tubes.

20462A — 1000-750-0-750-1000 AC at 300 MA, DC... $5.20
20462B — 1500-1250-0-1250-1500 AC at 300 MA, DC.... $6.75
20462C — 2500-2000-0-2000-2500 AC at 500 MA, DC.... $10.95
20462D — 3000-2500-0-2500-3000 AC at 500 MA, DC.... $16.00
20462E — 515-525-0-525-515 AC at 500 MA, DC.... $5.20

FILAMENT TRANSFORMERS

Primary 115 volts — tapped at 105 volts, 50/60 cycles AC
22283 — Secondary 1 1/2 V.C.T. at 10 amps, 5000 volts insulation for 2-600 s... $1.65
22284 — Secondary 8% V.C.T. at 13 amps, 2500 volts insulation for Eimac tubes... $1.00
22285 — Secondary 7 1/2 V.C.T. at 8 amps, 2500 volts insulation for T-20, T-25, and 809 tubes... $1.00
22286 — Secondary 10 V.C.T. at 8 amps, 2500 volts insulation... $2.20

The following condensers are oil impregnated and conservatively rated.

1000 V., D.C., Working Voltage
mid. Special $1.19
mid. Special $1.50
mid. Special $2.00
mid. Special $2.50
mid. Special $4.65

2000 V., D.C., Working Voltage
mid. Special $1.19
mid. Special $1.75
mid. Special $2.45
mid. Special $3.75
mid. Special $6.00
mid. Special $9.00
mid. Special $14.00

4000 V., D.C., Working Voltage
mid. Special $1.45
mid. Special $2.50
mid. Special $4.00
mid. Special $5.75
mid. Special $9.00
mid. Special $14.00

W2GWE W2ELJ W2KWW W2KXJ

OUR BEST VALUE IS OUR RECORD OF LOYAL SERVICE

HARVEY Radio Company of New York
103 WEST 43rd STREET • NEW YORK, N.Y.
CABLE ADDRESS: "HARADIO"

1. All contest work must take place in the contest period.
2. Reports must show each time of starting and stopping station operation in the log submitted to A.R.R.L., and if the total time of station operation exceeds 90 hours (in either period) the proper factor must be applied to the gross score as shown under "time limit."
3. Logs must include date, time of QSO, call of station worked, serial numbers exchanged and other information required tabulated neatly with the claimed score. (See the logs for required data.)
4. Scoring: Both the W/VE station, and the station in the remote locality receive one point when the W or VE serial number is acknowledged by the station in the remote locality. Each operator similarly, may add two points further when a serial number (to U.S., A., or Canada) is acknowledged by a W/VE station.
   (a) For W/VE entries. In computing points, each "received" serial number group counts 2. Each serial "sent" (properly sent in W/VE serial count) counts 1.
   (b) For entries from stations using any prefixes other than W or VE. In computing points, each serial number "received" counts 1 point, and each serial number "sent" (with proper acknowledgment) counts 2 points.
5. Logs must be marked for "phone" or "c.w." transmissions with work in a single entry all by one method for one period. Separate entries may be made for both periods if desired. This is optional.

W/VEs: First Period (C.W.). Quota of three stations per country (prefix) may be worked in each different band and is the limit to count points toward the score, except that if one way exchanges with some of these three have been made, more stations can be worked to give not more than 9 points (basic) per country. This quota shall be permitted in each different band.
Second Period (Phone). No quota limit on stations per country.
6. Multiplier shall consist of the number of countries (prefixes) worked on one band plus those worked on a second band, plus those worked on a third band, etc.

All Others:
7. No quota limit on stations.
8. Scoring points shall be multiplied (for total) by the number of U.S., A., and Canadian licensing areas contacted (a possible 14). The multiplier is also increased further by working the same areas on additional frequency bands. (Example: All districts are worked on two bands, possible multiplier is 28; 10, 8, 6, and 5 licensing areas are worked on four bands. The sum, 28 licensing areas, is the multiplier to use to get the gross score.)
9. All entrants agree to be bound by the Rules and Contest Announcement and the regulations of their licensing authority. In a contest of this magnitude, no correspondence is not permissible and all reports must show each time of starting and stopping station operation. In a contest of this magnitude, no correspondence is not permissible and all reports must show each time of starting and stopping station operation. All reports and logs from participating stations shall be received at A.R.R.L. Hq. from all W/VE stations on or...
SOLID or FLEXIBLE — METAL or INSULATED

Whichever you need, you'll find a Johnson unit just right for the job.

Johnson Flexible Couplings provide a new conception of flexibility, but with absolute freedom from backlash. Hubs cannot turn or loosen, and two set screws 90° apart in each hub assure positive drive.

Spring material is non-rusting phosphor bronze and all metal parts are cadmium plated.

