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<td>24 South Fairview Ave.</td>
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<tr>
<td>W9IVP</td>
<td>1022 11th St., S.</td>
<td>Fred J. Wells</td>
<td>Fargo, North Dakota</td>
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<td>601 S. Orange Ave.</td>
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<td>1040 Fairquier St.</td>
<td>Robert C. Harrabiner</td>
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<td>W9DET</td>
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<tbody>
<tr>
<td>W5ABI</td>
<td>2918 West 15th St.</td>
<td>H. E. Veite</td>
<td>Little Rock, Arkansas</td>
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<td>1924 Allen Ave.</td>
<td>W. P. Allen</td>
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<td>P. O. Box 66</td>
<td>F. P. Furry</td>
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<td>W4AFM</td>
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<tr>
<td>W2LU</td>
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<td>Robert E. Haight</td>
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<td>1783110th Ave.</td>
<td>Robert Maloney</td>
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<td>W9FDF</td>
<td>3734 Summit St.</td>
<td>George D. Hansen</td>
<td>Sioux City, Iowa</td>
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<td>305 Western Ave.</td>
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<td>W9KYG-JPT</td>
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<td>W1CDX</td>
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<td>John W. Singleton</td>
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<tr>
<td>K7QO</td>
<td>Box 301</td>
<td>Richard J. Box</td>
<td>Ketchikan, Alaska</td>
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<td>K5EQW</td>
<td>21st Infantry Brigade</td>
<td>Atlas A. Adams</td>
<td>Schofield Barracks, Hawaii</td>
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<td>W5D2N</td>
<td>Route 6, Box 423</td>
<td>G. H. Lavender</td>
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<tr>
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<td>2812 Montrose Ave.</td>
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<td>Wendell, Colorado</td>
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<td>W5A3J</td>
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<td>R. N. Eubank</td>
<td>Richmond, Virginia</td>
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<td>W8H9D</td>
<td>100 20th St.</td>
<td>C. S. Hoffman, Jr.</td>
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<td>W8BTO</td>
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<td>T. R. Hecker</td>
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<td>W5H6O</td>
<td>6126 Ave. G.</td>
<td>David H. Cark</td>
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<td>W5DOJ</td>
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<td>Halifax, Nova Scotia</td>
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<td>V92G</td>
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<td>1754 Graveley St.</td>
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<tr>
<td>V9ASL</td>
<td>711 Asburn St.</td>
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The American Radio Relay League, Inc., is a non-commercial association of radio amateurs, bonded for the promotion of interest in amateur radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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THE EDITOR'S MILL

The editors of *QST* are firm believers in the ultimate high usefulness of the ultra-high frequencies. While they may seem to have no value for communication at customary amateur distances, that same thing was true of 200 meters back in 1912. Enterprise and initiative, and actually getting out and trying, resulted in the developments that have made present-day amateur radio technique. The great trek upwards from 1500 kilocycles was marked by many a pause beyond which it seemed the frequencies must be worthless. But they weren't. They were better—when we found out how to handle them. Isn't there good possibility that the ultra-high frequencies will turn out the same way?

We do not suggest that amateur radio prepare forthwith to move exclusively into the very short waves. But if these frequencies have inherent DX value we ought to be finding out more about them than we now know and we ought to be thinking now about the place that we will eventually want in that end of the spectrum. Other people are planning for their eventual occupancy. Some of the commercial companies have done some mighty interesting work on "microrays" of just a few centimeters length, and work on wavelengths of a few meters is going ahead astonishingly fast. Public-service systems employing automatic repeaters to extend the transmissions far beyond the optical limit of a single transmitter are under contemplation. Some radio engineers go so far as to suggest that the radio communication of the future will be almost altogether on these very high frequencies, with the region above 60 megacycles parcelled out in neat little slices to a multiplicity of services. If they are right, some day we amateurs will regard the low frequency of 4000 kilocycles as just as uninteresting as we do 4000 meters to-day. That is one reason why the editors of *QST* have done as much as they could to stimulate interest in 30-mc. and 60-mc. work. For the same reasons the American Radio Relay League has a request before the Federal Radio Commission to extend amateur rights into the really ultra-high-frequency region now available only under experimental license, so that we may learn what 120 mc. is like—and 240 and 480 and 960!

We amateurs have done plenty of high-frequency work, more than all the other radio services combined. We have thousands upon thousands of 5-meter stations engaged in practical communication. We have developed practical apparatus that is the basis for much of the commercial interest of to-day. We have been doing automatic relaying too, and chains of 5-meter amateur stations lend their services to one another to carry communications far beyond the range of any member of the chain—in a most interesting adaptation of the relay idea upon which our League is founded. The potentialities of this idea are enormous and it may be that for many a year we will find an outlet for our restless energies in some such plan.

But that is not the theme of this piece. There is, as we see it, a more fundamental problem into which the present splendid work has really not bitten at all. That problem is not the generation or detection of these high frequencies. It is the need for doing something to these waves to affect their radiation, so as to overcome their present restriction to the "optical distance." Before they become useful for communicating at longer distances some new method must be developed to make them perform in different fashion. It is a technical problem of the first magnitude but, we think, an immensely intriguing opportunity for the amateur experimenter. These waves may be reflected, focused, refracted, plane-polarized, circularly-polarized and otherwise operated upon as are light and heat waves. There is many an interesting idea in any physics text that might be applied to them to make them perform. The physicists amongst our ranks might investigate propagation in terms of quantum mechanics rather than wave motion. Somewhere in these things must lie the secret to the taming of the u.h.f.

Doesn't it seem odd that we still connect modern crystal-control transmitters and sniggle-snooper receivers to perfectly ordinary pieces of copper wire representing the elementary Hertz antenna invented in 1888? True, the commercials have various types of beam antennas, of differing degrees of complexity, but they are only for the purpose of focusing the waves to give directivity and greater strength. In effect they still consist of a multiplicity of these elementary antennas, generally unimproved upon for many years. We pay much less attention to our antennas and their action than to our other apparatus. Almost blindly we hitch our elaborate gear to a quarter's
worth of antenna, with scarcely a thought to what it is doing. It is the weak link in our system.
Fortunately for convenience's sake, the radiating systems for ultra-high frequencies may be very small and experimental work is made easy. It is, we think, the most fascinating field of the radio of to-morrow. Not the least of its potentialities lies in the thought that any scheme that makes the ultras good for DX will mean that any station can work at any desired distance on any given frequency.

Well, summer is here. How about a little ultra-high-frequency work?

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K. E. W.

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Second Annual A.R.R.L. Field Day Contest to Test Portables

June 9th–10th

ALL hams with portable stations, attention!! This is the annual League event which combines the possibilities for an outing, with the opening of the season for out-door radio activities. Starting Saturday, June 9th (4 p.m. local time) and ending Sunday, June 10th (7 p.m. local time) all U.S.A. and Canadian station owners are invited to schedule field activities. The operation of portable transmitters and receivers afield is a most enjoyable activity; in addition it facilitates operator preparation to render constructive service in time of emergency and encourages the development of equipment suitable for operation independent of interruptions of commercial power sources suitable for emergencies. Only portable stations, actually operated in the field (away from the “home” address) are eligible to submit field-day scores.

The object will be for each “portable” station to work as many other amateur stations as possible—each to count one point toward a score. These stations may be locals, fixed stations, other portables, or foreign amateur stations. Any or all amateur frequency bands may be used, voice or c.w. telegraph likewise.

All points must be made in the contest period given above. The log of operation, claimed score, and data on power and frequency band used for each contact should be sent in promptly at the conclusion of the test. Please note what was used as a source of plate and filament power, along with the “watts input” to final stage, too. Special credits: Scores may be multiplied by 2 if either receiver or transmitter is independent of commercial power supply, by 3 if both transmitter and receiver are supplied from an independent local source rather than from public mains. The following additional score multiplier will be used to give all stations an equal chance. If the power input to the final stage (plate current times plate voltage—\(E \times I\)) is:

(a) Up to and including 20 watts—multiply score by 3
(b) Over 20, and up to 60 watts—multiply score by 2
(c) Over 60 watts—multiply score by 1

To comply with F.R.C. regulations for portable station operation, licensees in the U.S.A. have only to observe the instructions of pars. 387 and 384 of the Rules and Regulations, as respects advance notification of the locations in which the portable will be operated to the Inspector-in-Charge of the district, and as regards proper station identification. In the U.S.A. not only 28- and 56-mc. band portable work is permissible, but operation in any communicating amateur band. In Canada the new regulations permit portable sets to be operated only for 56–60 mc. and then only in the province in which the station is licensed.

The League’s affiliated radio clubs (more than 400) have all been invited to encourage their members to build portables, and to arrange special Field Day activities for June 9th and 10th. Get together with your local ham club in plans for work with portables on these dates if you can. However, don’t forget that every amateur is invited to take part, whether or not you are able to participate in club plans. Your portable transmitter can be a source of great pleasure for the whole summer season. Get it working now. Place it in the Field Day plans and let us have your report. Take it to the mountains or seashore later and make your summer complete. Keep an operative portable at hand all the year, so it will be where you can put it to work promptly in the event of disaster or public emergency. Don’t forget to send your results for the report in \(QST\)—a postal card or letter will be most welcome, and please add any suggestions for the next Field Day, or for some “simulated emergency tests” before next year, if you want them.

—F. E. H.
What About the Simple Receiver?

The Conditions With Which It Must Contend and a Description of a Two-Tube Receiver Using an Improved Band-Spread System

George Grammer, Assistant Technical Editor

In these days of low-priced superhets and tuned-r.f. receivers it might seem something of a problem to justify the home construction of simple regenerative rigs. A two-tube receiver must give something that the other sets don't or there would be no real justification for its existence. What, then, does the simple receiver have to offer? First, small cost; second, ease of construction; third, sensitivity—the once-familiar claim that a regenerative detector will bring in anything that a more complicated rig can pick up still seems to be true, given reasonable freedom from QRM and a fair break on artificial background noise; fourth, a means of covering a wide range of frequencies without a regiment of plug-in coils. This last alone justifies the existence of the two-tuber as an adjunct to the ham-band superhet.

Selectivity

These four make a pretty formidable list in favor of the simple receiver, especially since the ability to pick up distant signals is there in good measure. The "but"—somehow there always is a "but"—is the old bugbear, selectivity. A secondary "but" is that under certain conditions—or rather, lacking certain conditions—the two-tube set suffers by comparison with other types of receivers in stability.

In discussing selectivity for c.w. reception it is necessary to define some terms. We can conveniently classify selectivity into the "local" and "distant" variety. Of all types of receivers except the kind having an untuned r.f. stage, the detector-audio type possesses the least "local" selectivity. Signals from near-by stations working on frequencies considerably beyond beat-note audibility with the desired signal can and do cause serious interference of a most annoying kind. So-called "shock" excitation of the detector by a local signal will cause interference-producing spurious harmonics on higher-frequency bands than the one on which the signal actually exists. The reverse can happen, too; harmonics of the oscillating detector can beat with a local signal on a higher frequency band to produce a second type of interfering signal which is not the fault of the transmitter. Also, the transmissions of near-by broadcast stations often will be bothersome, especially on the 1715- and 3500-kc. bands.

"Distant" selectivity for c.w. reception can be defined as the ability of the receiver to separate two signals of moderate strength operating on frequencies within audible beat of each other. The comparison between the two-tuber and practically any other type except the Single-Signal for this kind of selectivity is not so unfavorable. The detector-audio set is every bit as good as the tuned-r.f. receiver, and generally speaking is as good as the ordinary "10-ke." superhet. The actual separation of the signals must be done by the ear through its ability to distinguish between different tones. A trained ear can do a pretty fair job. Although real distant selectivity is achieved

This two-tube receiver has a continuous frequency range of 1450 to 41,000 cycles and gives complete band-spread on five amateur bands.

It can be used with either 2.5- or 6.3-volt tubes without change in the wiring. The right-hand dial gives general coverage and that at the left gives band-spread around any frequency for which the general-coverage dial may be set.

June, 1934
only in the Single-Signal superhet, the amateur who perform must use less expensive equipment does not expect 100% reception all the time. Unquestionably such an amateur can do excellent work with simple equipment—in fact, he always has.

STABILITY

A detector coupled to an antenna is not exactly in a favorable spot for stable operation. With reasonable coupling between the detector and antenna a change in the constants of the latter is bound to be reflected as a change in the frequency of oscillation, which in turn causes a change in the beat note. This sort of instability can be overcome by using a rigidly-strung antenna, preferably located indoors so the wind cannot start an unwanted shimmy. Secondly, a detector operated at its most sensitive point—just beyond the start of oscillation—is readily controlled by a strong signal and is often pulled into synchronism with it. One of the most familiar manifestations of this is the case of a strong signal subject to fading; if the beat note is set when the signal strength is “down,” a rise in strength often will tend to pull in the detector and may cause the beat note to disappear entirely. If the fading is rapid the signal has a pronounced wavering and is hard to copy. Ham signals do not often offend in this way with the two-tuber, however, unless the receiving antenna is quite long. It is interesting to note that a stage of tuned r.f. only makes matters worse since it puts a too-strong signal at the grid of the detector!

A third factor is the inherent stability of the detector as an oscillation generator, especially its ability to maintain a single frequency during changes in plate voltage of the order encountered with a rectified-a.c. supply. The proper choice of circuit and constants can do much to improve this sort of stability, and it is not difficult to build a regenerative detector which is quite satisfactory in this respect.

Instability of a fourth type is peculiar to the oscillating detector coupled to an antenna, and evidences itself in the form of “body capacity” at the tuning controls. It results from coupling the coupling tube introduces a background of tube hiss and accentuates cross-modulation and local interference effects.

THE METAL BASE HOLDS ALL COMPONENTS—NONE ARE MOUNTED ON THE CABINET

Bandspread condenser C1 is at the left, C3 at the right.

TUBES AND CIRCUITS

Summing up, then, we find marks on both sides of the ledger for the simple receiver. If the local selectivity is poor, the distant selectivity is at least fair, and the sensitivity is very good. Although the stability is not as good as that of a good superhet, it can, with proper precautions, be made satisfactory. The cost of the two-tube set is low, and the frequency range that can be covered with comparatively few coils is great.

So far as tubes are concerned little, if anything, is to be gained by using special types. A screen-grid detector is still the most satisfactory, and for headphone reception nothing larger than a small triode is needed for the audio stage. More gain could be secured from a power pentode—but at the expense of rather high plate current, which in turn calls for the use of an audio output coupling device to prevent burning out the phones. The small tubes will produce more than enough headphone strength. For the detector, the 57, 58, 77, 78, 6C6 and 6D6 types are most satisfactory. The results are about the same with all of them. The 56, 76 and 37 are satisfactory audio amplifiers.
The screen-grid feedback circuit which has had wide application in tuned-r.f. receivers is equally satisfactory for the two-tube set. The stability of this type of circuit is good, and the coils are conveniently made. Regeneration control through varying the detector screen voltage is smooth and easy to effect. Essentially, then, neither the tubes nor circuits are startlingly different. There is no good reason why they should be.