Other Johnson coupling units include a solid coupling for ¼" shafts insulated with Alsimag 196 (No. 252), phosphor bronze flexible shafts with ¼" hubs in 3" (No. 253) and 6" (No. 254) lengths, compression shaft coupling (No. 259) of cadmium plated brass for ¼" shafts and panel bearings (No. 255) with 3" (No. 256) and 6" (No. 257) ¼" shaft extensions.

For these and other Johnson products, ask your Jobber or write for Catalog 9641.
This New Shure "Military-Type" Hand Microphone

Here's the answer to a long-felt need for a microphone that would fit naturally, firmly, in the palm of your hand. Small, light, compact — yet rugged and dependable. No bothersome handle. Slips easily into pocket. Takes minimum space in portable equipment. Optional locking press-to-talk switch. Relay contacts can be furnished. Usually high output plus famous Shure "high-efficiency" speech characteristic.

Ask your Jobber or Write for Bulletin 144Q.

Shure Patents Pending. Licensed under patents of the Brush Development Company.

Hand Microphone

Here's the answer to the long-felt need for a microphone that would fit naturally, firmly, in the palm of your hand. Small, light, compact — yet rugged and dependable. No bothersome handle. Slips easily into pocket. Takes minimum space in portable equipment. Optional locking press-to-talk switch. Relay contacts can be furnished. Usually high output plus famous Shure "high-efficiency" speech characteristic.

Ask your Jobber or Write for Bulletin 144Q.

Shure Patents Pending. Licensed under patents of the Brush Development Company.
200-R TRANSMITTER
with Redesigned RF Section


The 200-R is but one of a complete line of transmitting units varying in power output from 10 to 750 watts and bearing the name HARVEY which is your guarantee of satisfaction.

Write for catalog 52 which gives full details and prices.

HARVEY RADIO LABORATORIES, INC.
25 Thorndike St., Cambridge, Mass.

SPECIAL TO AMATEURS
Piezo-Electric Crystals — $2.50 EACH POSTPAID
Until supply is exhausted, we offer 80 meter band crystals unmounted; accurate calibration, excellent oscillators. Limited quantity.

SCIENTIFIC RADIO SERVICE
"The Crystal Specialist Since 1925." University Park, Hazelton, Md.

RADIO ENGINEERING
broadcasting, aviation and police radio, servicing, marine 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. DODGES INSTITUTE, Day Street, Valparaiso, Indiana.

THE COMPLETE LINE OF TELEGRAPH KEYS

Model 312 Key

No. 312 Key ................................ List Price $1.15

Other models of hand keys from $1.50 to $3.50 list. Available at leading jobbers everywhere.

Write for new literature and amateur discounts

LES LOGAN CO.
646 Jessie Street
San Francisco

MEMORANDUM

You need a copy of the new Bigger-than-ever 1938 Handbook.

You need a binder for your 1937 QST's — and another for 1938.

FEBRUARY, 1938

Here's a book that's very much in demand...but you can get your copy FREE at Sun Radio! 44 pages of information. Complete descriptions with diagrams of 10 modern x'mtrs from 10 watts to one K.W. Also data on all Stancor transformers and chokes. ANOTHER SCOOP! The new Stancor Amplimanual—44 pages describing 10 new audio amplifiers ranging in power from 3 to 60 watts. It, too, is FREE! Come in and pick up your copies.

There's a Reason for the Fast Growing Popularity of Sun Radio

Always a leader...it's only natural that amateurs should look to Sun Radio to set the pace. If you want the newest numbers of every leading manufacturer if you want fast, dependable service and merchandise backed by a guarantee of satisfaction that has stood the test of 16 years...try us on your next order.

RCA ACR 155 Amateur Receiver. $44.50 Complete with Tubes, Was $74.50. Now $44.50

RCA TMV 135A Crystal and Holder. "V" Cut. 3500 to 4000 Kc only. Quantity limited. Formerly $9.85. Special at $3.95

1938 Hallicrafters Super Skyrider

Complete with tubes, crystal and speaker $123 Write for time payment plan

Hallicrafters 1938 Sky Challengers

with speaker, crystal and tubes in stock.

- National Receivers in Stock. HRO, NC100, NC80X, HRO Jr., NC101X, for immediate delivery.
- Western Electric Keying Relays, Eeach...$0.95

New Low Prices on Taylor Tubes!!

<table>
<thead>
<tr>
<th>Type</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYLVANIA 211C</td>
<td>$6.75</td>
</tr>
<tr>
<td>The new RCA 814 in stock</td>
<td>$17.50</td>
</tr>
<tr>
<td>AMERICAN CODE READER</td>
<td>$12.00</td>
</tr>
<tr>
<td>STANCOR TRANSFORMERS IN STOCK</td>
<td>$11.25</td>
</tr>
<tr>
<td>AMATEUR X'MITTING TUBES BY TAYLOR, RAYTHEON, EIMAC, RAYTHEON, W.E.</td>
<td>$9.94</td>
</tr>
<tr>
<td>AMERICAN TELE-KEY with adjustable side-swiper</td>
<td>$9.94</td>
</tr>
<tr>
<td>BLILEY B5 40 M, crystals. Your choice of a huge stock. $4.80</td>
<td></td>
</tr>
<tr>
<td>TRIMM Commercial Phones, 17,000 ohms</td>
<td>$9.41</td>
</tr>
<tr>
<td>STANCOR 3-stage X'mtr kit, complete</td>
<td>$49.95</td>
</tr>
</tbody>
</table>