**Band-Spreading**

Most band-spreading systems are unsatisfactory from one standpoint or another. At the moment two methods seem to hold the stage to the exclusion of practically all others: the parallel condenser and the tapped coil. The first has the advantage of giving both band-spreading and general coverage with the same coil, but suffers the defect that the band-spread is not readily adjustable to meet the varying widths of different bands. A parallel condenser which tunes across the 1.75- and 3.5-mc. bands usually covers entirely too much territory on 7 and 14 mc. unless the padding capacity is inordinately large. Generally, too, if maximum band-spread is given first attention on the higher-frequency bands it will be found that a set of four coils will not give complete coverage from 15 to 200 meters with 100-µfd. padding condensors; there will be gaps at one place or another. If the range is made continuous, complete band-spread has to be sacrificed. The tapped-coil method has the advantage of giving complete band-spread on any and all bands without special tuning condensers, but as generally used, at least in commercial receivers, requires one set of coils for ham-band coverage and an additional set for the in-between frequencies on which there is no band-spread.

Since the two-tube receiver is a simple affair, we can do some things which might run into the realm of the cumbersome when applied to receivers with more than one tuned circuit. One of the things that can be done is to incorporate a tuning system which not only will give continuous coverage over any range desired, but which also will give as much or as little band-spread as may be wanted on any amateur band—and this without any extra coils. The receiver pictured here has a continuous range from approximately 7.5 meters to 205 meters—11,000 to 1450 kilocycles—and gives practically 100-division band-spread on each of the five amateur bands included in that range. And it is done with only five plug-in coils, using four-prong coil forms.

The system is quite simple. Using a 100-µfd. main tuning condenser, the inductances of the coils are chosen so that overlapping ranges are secured over the whole spectrum covered, an amateur band falling somewhere within the range of each coil. This is thoroughly conventional. Then, for band-spreading, a second 100-µfd. tuning condenser is connected to an experimentally determined tap on the coil to give complete band-spread on this condenser’s dial when the main tuning condenser is set at the proper capacity. Both condensers are brought out to panel controls. The method, it will be seen, is simply a logical extension of the tapped-coil band-spread system.

**A PRACTICAL RECEIVER**

The circuit diagram of a receiver built along these lines is shown in Fig. 1. Several views of the set are given in the photographs. The actual layout used is not particularly important except that, as always, it is desirable to have short leads in the r.f. circuit. Metal chassis construction is strongly recommended, since the shielding thus afforded is helpful in reducing capacity effects and in cutting out hum pickup from the induction fields which permeate most homes having a.c. wiring. For these same reasons a metal cabinet is advan-

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**FIG. 1—CIRCUIT DIAGRAM OF THE TWO-TUBE RECEIVER**

For 2.5-volt a.c. filament operation, the 57 and 58 are recommended as detectors and the 56 as the audio amplifier. For storage battery operation suitable detectors are the 77, 78, 6C6, and 6DG6 audio amplifier, 76 or 37. These tubes also can be operated from a 6.3-volt transformer.

- **C1, C2—100-µfd. midget variable (Hammarlund MC-100-S).**
- **C3, C4—100-µfd. fixed mica condenser (Aerovox Type 1460).**
- **C5—5 µfd. or larger.**
- **R1—5 megohms.**
- **R2—50,000-ohm potentiometer (Frost) small size.**
- **R3—25,000 ohms, 10 watts (Ohmite).**
- **R4—75 ohms, center-tapped (Ohmite).**
- **RFC—Universal wound short-wave choke (Hammarlund).**
- **L5, C9, R5—Screen-grid condenser (National Type S-101). Suitable values are L5, 500 henrys C9, 0.1 µfd; R5, 0.5 megohm.**

**Coil Data**

<table>
<thead>
<tr>
<th>Frequency Range</th>
<th>Total Turns</th>
<th>Cathode Tap</th>
<th>Band-Spread Tap</th>
</tr>
</thead>
<tbody>
<tr>
<td>1450 to 3400 kc.</td>
<td>54½</td>
<td>39½</td>
<td>23½</td>
</tr>
<tr>
<td>3030 to 7100 kc.</td>
<td>27½</td>
<td>11½</td>
<td>11½</td>
</tr>
<tr>
<td>6100 to 14,200 kc.</td>
<td>13½</td>
<td>5½</td>
<td>4½</td>
</tr>
<tr>
<td>10,600 to 24,000 kc.</td>
<td>7½</td>
<td>1½</td>
<td>1½</td>
</tr>
<tr>
<td>18,000 to 41,000 kc.</td>
<td>3½</td>
<td>1½</td>
<td>1½</td>
</tr>
</tbody>
</table>

All coils are wound with No. 24 d.c.s.c. wire on 1/4-inch diameter forms, the length of the coil being 1½ inches in all cases. The figure in parenthesis after each frequency range indicates the amateur band for which that coil is used. The taps are counted off from the lower or ground terminal. Assuming that the tuning dials have 100 divisions and that the D end of the scale represents maximum condenser capacity, the setting of C4 to give amateur band coverage on C3 will be approximately as follows, using appropriate coils: 1.75 mc., 44; 3.5 mc., 39; 7 mc., 28; 14 mc., 54; 28 mc., 78. See text on coil construction.
tageous, and since it is now possible to purchase metal boxes for less than the cost of the aluminum that would go into one of the same dimensions—to say nothing of getting a better mechanical job unless the builder is particularly handy with tools—this set was made to fit such a box, in this case a National Type C-SRR. The aluminum base or chassis on which all the parts, including the tuning condensers and the regeneration control, are mounted measures 7½ by 7½ inches. Quarter-inch square brass rods, drilled and tapped for 6-32 screws, are fastened along two edges of the base to furnish a convenient means of securing it in place in the cabinet.

The two tuning condensers are mounted along the front edge of the base with their shafts projecting beyond the edge so the dials can be fastened to them when the set is put in the box. Behind the tuning condensers is the socket for the plug-in coils, an isolantite socket mounted on metal pillars so the socket prongs clear the base. The grid condenser and leak are just behind the right-hand tuning condenser, the far end of the condenser being supported from the base by a small piece of bakelite drilled and tapped to serve as a mounting.

To the rear of the grid condenser is the detector tube socket, and in the rear right-hand corner the binding posts for the phones. The audio tube socket is next, and occupying the rear left-hand corner is the audio coupler. The antenna and ground terminals are along the left edge of the base. These terminals, incidentally, are an assembly of two push-type binding posts mounted on a bakelite strip, a convenient gadget which can be purchased at most radio stores. A similar terminal was first used for the headphone connections, but the push-posts proved to be unsatisfactory for holding phone tips and regular binding posts were substituted, retaining the insulating strip.

The coil socket is mounted so that the leads to the tuning condensers are short and convenient. The rear right-hand socket terminal (No. 4) is connected to the cathode of the detector tube; the wire from the coil socket drops down through a hole in the base and runs underneath to the tube socket. A wire from this same prong also runs through another hole in the base to the antenna post. The connection to the ground terminal is similarly made to the rear left-hand terminal (No. 2) on the coil socket. The feedback coil—the part of the coil included between the cathode tap and ground—is thus made to serve as the antenna coupling coil as well. Experiment has shown that this method provides just about the right amount of coupling, keeping antenna effects to a minimum while providing plenty of signal strength.

**FURTHER CONSTRUCTIONAL DETAILS**

Parts mounted below the base include the regeneration control, the plate by-pass condensers and plate choke, and the screen and audio cathode by-pass condensers. This last is a double condenser having two sections of 0.5 µfd. each. Increasing each to 1 µfd. will reduce regeneration-control resistor noise and aid in amplification of the lower audio frequencies. The audio cathode resistor and the screen dropping resistor also are mounted underneath the base. The regeneration control resistor is mounted on a bracket made from half-inch brass strip, from which it must be insulated. An extension shaft gives the necessary length so that this resistor can be controlled from the panel.

Fitting the set to the box requires a little care, but presents no particular problems. The back and bottom of the box should be removed, after which the receiver can be pushed in from the rear. A space of about two inches between the bottom and the base will be sufficient; lines should be ruled along the inner sides of the box as guides so the chassis will be square with the box. Then the points at which the shafts of the tuning condensers and regeneration control go through the front should be marked and holes drilled to correspond. These may be made fairly large, and small inaccuracies will not matter. The next step is to drill small holes along the sides of the box for the screws which fit into the brass-rod mounting strips. Drilling and tapping of these rods for the side screws should be left until after the holes in the sides of the box have been drilled, so that their exact location can be easily spotted when the set is in its final position. The dials should not be fastened in place until all the other mechanical work has been finished; if dials similar to those shown (National Type B Midget) are used, the drilling template should be lined up with the condenser shafts after the receiver is securely mounted in the box. This will avoid the embarrassment of having condenser shafts and dials refuse to line up. The only precaution to be observed in connection with the regeneration-control shaft is to see that it does not touch the box as it comes through.
COIL CONSTRUCTION

Fig. 2 shows how the connections are made on the coil forms, while the specifications are given under Fig. 1. In all cases the grid and ground ends of the coils come through the forms directly over their respective pins, and the tap specifications are given in turns and fractions of turns from the ground end. The length of the winding should be exactly 1½ inches on all coils, and on all but the 1.75-mc. coil the turns should be separated to give an even spacing throughout. The 1.75-mc. coil is close-wound with the wire specified. Different brands of wire vary a bit in insulation thickness, so if the completed close-wound 1½-inch coil has a turn or two more or less than indicated in the coil table it is quite in line with what would be expected. A small variation in the total number of turns on this coil is unimportant so long as the taps are counted off from the ground end as specified. The turn spacing on the 3.5-mc. coil is adjusted by putting another winding of the same size wire between the turns of the actual coil, the auxiliary winding being removed after the coil terminals are soldered in place. Spacing on the higher-frequency coils is adjusted by hand. Taps are made by drilling a hole through the form at the proper point, cutting off the wire and running it down to the proper pin. A new piece of wire with its end fastened in the same pin continues the winding. When finished, the windings should be given a coat of clear Duco or coil dope possessing good adhesive properties.

With the coils specified, the band-spread is between 80 and 100 dial divisions on the bandspread condenser on all except the 3500-kc. coil. In this case the tap has been adjusted to spread the 400-kc. c.w. portion over the whole dial. Good spread on the 'phone portion is obtained by resetting the main tuning condenser, C2, so that the high-frequency end of the band is covered on C1.

Any desired degree of spread can be obtained by changing the position of the tap. Moving the tap toward the grid end will make C2 cover a wider frequency range. Unfortunately the position of the tap for a predetermined amount of band-spread cannot be readily calculated, and the work must be done experimentally.

ELECTRICAL POINTERS

So much for the mechanics of the set. Electrically, there are only two pitfalls to avoid. The first is to make sure that the part of the coil included between the cathode tap and ground end is as close to specifications as possible. It does not take much "tickler" in this circuit to provide all the needed feedback, and too much feedback not only reduces the sensitivity but also may lead to howls of astonishing proportions. Variation in the other direction is likewise bad, although there is of course some leeway.

The second thing to avoid is the use of a makeshift audio coupler between the detector and amplifier. While audio transformers often have been pressed into service as coupling impedances, a good many of them show a pronounced tendency to produce fringe howl. This is not to say that an audio transformer cannot be used, but simply to point out that if one is used and the set has a fringe howl, the audio transformer is very likely the cause of it. Trouble of this sort can be sidestepped by acquiring a coupler made especially for the job of coupling a screen-grid detector to an audio amplifier. There are several of them on the market.

The receiver can be used with either 2.5- or 6.3-volt tubes of the types previously enumerated, and is suitable for either a.c. or storage-battery operation of the filaments of 6.3-volt tubes. Plate voltage can come either from a "B" pack or batteries, with voltages from 90 to 250 volts being satisfactory. Somewhat greater signal strength will be obtained at the higher "B" voltages.

The set should first be tested with the antenna disconnected to make sure that it goes into oscillation smoothly, and, incidentally, to make sure

(Continued on page 88)
A significant trend in the present phase of our crystal-controlled and oscillator-amplifier transmitter development is that towards simplification of multi-stage outfits, particularly towards reducing the number of stages necessary for the power output we want at the various amateur-band frequencies. One step in this progress has been in circuit development, of which the Tri-tet crystal oscillator is an example. Another step has now been made possible by tube development, as exemplified in the new pentode-type screen-grid tube introduced in May QST. After all, so far as output is concerned, 'phone operation where this element becomes a "natural" for application of the modulation.

The ratings and characteristics of this type tube were covered in the May article, and this story will be confined to practical transmitting circuits and their operating details. Principal among these arrangements are the r.f. power amplifier and high-power Tri-tet oscillator, both including provision for suppressor-grid modulation. It must be emphasized that the versions shown are intended as typical examples of simple transmitter assemblies, made up as modifications of familiar bread-board set-ups previously described in QST so that the easy transition from old practices to new are plainly demonstrated. Even the minimum shielding that would ordinarily be used is deliberately omitted—to show the bare minimum that can be tolerated. More highly "engineered" construction may be used to advantage.

A High-Gain R.F. Power Amplifier

The circuit of the experimental r.f. power amplifier unit is shown in Fig. 1. This unit resembles the Tri-tet oscillator shown in the illustration and actually has the bread-board 50-watt triode amplifier described by George Grammar in QST for December, 1933 (and in Chapter Seven of the current Handbook) as its basis. The only essential changes made in adapting the pentode to this unit were in substituting a five-prong socket, omitting the neutralizing condenser, and making the extra connections for the screen and suppressor grids. The circuit constants are generally the same as for the triode amplifier, being as given with the diagram.

The tuned grid and plate circuits are conventional and can well be as specified for the original
triode circuit. It is not necessary to use the "split" type tank circuit, which was an essential feature of the neutralizing arrangement with the triode, although it makes the output more adapted to coupling to a balanced load such as a two-wire transmission line or to the input of a push-pull high-power (250- or 500-watt) stage. A single-section tuning condenser (100-µµfd. or so) would be used with the unbalanced type tank, the coil being the same, and the rotor of the condenser would be returned to ground. As an alternative to the shorting system, with clips, here used to vary the plate tank inductance, the untapped coils specified for the parent rig could be used as well. The shorting arrangement is convenient in reducing the number of coils necessary to cover the various bands, however, and does not materially affect the overall efficiency.

In operation, there is little deviation from what would be experienced with ordinary amplifiers. The principal difference is in the excitation required with tubes of this type. More likely than not, the usual exciter will give too much excitation; that is, a driving stage putting more than about a watt into the grid circuit will cause output less than the 50 watts or so that should be obtained. This is simply remedied by reducing the coupling between the exciter's output and the pentode's grid circuit, or by reducing the driver's output. The latter would be readily accomplished by lowering the screen or plate voltage of the exciter, for instance. An especially excellent adjustment of excitation with a Tri-tet oscillator using a 59 in the exciter is obtainable by varying the voltage on the oscillator's suppressor grid: making it negative if necessary. A 24-A or 59 operating "straight" or as a doubler provides adequate excitation.

The leak, $R_i$, may be used alone to furnish grid bias for the amplifier, with the C-minus and C-plus terminals shorted as indicated by the dash-line in Fig. 1, or some fixed bias may be connected in series with the leak. Battery bias of 45 volts or so will provide insurance against excessive plate dissipation in case of excitation failure or mis-adjustment during the tuning-up process. Since the grid current is relatively small, running but 5 ma. or so for optimum conditions, the smallest type of B-battery can be used to advantage.