RCA ACR 155 Amateur Receiver

DX and the Ionosphere

(Continued from page 8)

and the trend over a short period is not marked. Since 1933 sunspots have been on the increase and can be purchased quite inexpensively, hence only electrical specifications are given and no particular brands specified. The total cost of the power supply probably will be about the same as that of the transmitter, in the neighborhood of twenty-five dollars. The two units together figure out to about fifty cents per watt of r.f. output, which is quite reasonable for transmitters of the 100-watt class.

(Continued on page 188)
### Where to Buy It

A directory of suppliers who carry in stock the products of these dependable manufacturers.

#### RADIO MFG. ENGINEERS, Inc.
- **ALBANY, NEW YORK**
  - Uncle Dave's Radio Shack
  - 356 Broadway
- **BINGHAMTON, NEW YORK**
  - Radio Test House
  - 25-27 Sturges Street
- **CONCORD, NEW HAMPSHIRE**
  - Evans Radio
  - Rear, 80 N. State Street
- **HARTFORD, CONNECTICUT**
  - Stern Wholesale Parts Company
  - 210 Chapel Street
- **NEW YORK, N. Y.**
  - Harrison Radio Co.
  - 12 West Broadway
  - Terminal Radio Corp.
  - 80 Cortlandt Street
  - Radio Parts & Equipment Co.
  - 244 Clinton Ave., N.

#### RAYTHEON
- **ALBANY, NEW YORK**
  - Uncle Dave’s Radio Shack
  - 356 Broadway
- **BOSTON, MASS.**
  - 46 Brattle Street
- **BOSTON, MASS.**
  - Selden Radio Company
  - 28 Brattle Street
- **BOSTON, MASS.**
  - Wholesale Radio Service Company, Inc.
  - 110 Federal Street
  - Evans Radio
- **BRONX, N. Y.**
  - Wholesale Radio Service Company, Inc.
  - 542 East Fordham Rd.
- **BUFFALO, NEW YORK**
  - Radio Equipment Corp.
  - 326 Elm Street
- **CONCORD, NEW HAMPSHIRE**
  - Rear, 80 N. State Street
  - Evans Radio
- **JAMAICA, L. I.**
  - Wholesale Radio Service Company, Inc.
  - 90-08 166th Street
- **NEWARK, N. J.**
  - Wholesale Radio Service Company, Inc.
  - 219 Central Ave.
  - 404 Walnut St.
  - 104 North Ninth Street
  - Sun Radio & Service Supply Co.
  - 938 F Street, N. W.
- **NEW YORK, N. Y.**
  - Gross Radio, Inc.
  - 51 Vesey St.
  - Serling Radio & Supply Co., Inc.
  - 349 Worthington St.
  - Sun Radio & Service Supply Co.
- **POTTSVILLE, PENN.**
  - E. Norwegian & George Sts.
  - 285 Craig Street, West
  - Canadian Electrical Supply Co., Ltd.
  - 938 F Street, N. W.

#### TRIPLET INSTRUMENTS
- **ALBANY, NEW YORK**
  - Uncle Dave’s Radio Shack
  - 356 Broadway
- **BOSTON, MASS.**
  - Radio Shack
  - 46 Brattle Street
  - Selden Radio Company
  - 28 Brattle Street
- **BOSTON, MASS.**
  - Wholesale Radio Service Company, Inc.
  - 110 Federal Street
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  - 90-08 166th Street
- **NEWARK, N. J.**
  - Wholesale Radio Service Company, Inc.
  - 219 Central Ave.
  - 404 Walnut St.
  - 104 North Ninth Street
  - Sun Radio & Service Supply Co.
  - 938 F Street, N. W.

**Listings on this page do not necessarily imply endorsement by QST of the dealers or of other equipment sold by them.**
RCA OSCILLOGRAPH PRICES REDUCED!

These fine new instruments, excellent for use with amateur transmitters, now yours at amazing low cost.

WAS $84.50 NOW $63.95

Stock No. 9545 RCA 3-inch Cathode Ray Oscillograph

Thousands have been sold during the three short years since this splendid instrument was introduced. Its sensitivity is 0.7 volts (R.M.S.) per inch.... linear saw-tooth sweep oscillator, 10 cycles to 10,000 cycles... wide range amplifiers, 10 cycles to 90 kilocycles. Gain 60...

Complete with Tubes.

WAS $47.50 NOW $39.95

Stock No. 151 RCA 1-inch Cathode Ray Oscillograph

This Oscillograph will give you "big time" performance. Its sensitivity is 1.75 volts (R.M.S.) per inch... amplifier range 30-10,000 cycles. Gain 50... Linear timing axis (horizontal sweep) 30-10,000 cycles... All controls on front panel... Gray wrinkle lacquer finish with nickel trimming...