There is also considerable latitude possible in connection with supplying screen voltage. The recommended method is by means of a voltage divider, as shown in the diagram. However, screen supply from a separate power pack giving 300 to 400 volts has been used, as has also supply through a series resistor of 20,000 ohms (25-watt type) from the positive of the plate power pack. The divider arrangement is to be preferred, especially for 'phone where maintenance of the screen-to-plate-voltage ratio is of some importance. If a divider resistance combination different from that specified is used, the tap should be set to give a screen voltage of approximately 400 (or a screen current of approximately 30 ma.) with tuning adjustments for optimum output and with the suppressor voltage 45 volts positive.

If the amplifier is to be used at full output for c.w. or to drive a succeeding high-power stage, the suppressor voltage ($E_s$) should be set at approximately 45 volts positive. This voltage can be obtained from the same divider used to supply the screen voltage, or from small B batteries. The suppressor current will be approximately 4 ma. at this voltage, with the amplifier operating normally. In preliminary tuning up, however, it is advisable to set the suppressor voltage at 45 volts or so negative, thus limiting the plate current with the tank off tune. Once the approximately proper settings have been found for the grid and tank tuning condensers, by the usual plate-current dip for resonance and so on, the

FIG. 1—THE AMPLIFIER CIRCUIT

With the following exceptions, specifications are the same as given in December, 1933, QST, and in Chapter Seven of the current Handbook:

- $C_i$—0.001 µfd. plate blocking condenser.
- $R_i$—15,000- or 20,000-ohm 2-watt grid leak.
- $R_s$—800-ohm 25-watt resistor.
- $R_p$—13,000-ohm 100-watt resistor.
- $R_m$—500-ohm 2-watt modulator stabilizing resistor.
- $T_1$—1-to-1 Class-B input type transformer (See text).
suppressor voltage can be shifted to the positive side and the final adjustments made for full output. With plate voltage of 1000 to 1250 volts, and with optimum load coupling, the plate current will run between 85 and 100 ma.—and the output between 50 and 70 watts. Higher output, efficiency than other systems of control-type modulation (such as the control-grid-bias system) and with considerably less critical adjustment. The power requirement in the modulator is small, so that almost any type of receiver power output tube is adequately capable of handling one or two of the new 50-watt type pentodes in the r.f. stage. In spite of their reputed for distortion, even the audio pentodes, such as the 2A5, have been found to give decidedly good performance as suppressor-grid modulators.

The coupling is easily arranged, the transformer method specified in the diagram being the most generally suitable. The transformer may be of the input type commonly used for a 46 or 10 Class-B stage, although comparable results have been obtained with a receiver output transformer intended to work from a 2A5 pentode into a high-impedance speaker (4000-ohm load). The stabilizing resistor across the transformer secondary should be used if the full linear range of the suppressor characteristic, running to approximately 45 volts in the positive region, is to be used. The suppressor draws some current from zero up, demanding a little power, which makes this stabilizing necessary for minimum distortion on the positive peaks.

To adjust the amplifier for 100-percent modulation, the full-power tuning and excitation adjustments are made as previously described, with the suppressor 45 volts positive. Then the suppressor is biased negative until the antenna current is halved. With the preliminary cylindrical-plate type tubes whose characteristics were given last month, this bias was around —24

(Continued on page 78)
DR. BURTON T. SIMPSON, W8CPC, has one of the most unique practices in the history of medicine. He does not practice in Buffalo, the city where he lives, but does have a consultation practice among radio amateurs throughout the United States and Canada, and sometimes in other parts of the world. They see him listed as an M.D. in the call book, and consult him concerning their physical ailments. His actual work is Director of the New York Institute for the Study of Malignant Diseases, which is a research institution established for study into the causes and cure of cancer. It is the first institution to be established for this purpose in the world, and ranks as the foremost. His amateur career started in 1926, upon graduation from the B.C.L. set-builder class. The first outfit was a '10 in Hartley, followed in the same year by 3 '10's with crystal control—one of the first c.c. rigs in the vicinity. The present station has two transmitters, each with the maximum legal input, beautifully built in rack and panel style, with which he works 14 and 7 mc. c.w., and 14 and 4 mc. 'phone. Personal contacts and DX represent his main interest.

IT’S “Grandpa” Kerr who represents the Midwest Division on the A.R.R.L. Board of Directors. He was dubbed with this nickname by Supervisor Hayes, who assigned him the call W9GP. “Gramp” got his interest in amateur radio while working as W. U. and railway Morse operator, back in the days when sparks rent the ether in both auditory and electrical senses. Later, in the publishing business, as editor of a weekly newspaper, a litter of parts accumulated in the print shop and W9DZW resulted. W9GP continues from his home. To his weekly newspaper he has added the publication of a ham sheet, and the print shop is as often as not in use preparing a circular to be distributed to the Midwest Division membership. “Gramp” (whose full name is Harry Wallas Kerr) served as S.C.M. of Iowa prior to his elevation to the Board, and also is active as the Radio Aide of the 7th C.A. for the A.A.R.S.

IN the QRR Log in the December, 1933, issue of QST we described briefly the work of Ed Thompson, W3CQS, during the Delmarva storm and flood emergency work. We told how the emergency transmitter was set up in one of the booths in his restaurant, how the antenna was erected in the teeth of a fifty-mile gale, how the operators stuck to the key in knee-deep water through a night and a day until the regular wire lines were back in commission. Now we present W3CQS himself, leader of the daring and invaluable emergency relief work, formerly A.R.R.L. 3d district QSL manager, R.M. for his section, member of the A.A.R.S. and R.O.W.H., interested in amateur radio since 1913. He attends all the hamfests and conventions he can, and has a swell time at each. He even staged one highly successful affair himself, with 131 delighted delegates in attendance. In between times the Collins 40B and Hammarlund Comet Pro keep his fist pretty steadily on the air.

IT TAKES a real operator to hold the key at WLM, and Sergeant Ed Day is the man for the job. He takes 40 per with ease, and thrives on a routine which starts with skeds at 4 p.m. lasting until 3 and 4 a.m.—all in addition to being Capt. Garland C. Black’s right hand man in running the Army Amateur Radio System. Twenty-seven years old, (Continued on page 58)
A Simple Mounting for the Cathode-Ray Tube

At first glance the requirements for a cathode-ray tube mounting would seem to make construction difficult for the amateur. A tube rested in its packing case in the Lab for some weeks before it was mounted—for just that reason. We wonder if others are troubled with the same problem. The mount to be described turned out to be a very simple and inexpensive mechanical job, and the finished product is highly respectable looking as well as acting.

Shielding must be non-magnetic and, to be of greatest utility, the mounting should be on a swivel joint. The tube we used was the 905, which is one size larger than the popular 906. Three cracker tins served for our shield and a discarded universal joint from a periscope mounting became the swivel for our “trench mortar” type mount.

**Construction**

Two cracker tins of 5-inch diameter are used for the barrel of the mount. The ends are pried off both cans, leaving two cylindrical pieces of tin. One of the covers is saved to be used at the base. The rounded lip of one cylinder is unfolded to serve as a collar to slip over the other cylinder about \( \frac{1}{4} \) inch. After a bit of sandpapering solder will flow over the surfaces readily. The barrel is now complete.

The hood is made of a 6-inch diameter cracker tin. The bottom is removed leaving the plain cylinder. The cover of the hood is placed right side up on a table, and the barrel is placed on it. Use this as a template and, after the barrel is centered on the cover, scribe a circle around the barrel. Then, with a pair of old shears, cut away the tin around a circle \( r^2 \) inch inside of the scribed line. Now cut slits about every half inch up to the scribed line. When the circle is completed these slits are bent back at right angles away from the cover.

This hood cover becomes the reducer after it has been placed on the barrel and soldered to it. If reasonable care has been taken the resulting barrel with soldered reducing cover should make a nice mechanical fit. The hood is a detachable part of the mount and can be removed at any time, as it fits into its cover.

The cover which was saved from one of the 5-inch tins is now used for the base of the barrel and as a mount for the 5-prong tube socket. As (Continued on page 88)
Low-Cost Crystal Control for High Power

Applying the Crystal-Lock System in a 250-Watt Outfit

Durward J. Tucker, W5VU*

The day has at last arrived when every amateur station is required to put out a decent note and it is encouraging to note that crystal-control stations are steadily increasing. Good low-powered crystal control can be accomplished with a very reasonable outlay of cash, as has been demonstrated by the fine articles in QST during the last year. However, any ham knows that crystal control for a 250-watt or a 500-watt transmitter means plenty of cash. All too often when a fellow must choose between a 10 crystal outfit or a 52 or 04-A TNT outfit, the high-powered TNT wins. Contrary to popular belief, all high-powered transmitters are not owned by fellows with plenty of ready cash; and crystal control for them constitutes a real problem. I fall within this class and it has kept me figuring for several months how I could change my 325-watt TNT transmitter over to crystal control at a very minimum cost. The TNT outfit consists of a W.E. 212-D with 1500 volts on the plate with an input of 325 watts. The probability of an intermediate amplifier of considerable power and corresponding power supply, following the crystal and doubler—to say nothing of a neutralizing condenser for the 212-D—did not look a bit good.

I finally hit upon the synchronization scheme mentioned in August, 1933, QST. A TNT self-excited oscillator is locked into synchronization with a crystal oscillator circuit. I was not overconfident that this radically different method of crystal control would prove satisfactory and fool-proof; so a very modest, but carefully constructed, 3500-kc. crystal oscillator and 7000-kc. doubler unit was built from parts out of a homemade short-wave receiver. Midget tuning condensers and plug-in L'Oils were used for both crystal and doubler stages.

Since it was not convenient to couple the doubler tank coil directly to the TNT grid coil, a transmission line was used consisting of 2 feet of twisted lamp-cord wire and connected to three turns of the same wire on both the doubler tank coil and the TNT grid coil. The coupling in each coil is not critical and is "medium." The transmission line can be several feet long or only a few inches without any appreciable operating difference. The normal plate input of the doubler is about 15 watts without the transmission line connected. With the transmission line connected the plate input increases to about 18 watts.

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ADJUSTING THE CRYSTAL STAGE

In order to insure the stability of the crystal stage, the tank circuit should be tuned to a slightly higher frequency than that of the crystal. This should be accomplished by setting the tank condenser at minimum capacity and gradually increasing the capacity until the milliammeter dips to a minimum value; then the capacity of the condenser should be decreased slightly so that the milliammeter reading increases two or three milliamperes. Should the condenser capacity be increased beyond the point of minimum dip the crystal stage stops oscillating easily and may not start every time it is turned on. Extreme care should be used to make the crystal circuit very stable with this method of crystal control.

SYNCHRONIZING

All adjustments of the crystal and doubler stages should be made with the TNT stage tube filament lit and plate supply connected but with the key open. After the crystal and doubler are
adjusted the signal is picked up with the monitor and logged. With the crystal and doubler power turned off, but not disconnected, the key in the TNT oscillator is pressed and the tank circuit adjusted, with the aid of the monitor, to a slightly lower resonant frequency than the crystal frequency. Next turn on the crystal and doubler again and press key of the TNT oscillator. If a single clear clean crystal note is heard in the monitor, then the circuits are in synchronism.

Attention is called to the fact that synchronizing the two circuits the limits should be determined and the TNT tank circuit tuned near the center of this band. The TNT tank circuit should be adjusted while it is drawing full load. If the TNT tank is tuned too close to the edge of the synchronizing band it may take a second or a fraction of a second for the two waves to synchronize each time the key is pressed. This will give the signal a peculiar chirp.

Dependability and quality

If the system is adjusted properly the load can be removed and synchronism still main-

(Continued on page 78)
A Medium-Power 56-Mc. Transceiver

A Battery-Powered Class-B Modulated P.P. Oscillator with Ten Times the Output of 30 Type Units

Frank Jacobs, W2BSL*

Arm-chair experimenters, in their eagerness to find something wrong with something, have enjoyed rapping the modulated-oscillator Type 56-mc. transmitter and the super-regenerative receiver. Probably they will continue to do so. The fact remains, however, that this type of equipment is still the only genuinely practical one for portable and mobile work. QST has long recognized the need for a reduction of frequency modulation on the 56-mc. band and will continue to advocate firmly the use of stabilized transmitters for fixed locations and in congested districts. At the same time, we strongly suspect that the stabilized transmitter for 56-mc. (or the still higher frequencies) will not involve application of an inefficient string of amplifier tubes. Much more modern and more promising methods are on the horizon. In the meantime we present another modulated-oscillator unit of proven effectiveness.—EDITOR.

In his article, "Featherweight Sets for the Ultra High Frequencies," Ross Hull made a closing plea that amateurs should consider these circuits and illustrations not as something to be rigorously copied but as suggestions of possible use in the development of new and better equipment." Bearing that in mind and taking hints from Reinartz on the use of dual tubes in unity-coupled transmitting circuits, I developed a dry cell operated transceiver having an output of 2.0 watts instead of the conventional 0.2 watt of the Type 30 transceiver. The result is a healthy signal that is comparable to that radiated by a medium power transmitter using push-pull 71-A type tubes; a popular combination in the past. Unlike the 30-type transceivers, this one employs a stage of audio amplification, permitting reception several feet from the phones. Only three tubes are used, a 30, and two 19's.

A Type 30 tube is employed in the dual role of interruption-frequency oscillator for receiving and speech amplifier or driver tube for transmitting. The manufacturers specify an output of 170 milliwatts from this tube when coupled to a Type 19 Class-B stage and operated with 135 volts on the plate and -9 on the grid. The Class-B stage delivers an undistorted power output (U.P.O.) of 2.1 watts when operated without bias, and with 135 volts of plate potential. As the practical or operating plate efficiency of Class-B systems is approximately 50 per cent, instead of less than 25 per cent characteristic of Class-A, the plate batteries need not be enormous, making portable operation a reality. The total plate current of all tubes in the receiving position is normally 20 milliamperes; the total drain on modulation peaks of transmission sometimes reaching 75 milliamperes. Type 30 transceivers when operated at 90 volts draw about 7 milliamperes on transmission, an input of 0.63 watts. The Type 19 has an input of 0.75 watts; 50 milliamperes at 135 volts; or over ten times that of the Type 30 transmitter. As the 30 type modulator tube delivers only 0.17 watts for modulating 0.63 watts oscillator input, and as the 19 Class-B gives an audio power of 2.1 watts for modulating an oscillator input of 6.75, the ratio of audio power to oscillator power is seen to be lower in the latter; or in other words the percentage of modulation is higher in the 19 Class-B combination. These values may not be exactly the same in all cases, but they will serve as a guide for comparison.

Change-over from transmitting to receiving is

THE COMPLETE TRANSCEIVER CIRCUIT

C₁—150-μufd. fixed condenser.
C₂—2000-μufd. fixed condensers.
C₃—35-μufd. variable.
R₁—20,000-ohm fixed resistor.
R₂—0.5-megohm fixed resistor.
R₃—1.5-ohm fixed resistor.
R₄—0.5-megohm potentiometer.
L₁, L₂—See text.
L₃—Sickles interruption frequency coil unit.