Complete with Tubes.

Over 200 million RCA Tubes have been bought by radio users... in tubes, so in le 1 name a count, it pays to go RCA ALL THE WAY! Listen to the Magic Key of RCA every Sunday, 2:40 P.M., E. S. T., on NBC Blue Network.

READ AND SEND

Learn Easily at Home this Quicker Way:

No experience needed. Beginners read code quickly, copy accurately. If already an op, speed up your work this approved way. "Ham" experts can use this code in their Electric Master Telex. Only instrument ever produced which records your sending in visible dots and dashes on specially prepared paper tape — then sends back your own key back for comparison with the standard. Results because you learn by HEARING as well as seeing. That is why thousands agree this method is surest and quickest. 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 Q2; no obligation.

The "Ham" Special


tandard Telex — a highly efficient code teacher using heavy specially prepared waxed paper tape, having two rows of perforations. Write for Free folder QT-2.

We are the Originators of this type instrument

TELEPLEX CO. 79-76 CORLINTAD ST. NEW YORK, N. Y.

THE NEW EARCAPS

Improve the quality of your head-phone to give results of a dynamic speaker. Immediate delivery for Ambassador, Baldwin, Bradford, Campton, Holophone, Kellogg Murdock, Radford, Sold. Limn Featherweight and Professional, and Western Electric "phones.

Send for illustrated literature giving complete information.

Inventor and Manufacturer, Dept. Q-2

PAUL JARNAK, 69 West 83rd St., NEW YORK CITY

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

answer; the ionosphere data show better average conditions.

The low period of 1933 can also be considered to have extended over most of 1932. Experience is not of much value to us for the preceding five years; there were fewer amateurs, especially in foreign countries; before 1929 amateur radio had no official existence in many of them and it took years to gain a real foothold subsequently. Considering all these factors, our speculations lead us to the conclusion (it may only be a hope!) that the coming low will not reach the depths that the last one did. Considering the period since 1933, it is reasonable to expect that the worst part will not last longer than about two years. With better antennas and a background of experience, we should not be surprised to find the DX gang doing the same old business at the same old stand— in 1944. The digging no doubt will be harder, but there may be something to dig for. At any rate, the postman should be busy carrying W.A.C. cards until 1942 at least.

As a sidelight, the ionosphere conditions which make good DX possible on 14 and 28 Mc. also tend to spoil long-distance communication on the medium-high frequencies. The greater density of ionization tends to cause greater absorption of these frequencies in the lower layers. Best conditions, therefore, do not prevail over all bands at once. The DX activity on the different bands definitely reflects these trends.

Those interested in the current state of the ionosphere will find it profitable to pick up the broadcasts from the Bureau of Standards' station WWV, which are transmitted each Wednesday. The bulletin is sent by voice on three different frequencies: on 10,000 kc. at 1:30 P.M., on 5000 kc. at 1:40 P.M., and on 20,000 kc. at 1:50 P.M. Data on critical frequencies and virtual heights of the various layers, with maximum usable frequencies corresponding to several skip distances up to 2500 kilometers, are given, based on measurements made at noon of the same day. Corresponding data also are given for the previous night, with a short discussion of ionosphere conditions during the previous week. Comparison of existing transmission conditions with the broadcast data is both interesting and instructive. In recent weeks the calculated maximum usable frequency at noon has several times been in the vicinity of 50 megacycles, which certainly brings 56-Mc. DX within the realm of possibility.

Some years ago when ten meters started to open up, we had a working rule that when skip was short on 20 the chances of hearing something on 10 were pretty good. The ionosphere data bears this out. But now if you hear S9 signals on 20 from stations within a hundred miles or so, especially around noon, look out for 56-Mc. DX. If inter-continent 56-Mc. QSO's are ever to be pulled off, 1938 should be the year.


QUARTZ—direct importers from Brazil of best quality pure quartz suitable for making piezo-electric crystals. Diamond servicing, navaline and Morse telegraphy taught thoroughly.

QUARTZ—direct importers from Brazil of best quality pure quartz. Prices: $1.35 for 1 lb. and $4.35 for 5 lb. Your call and QRA printed on all QSL cards. All expenses low. Catalog free. Dodge's Institute, Byrd St., Valparaiso, Ind.

SELL: Esco generator, 1000 volt 100 watt separately excited. Sent postpaid $1.25, or a whole year (four issues) for $4. Simon 500 watt 500 cycles with exciters, $8. Slightly used, $6.

COMPLETE training for all amateur and professional radio operators. All bands in large type $1 per year. Radio Amateur Call QST, 610 S. Dearborn, Chicago.

HIGH powered portable power supply 1/2 H.P. Johnson engine and silent carb. Drive. Send $30. Guaranteed to sell for you. Write Radio, 124 Garrison, Jersey City, N. J.