*Terman, Radio Engineering, p. 164.

June, 1934
made by the flip of a 4-blade anti-capacity switch. The 0.5-megohm resistor, R2, is shunted out when the switch is thrown to the sending position. Resistors up to 2 megohms may be used in this circuit with varying intensities of the characteristic super-regenerative rushing or hissing sound. Trial will determine the correct resistance for optimum smoothness of hiss.

The chassis is bent from a 7 by 14 by \(\frac{3}{16}\) -inch aluminum panel. The completed unit is \(3\frac{1}{2}\) by 12 inches on top by \(1\frac{3}{4}\) inches high. Deep scratches are made on the inner sides of the panel before bending between two boards clamped together in a vise. Socket holes are cut with an expanding wood bit kept moist with oil. Sub-panel type sockets are employed. The photographs show the layout of the various parts.

The unity coupled inductance is held firmly in position at the end of the chassis. The ends of the copper tubing go through \(\frac{1}{4}\)-inch holes in the bakelite end strip and are soldered directly to the oscillator socket plate prongs. The inner, or grid coil, leads cross over and connect directly to the grid terminals of the same socket.

The \(\frac{1}{4}\)-inch copper tubing from which the inductance is made is first threaded with a piece of solid number 18 push-back wire that has been tapped in the center. The tubing is then bent to form a circle 3 inches in diameter, and the ends are bent perpendicularly to the plane of the circle formed by the tubing, for entering the holes in the bakelite end piece of the chassis. The plate lead is bent in the same manner and is soldered to the main inductance. As viewed from the end of the chassis the inductance appears not unlike a 3-inch Greek letter Omega. Antenna coupling is provided by another copper coil bent to a diameter of about 2\(\frac{1}{2}\) inches. The ends terminate in porcelain stand-off insulators mounted on the wooden carrying case. Various antennas may be connected to these insulators whenever the user feels the urge to try what he thinks is a more efficient radiating system.

A 35-µfd. Cardwell midget condenser is mounted directly on the copper tubing at its junction with the tube plate prongs by the use of brass strips. A \(\frac{1}{4}\)-inch bakelite shaft, terminated on the outside of the chassis by a G.R. knob, is coupled to the condenser for tuning. Small size mica condensers by-pass the Sickles interruption frequency coil, the receiving grid leak and the phones. In some cases it may be advisable to by-pass the B batteries or the primary of \(T_a\). The values shown need not be copied exactly. Various values of capacity should be tried across the grid leaks until a smooth hiss is received. All ground connections are made to the aluminum chassis. Transformers similar to the ones used have been described in previous articles and can be made or purchased. In this particular transceiver \(T_1\) is a Thordarson microphone transformer, and \(T_2\) and \(T_3\) United Class-B input and output transformers respectively. Phones and microphone plug into midget jacks, one of which controls the filament circuit; making a separate filament switch unnecessary.

The carrying case is made of oak and is covered with two coats of clear duco. One side is hinged, permitting access to the side of the chassis with its knobs and jacks. Three 9\(\frac{1}{2}\)-lb., 45-volt Layer-bilt B batteries, two 4\(\frac{1}{2}\)-volt C batteries and two number six dry cells are carried in a separate wooden box equipped with a handle and a strap for shoulder carrying. A four-wire cable terminated on each end by a four-prong tube base permits rapid change from one location to another without troublesome entangling battery wires. Both the transceiver chassis and the battery box are equipped with subpanel sockets for ready (Continued on page 88)
Automatic Gain Control With Diode Detection

Using the Type-B7 Tube as a Combined I.F. Stage and Second Detector in the S.W. Superhet

Wolcott M. Smith*

Although almost universally used in modern broadcast receivers, diode detection combined with automatic gain control is seldom found in the present amateur-band superhet. Why should this be so? Because the requirements of amateur and broadcast reception are so widely different, straight adaptations to superhet receiver design of practices that are considered satisfactory in b.c. receivers do not always work out as improvements in our particular field. But recent tube developments and applications now fit diode detection to our special requirements and point the way to its practical use in our superhet receivers, as the author shows in this article.

ALTHOUGH the manufacturers of broadcast receivers have been using the diode detector with automatic gain or sensitivity control for the past several years, it has not yet established itself in high-frequency receiver design. Some consider this type of detector as excellent, while others do not agree with this view, declaring it insensitive. In its application a variety of circuit arrangements have been used, some decidedly inferior to others. The ultimate purpose of this article, which is based on two years of practical experience with diode detection in combination with several more or less technical papers on the subject, is to show how diode detection and automatic gain control can be used to best advantage in replacing the plate detection triodes commonly used in high-frequency superhet receivers.

DIODE ACTION

For many years the grid-leak and condenser detector has been used. Even to-day it is considered as one of the most sensitive of them all, although its use was discontinued in commercial receivers with the development of high r.f. gain. It interests us here because it is akin in action to the diode. In the diagram of Fig. 1-A is shown the usual circuit arrangement for the grid-leak detector. Fig. 1-B is the same circuit with the leak and condenser in the grid return circuit instead of the usual position in the grid lead of the transformer secondary. Fig. 1-C shows a special case in which the leak is directly to cathode or to ground instead of shunting C1, the grid condenser. The arrangement of Fig. 1-D is identical with that of Fig. 1-B except that a dotted line is drawn through the center of the tube, the circuit on the left being fundamentally that of the diode rectifier.

Tracing the action, an incoming signal is rectified in this grid-cathode circuit in familiar fashion. As this signal increases, the rectified current increases and the bias on the amplifier portion of the tube also is increased. When this incoming signal becomes large enough, the tube comes overbiased to such an extent that the grid acts as the diode plate.

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the peaks, thereby causing harmonic generation. This means that not only the notes originally in the input are heard from the output, but also that strong harmonics of these notes appear. In other words, if a 1000-cycle note modulates the radio frequency input, there is an undesirable amount of 2000-, 3000- and 4000-cycle output in addition to that of the original 1000-cycle grid rectified component. As we all know, this type of distortion makes the set sound “mushy” or “harsh.”

It is possible, by the simple expedient of leaving the amplifier functions of the tube to be performed in a separate tube or in a separate section of one of the new tubes, to eliminate this type of distortion. By proper operation of the diode circuit, any troubles likely to arise in its operation can be circumvented, or at least reduced to the point where they become negligible. The great advantages of diode detection lie in its wide tolerance and in the fact that it can readily be made to furnish rectified voltage for automatic gain control of the r.f. amplifier in the receiver.

There is another angle from which this diode detector action can be approached, starting out with the diagram of the Type 81 power supply of Fig. 2-A. This is the usual half-wave rectifier with its accompanying filter circuit. In Fig. 2-B the filter system, other than the filter condenser \( C_1 \) required to by-pass the lead \( R_1 \), is dropped and the positive instead of the negative side of the output is grounded. The circuit of Fig. 2-C shows the equivalence of the grid circuit of a triode to the circuit of Fig. 2-B. Comparing with Fig. 1-D, it is seen that we have again arrived at grid-leak, or diode, detection. They are essentially the same thing. Each is a half-wave rectifier with a small filter. In each a pulsating direct-current potential is built up across the load resistor, \( R_i \). In both, power is drawn from the circuit to which they are connected, just as in any rectifier. The difference between this rectifier and the usual power-supply rectifier is simply that the diode detector deals with radio frequency and must retain the modulation envelope essentially intact.