MILLS, $7.50 each, three for $20. All five machines for $30. All ham receiver. W5GWA, Box 612, Greenwood, Miss.

NEW 1938 Super-Skyrider complete with crystal filter, speaker, $100. Absolutely like new, write for details. WSPJQ.


CRYSTALS: Zero cut, New low drift, 100-200-400 meters, $1.85; 20 meters, 35 cents. Postage, 75c. 400 meter, $3.50. Fisher Lab., 4525 E. 2nd St. San Diego, Calif.

QSL cards, neat, sharply engraved, reasonably priced. Samples free. Miller, Printer, Amber, Pa.

GUARANTEED plate and filament transformers designed to your specifications—very reasonable. Michigan Electrical Lab., Monroe, Mich.

SELL: New 1938 Super-Skyrider complete with crystal filter, speaker, $100. Absolutely like new, write for details. WSPJQ.


CRYSTALS: Zero cut, New low drift, 100-200-400 meters, $1.85; 20 meters, 35 cents. Postage, 75c. 400 meter, $3.50. Fisher Lab., 4525 E. 2nd St. San Diego, Calif.

SELL: 300 one-color cards, $1. Samples. 2143 Indiana Ave., Columbus, Ohio.

SEND: Few new Chevrolet steering wheels—just the thing for radio antenna control. Samples included. W9SSE, Salem, N. H.

QSL'S of distinction, W2AEY, 338 Elmore, Cincinnati, Ohio. TWO 1/2 k.w. 2500 v. CT transformers, $9. each. W8BDU.

QSL'S. Beautiful designs. Free samples. Maleco, 1012 Eastern Parkway, Brooklyn, N. Y.


DEALERS should carry our present and future 5 meter developments. Your letterhead to Paradio, 124 Garrison, Jersey City, N. J.

MANUFACTURERS but not sellers? Let this wire-live agency sell for you. Write Paradio, 124 Garrison, Jersey City, N. J.

QSL'S—75¢ for 100 two colors. Rush your order to W9DUG, Box 1215 Third Ave., New York City.

FRX-3A. Perfect prescaler. Dynamic, pack, all ham coils, $55. Four k.w. transformer variable d.e., to 6000, $60. Perfect RK-20's, $10. each. Winsor, Pleasantville, N. Y.

WATON: Navy receiver IFF-159, or similar. Cash or trade. WG0WA.

TBLPLEXES, instructographs, omnigraphs, typewriters bought, sold. Ryan's, Monroe City, Mo.

WANT 500 volt generator, W9AIRJ.

FRX-3A: Power from 20 to 5000 cycles, unconditionally guaranteed. $1.50. 40 M.V. four cycle drift, $2.75. Catalog. Ham Crystals, 1104 Lincoln Place, Brooklyn, N. Y.

OUR three inch oscillograph complete and ready to work with your present equipment. $65.00. We exchange used equipment for values only $30.90. Money-back guarantee. Order now. International Standards, 5037 Ravenswood, Chicago.

REMODEL—rebuilt at factory by RMS test engineer to RM999 circuits. Contains all six bands. Complete. Guaranteed O.K., $75. cash. W9DQH, Peoria, Ill.


FREE: 3 high-grade, porcelain cases, mica transmitting condensers, $4.00 each, 2000 volt 1000 volt and test tester. Above items used five months—A-1 condition. Beaver Radio Service, Beaver Dam, Wis., W9RHS.

HAM-ADS

(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in their pursuit of the art.
(2) To the best of our knowledge, no advertisement in this column shall indicate the belief that the exchange of business is excluded or that any special typographical arrangement, such as all or part capital letters, shall be used to make one advertisement stand out from the others.
(3) A special rate of 7c per word will apply to advertising which, in the opinion of the publishers, is non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of personal nature of surplus equipment, used or for sale by an individual for the purpose of personal use, or equipment that is not for special purposes, that is not for sale, or is not for sale for personal use, and that is not for sale for personal use by a member of the American Radio Relay League, is subject to a special rate of 10c per word.
(4) Send all advertising to the classified columns, the publishers of QST, 124 Garrison, Jersey City, N. J.

Having made no investigation of the advertisers in the classified columns, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products advertised.


Radio engineering, broadcasting, aviation and police radio, technical training taught thoroughly. All expenses low. Catalog free. Doederlein's Institute, Byrd St., Valparaiso, Ind.

SELL: All band 150 watt phone; PR-16 receiver. Accumulated crystals, 1104 Lincoln Place, Brooklyn, N. Y.

TELEPLEXES, instructographs, omnigraphs, typewriters bought, sold. Ryan's, Monroe City, Mo.

WANT 500 volt generator, W9AIRJ.

CRystals, $5, 500 volt, 500 cycles, $5.00. The Ham-Ad rate is 150 per word, except (1) to vendors of surplus equipment owned, used and for sale by an individual, for the purpose of personal use, or equipment that is not for special purposes, that is not for sale, or is not for sale for personal use by a member of the American Radio Relay League, is subject to a special rate of 10c per word.

(5) A special rate of 7c per word will apply to advertising which, in the opinion of the publishers, is non-commercial in nature and is placed and signed by a member of the American Radio Relay League. Thus, advertising of personal nature of surplus equipment, used or for sale by an individual for the purpose of personal use, or equipment that is not for special purposes, that is not for sale, or is not for sale for personal use by a member of the American Radio Relay League, is subject to a special rate of 10c per word.

(6) Send all advertising to the classified columns, the publishers of QST, 124 Garrison, Jersey City, N. J.

MANUFACTURERS but not sellers? Let this wire-live agency sell for you. Write Paradio, 124 Garrison, Jersey City, N. J.

QSL'S—75¢ for 100 two colors. Rush your order to W9DUG, Box 1215 Third Ave., New York City.

FRX-3A: Perfect prescaler. Dynamic, pack, all ham coils, $55. Four k.w. transformer variable d.e., to 6000, $60. Perfect RK-20's, $10. each. Winsor, Pleasantville, N. Y.

WATON: Navy receiver IFF-159, or similar. Cash or trade. WG0WA.


FREE: 3 high-grade, porcelain cases, mica transmitting condensers, $4.00 each, 2000 volt 1000 volt and test tester. Above items used five months—A-1 condition. Beaver Radio Service, Beaver Dam, Wis., W9RHS.
LOCAL--new tantalum 852's, fully guaranteed, $8. W9RYO.

QSL'S--SWL's--new rainbo effects. Samples. Fritz, 455 Mason, Joliet, III.

203A new, with socket and filament transformer, $5. W2EXR.


DOUGLAS Universal class B transformers. Match all tubes--50 watts audio $4.55 pr.; 100 watts audio $7.75 pr. guaranteed. For details write W9IXR, Weischauser, Wis.

A mounted crystal near your frequency 80-160 meter bands $1.25. Same unit 40 meters $2.25. R9 crystals, 338 Murray Ave., Arnold, Pa.

BRAND new: Acr-155's $44.50; ACR-175's $89.; SX11 eleven tube Super-Skyriders with crystals $79.50; $7.50 model Mackeys for $5.95. W9ARA, Butler, Mo.

RECONDITIONED sets shipped on ten day trial: NC100Xs $90.; NC100s $89.; PR-15s $70.; ACR-175s $89.; PR16Cs $94.; Breiting 12c $50.; Breiting 14c $60.; Scott XV Deluxe $50.; Super-Skyriders $29.; FB7s $19.; All Stars $17.50.; SW5s $9.; other sets. List free. W9ARA.

SELL: Collins 4A transmitter complete ready to operate $39. Also Collins 45A, 30FX, 32F. Write, W9ARA.

WHO said it can't be done? Faberadio is, after years of profitable manufacturing, still selling Y-cut 160 and 80 meter crystals at $1 each. Our dealers are making money, too. X-cut $2.25., A-cut $2.75. Catalog 37 is ready. Faberadio, Sandwirch, Ill.

RME products. W8ANT.

HALLMARKS. W8ANT. USED ACR136. W8ANT.

DOUGLAS Universal class B transformers. Match all tubes--50 watts audio $4.55 pr.; 100 watts audio $7.75 pr. delivered guarantee. For details write W91XR, Weischauser, Wis.

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Your Nearest Dealer Is Your Best Friend

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 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.

Patronize the dealer nearest you—You can have confidence in him

| BALTIMORE, MARYLAND | Radio Electric Service Co. 3 N. Howard St. Everything for the amateur |
| BRONX, NEW YORK | Wholesale Radio Service Company, Inc. 542 East Fordham Road “The World’s Largest Radio Supply House” |
| BUFFALO, NEW YORK | Radio Equipment Corp. 326 Elm Street WBOBK — Ham, service and sound equipment |
| BUFFALO, NEW YORK | Dymac Radio 216 E. Genesee Street Complete Line Ham and BCL Equipment Cl. 2080 |
| ELMIRA, NEW YORK | Miller’s Radio Shack 205 Railroad Avenue Fine equipment for amateurs |
| JAMAICA, L. I. | Wholesale Radio Service Company, Inc. 90-08 166th Street (Merrick Road) “The World’s Largest Radio Supply House” |
| MONTREAL, CANADA | Canadian Elec. Supply Co., Ltd. 285 Craig St., W. Quality parts and equipment for discriminating buyers |
| NEWARK, N. J. | Wholesale Radio Service Company, Inc. 219 Central Avenue “The World’s Largest Radio Supply House” |
| NEW YORK, N. Y. | Gross Radio, Inc. 51 Vesey Street Fair dealings plus fair prices. Anything in radio |
| NEW YORK, N. Y. | Wholesale Radio Service Company, Inc. 100 Sixth Avenue “The World’s Largest Radio Supply House” |
| NEW YORK, N. Y. | Harrison Radio Company 12 West Broadway “The Friendly Ham Supply House” |
| PHILADELPHIA, PENNSYLVANIA | Eugene G. Wile 10 S. Tenth Street Complete Stock of Quality Merchandise |
| PROVIDENCE, RHODE ISLAND | W. H. Edwards Co. 32 Broadway National, Taylor Tubes, Hallicrafters. Complete amateur supply house |
| RICHMOND, VIRGINIA | The Arnold Company 527 W. Broad Street W3EHL—“The Virginia Ham Headquarters”—W3FEL |
| ROCHESTER, NEW YORK | Radio Parts & Equipment Co. 244 Clinton Avenue, North Complete stock amateur-BCL parts. Standard discounts |
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"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.

Every conceivable need of a radio amateur can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff.

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126 Say You Saw It in QST — It Identifies You and Helps QST
A FEW DO'S AND DON'TS ON POWER WIRE WOUND RESISTORS

LAST MONTH we discussed the reasons why we make our IRC Cement Coated Wire Wound Resistors that way. This month it will be some hints on how to use them in a power supply. For a starter we can't think of a better subject than:

POWER RATING. The basis of our rating is the standards of the A.I.E.E. and N.E.M.A. These ratings correspond to the watts dissipation which will cause a temperature rise of 482 degrees Fahr. when the resistor is operated in "free air." By this we mean that the resistor under load will be 482 degrees hotter than the surrounding air when that air has plenty of room to circulate around the unit.

The "loss" in a resistor — the number of watts it must dissipate — can be calculated easily if you know its resistance and either the current through it or the voltage across it. Either square the current in amperes and multiply it by the resistance in ohms, or square the voltage and divide it by the resistance in ohms. In either case, the answer will be the number of watts the resistor must dissipate.

Now, in commercial equipment, it is considered good practice to use wire wound resistors at not more than 50 per cent of their rating to take care of the fact that air circulation is not so good, and other component parts such as transformers, etc. are also giving out heat. Since the maximum temperature is the limiting factor, you shouldn't take a "50 watt" resistor and put 50 watts into it if it is jammed in a small space above your hot rectifier tubes.

You have already guessed the answer — mount your heavy wattage bleeders near the rear of your chassis where the air will circulate around them. We even know one chap who successfully put 600 watts into a "100 watt" resistor by sticking an old piece of hose in each end and running tap water through the hole in the tube! We don't recommend this as a general practice. That water is at ground potential, don't forget, and besides we would rather sell more resistors.

The best bet is to put some thought into the design of your power supply just as you do into the R.F. portion of your rig. It will save you money in the end.

A FEW MORE TIPS. Don't move the slider on an adjustable unit with the juice on. An arc is harsh treatment for fine resistance wire and 1000 volts or so is uncomfortable to the touch.

If you are using a wire wound for your grid resistor, don't forget that it has some inductance. Put a good choke on the grid side of it, and be darned sure it is not mounted in the R.F. field.

If you want a neat arrangement for metering the rig, try some small "AB Type" resistors of 10 to 20 ohms in the circuit shown on Page 206 in the new Handbook. It saves a lot of meters, jacks (and jack).
HANDSOME, STURDY CONSTRUCTION ★ GOOD REGULATION ★ PRICED FOR THE MODERATE POCKET-BOOK ★

Audio and Power equipment for medium and low power rigs

PLATE TRANSFORMERS

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<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS-300</td>
<td>450 each side of center at 150 MA; SV-3A; 2½ V-10A; CV mtg. Net to Amateurs.</td>
<td>$3.90</td>
</tr>
<tr>
<td>CS-301</td>
<td>500 each side of center at 200 MA; 2½ V.C.T. 14 A; 5 V.C.T. 3 A; CD mtg. Net to Amateurs.</td>
<td>$4.80</td>
</tr>
<tr>
<td>CS-302</td>
<td>600 each side of center at 200 MA; 2½V-10A; 7½V-3A; SV-3A; CD mtg. Net to Amateurs.</td>
<td>$6.00</td>
</tr>
<tr>
<td>CS-303</td>
<td>800 each side of center at 150 MA; 600 V. D.C. CD mtg. Net to Amateurs.</td>
<td>$4.50</td>
</tr>
<tr>
<td>CS-304</td>
<td>800 each side of center at 250 MA; 600 V. D.C. CD mtg. Net to Amateurs.</td>
<td>$6.60</td>
</tr>
</tbody>
</table>

FILAMENT TRANSFORMERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>LM-1</td>
<td>2½ V.C.T. 20 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$1.80</td>
</tr>
<tr>
<td>LM-2</td>
<td>7½ V.C.T. 6.5 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.10</td>
</tr>
<tr>
<td>LM-3</td>
<td>10 V.C.T. 6½ A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-4</td>
<td>6.3 V.C.T. 5 A; 5 V.C.T. 6 A; 2500 V. insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-5</td>
<td>2½ V.C.T. 12 A; 5000 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.10</td>
</tr>
<tr>
<td>LM-6</td>
<td>5 V.C.T. 3 A; 5 V.C.T. 3 A; 5 V.C.T. 6 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-7</td>
<td>Three 7½ V.C.T. 2½ ampere windings; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-8</td>
<td>2½ V.C.T. 5 A; 2½ V.C.T. 5 A; 5 V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.10</td>
</tr>
<tr>
<td>LM-9</td>
<td>2½ V.C.T. 5 A; 5 V.C.T. 4 A; 7½ V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-10</td>
<td>2½ V.C.T. 5 A; 7½ V.C.T. 3 A; 7½ V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-11</td>
<td>5 V.C.T. 3 A; 7½ V.C.T. 3 A; 7½ V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-12</td>
<td>2½ V.C.T. 5 A; 5 V.C.T. 4 A; 6.3 V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-13</td>
<td>6.3 V.C.T. 3 A; 7.5 V.C.T. 4 A; 5 V.C.T. 3 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
<tr>
<td>LM-14</td>
<td>6.3 V.C.T. 3 A; 7.5 V.C.T. 6 A; 2500 V. Insulation. OT mtg. Net to Amateurs.</td>
<td>$2.40</td>
</tr>
</tbody>
</table>

Gleaming chromium plate! Welded cases! Vacuum treated and humidity proof! Transformers fully clamped internally. All outputs with a variety of impedances! Trim professional units all physically symmetrical and with uniform mounting arrangements.

The new chromshield VARIMATCH modulation transformer incorporates a modified VARIMATCH coil structure making possible universal matching from all the popular modulator tubes to a 5,000 or 3,500 ohm rf load. It will handle 20 watts of audio.

A PRIME AND CLASS B OUTPUT TRANSFORMERS

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS-R</td>
<td>Designed for class A, B and B tubes like the 45, 50, 2A3, 42, 59, 47, 2A5, 6F6, 6V6, 6BS, 6A0, 51, 79 and similar tubes to 40 in load of 5000 and 3500 ohms. C-4 case. Net to Amateurs.</td>
<td>$2.10</td>
</tr>
<tr>
<td>CS-L</td>
<td>Will match same tubes as above but to a 500, 15, 8, 4 or 2 ohm line. C-4 case. Net to Amateurs.</td>
<td>$2.25</td>
</tr>
<tr>
<td>CS-V</td>
<td>Will match same tubes as CS-R but to a 15, 8, 4 and 2 ohm line. C-4 case. Net to Amateurs.</td>
<td>$1.95</td>
</tr>
</tbody>
</table>

A PRIME AND CLASS B INPUT TRANSFORMERS

<table>
<thead>
<tr>
<th>Model</th>
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<tbody>
<tr>
<td>CS-29</td>
<td>Driver plate to 53, 6A6, 49, 79 or 89 grids. C-4 mtg. Net to Amateurs.</td>
<td>$1.65</td>
</tr>
<tr>
<td>CS-30</td>
<td>Driver 46 or 59 plate to 46 or 59 grids. C-4 mtg. Net to Amateurs.</td>
<td>$1.65</td>
</tr>
<tr>
<td>CS-291</td>
<td>Single 2A3, 45, 42, 2A5, 6B6, 6DS tritode plate to push pull A prime 2A3, 45, 42, 2A5, 6F6, 6DS grids. C-3 mtg. Net to Amateurs.</td>
<td>$2.25</td>
</tr>
<tr>
<td>CS-292</td>
<td>Push pull 53 or 6A6 tritode plates to two or four class B 53 or 6A6 grids. C-3 mtg. Net to Amateurs.</td>
<td>$1.95</td>
</tr>
<tr>
<td>CS-293</td>
<td>Push pull triode 56, 47, 57, 77, 6C6, 6C5 plates to two or four A prime 45, 2A3, 42, 2A5, 6F6, 6DS grids. C-3 mtg. Net to Amateurs.</td>
<td>$2.10</td>
</tr>
</tbody>
</table>

UNIFIED TRANSFORMER CORP.
72 SPRING STREET * NEW YORK, N.Y.
EXPORT DIVISION 100 WARICK STREET NEW YORK, N.Y. CABLES "ARLAB"
In these few short months the NC-80X and NC-81X receivers have become part of the National tradition. Their advanced circuit details, including the wide-range crystal filter and high IF frequency for image rejection, have brought a new standard of performance to the low priced field. Their thoroughbred construction keeps that performance consistently high. And their convenience makes operation swift, accurate, and tireless.

NATIONAL COMPANY, INC.

Effective February 15th the net price of the NC-80X and the NC-81X receivers complete with crystal, tubes, and speaker will be $99
RCA pioneered the development and sale of transmitting tubes in 1921. Since then, RCA has greatly increased performance capabilities of these tubes, thereby insuring greater sales, which have consistently lowered price levels.

These transmitting tubes were developed and sold by RCA.

These RCA transmitting tubes give better performance at lower cost.