As the design of the circuit for diode detection is begun, it is best to consider perfection as the ultimate goal towards which to aim. Thus, the circuit must be so arranged that greatest efficiency is attained. Simultaneously, its sensitivity must be as high as possible. The audio output must be free from harmonics due either to improper matching of \( C_1 \) and \( R_1 \) or to the use of too-heavy an audio load in parallel with the direct current load. The formulas given later are quite tolerant, good results obtaining with as much as 25% variation in component values. When these formulas are closely applied, the detector output will be free from distortion with inputs having modulation up to at least 75% and within the audio-frequency range for which the value of \( C_1 \) is selected. The autogain circuit will prevent excessive radio amplifier overload when the coupling from the last amplifier to the diode is near its optimum value.

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3 The Radio Amateur’s Handbook, Chapter Four.
work on these tubes, building three functions into one tube in a decidedly satisfactory manner. The screen-grid amplifier portion is a pentode with a plate impedance of 650,000 ohms, lower than most any of the other r.f. pentode amplifiers, and for this reason more easily matched by its load. In fact, with the diode detector properly arranged, very nearly ideal conditions can be realized. Besides the pentode portion there are also two diode plates, each capable of handling far more power than is ever required of them in a well designed diode detector fed by the pentode section. From this it is evident that a -B7 tube can replace the second intermediate amplifier and detector; or, better yet, it can be used to replace the usual triode or s.g. second detector, adding i.f. gain while providing real power detection. This application is the one utilized in the arrangements diagrammed in Figs. 3 and 4.

The 2B7 and 6B7 are identical except for their heater requirements, the 2B7 having a 2.5-volt 0.8-amp. heater intended for a.c. operation and the 6B7 having a 6.3-volt 0.3-amp. heater intended for either a.c. or d.c. operation. Maximum plate voltage is 250 and current 9 ma. Maximum recommended screen voltage (grid No. 2) is 125 volts, and screen current 2.3 ma., control grid bias being 3 volts negative. The suppressor grid (No. 4) is connected directly to the cathode internally. Referring to the standard pin arrangement (Chapter Five of The Radio Amateur's Handbook, eleventh edition, or page 50, March, 1933, QST), the connections are as follows: Pin 1, screen; Pin 2, pentode plate; Pins 3 and 4, heater; Pin 5, cathode; Pin 6, diode plate; Pin 7, diode plate; and cap, pentode control grid. Viewing the base from the bottom, the pin numbering progresses counter-clockwise (from left to right) with the heater pins identified as the two larger than the rest.

These circuits are adaptable to several standard superhets, such as the Hammarlund "Pro," and National AGS and FB7's, as well as to the S. S. Super described by J. J. Lamb in August and September, 1932, QST. The diagrams follow the lineup of the QST’s s.s. superhet particularly and are generally according to standard practice. Only the circuit elements actually involved in the detector and a.g.c. operation are shown in detail since other sections are conventional. The two detector arrangements are similar except that whereas that of Fig. 3 utilizes a choke as the

![Diagram](image_url)

**FIG. 3—AN ILLUSTRATIVE ADAPTATION OF THE B7 TYPE TUBE AS A COMBINED I.F. AMPLIFIER DIODE DETECTOR AND SEPARATE DIODE A.G.C. RECTIFIER REPLACING THE USUAL TRIODE OR SCREEN-GRID SECOND DETECTOR OF A TYPICAL SUPERHET**

In this arrangement the r.f. voltage applied to the diode circuits is taken off across the plate choke of the -B7. Circuit constants are usual except as specified below:

- R1-2.0-megohm unshielded manual volume control. See text.
- R2-3.0-megohm 1/2-watt, each.
- R3-0.5-megohm 1/2-watt.
- R4-4.0-megohm 1/2-watt.
- R5-10.0-megohm 1/2-watt.
- R6-50.000-ohm 1/2-watt.
- R7-0.25-megohm 1/2-watt.
- R8-0.25-megohm 1/2-watt.
- R9-100-ohm 1/2-watt. Manual gain control, 1,000 ohms (approx.).
- R10-500-ohm 1/2-watt.
- R11-400-ohm 1/2-watt.
- R12-60,000-ohm 1-watt.
- C1-50-µfd. mica.
- C2-100-µfd. each mica.
- C3-250-µfd. to 50-µfd. mica.
- C4, C5, C6-0.002-µfd. above 1500 kc., 0.005-µfd. below 1500 kc., 600-volt mica.
- C7-0.3-µfd. 200-volt.
- C8-0.1-µfd. or less, 200-volt (see text).
- C9-10.0-µfd. 50-volt electrolytic.
- C10-1.0-µfd. 600-volt.
- C11-0.01-µfd. mica.
- C12-250-µfd. mica (if used).
- RFC-10-30°mh. r.f. chokes.
- SW,—S.p. cathode resistor shorting switch. See text.
- SW,—A.g.c. on-off switch.
- SW,—Audio tone control (Phone-c.w.).
- SW,—A.g.c. time constant control.
- Ti—Standard i.f. transformer.
- T1—Audio output transformer.

June, 1934
r.f. load impedance for the -B7 pentode section, with the r.f. voltage to the diodes taken off across this impedance, the arrangement of Fig. 4 uses tuned transformer coupling between the pentode output and diode circuits. The choke method is the simpler to adapt, but since it requires fewer additional components, is inferior to the transformer method in several respects.

The greatest drawback to this method of adaptation is the necessity for a dependable unshielded manual audio volume control of very high resistance, which is not a readily procurable component. It is also difficult to keep the capacity losses across this unit and its associated wiring to a sufficiently low value. Satisfactory results can be obtained, though, if care is used to keep all wiring well away from either the chassis or the other wiring of the set. Shielding can be accomplished, if necessary, by placing strips of aluminum vertically in the base of the chassis as baffles to prevent undesirable feedback. Direct feedback through the wiring is more often the cause of oscillation, however, and it will usually be found that it is best to filter the plate circuit of the -B7 pentode. Some regeneration, in the arrangement of either Fig. 3 or of Fig. 4, is rather desirable because the overall receiver gain and selectivity are appreciably improved by it. Sometimes it may be found helpful to omit the plate filter circuit and leave out the cathode bypass of the -B7 tube. This has been found to provide a controllable regeneration in most cases. On the other hand, in some sets it may turn out that the plate filter is needed with omission of the cathode bypass. This will usually be so when the set has insufficient filtering and shielding.

CIRCUIT DESIGN

Although the circuit specifications given with the diagrams will be satisfactory in most instances, the method of determining the proper values and description of their effect on operation will be helpful in clarification of the principles involved. The following simple formulas are used to determine these values, the resistance and capacitance designations referring to the designations in Figs. 3 and 4:

\[ R = 2R_sL_m \text{ (at least).} \]

Where \( R_s \) = Generator (tube plate) impedance, ohms.
\( L_m \) = Coupling in diode transformer, per cent.
\( R_1 = \frac{R_s R}{R_s - R} \)
\( R_2 = \frac{R_s R}{R_1 - R} \)
\( R_4 = \frac{C_1 + C_4 + C_6 - R_2}{R} \)
\( R \) in megohms, \( C \) in \( \mu F \).
\( C_1 \) = Capacitance to give \( X_4R = 1.0 \) for either \( R_1 \) or \( R_4 \).
\( X_{\text{eq}} = 0.5 \times R_4 \) megohms.

See Table I for values of \( X_{\text{eq}} \). Since the values of resistors \( R_1 \) and \( R_4 \) depend upon the plate impedance of the generator tube (the r.f. pentode section which feeds the diodes), these values are the first to require attention. For the choke-fed arrangement of Fig. 3 \( L_m \) becomes unity, so that \( R \), the combined value of \( R_1 \) and \( R_4 \) should be at least twice the plate impedance, or 1.3 megohms. By making \( R_1 \) as small as permissible without making \( R_4 \) too large this value can be closely approximated. Thus, with \( R_1 \) a 2-megohm resistor (the manual volume control, which must be an unshielded unit in order to prevent capacity losses across the diode plate to which it is connected), the value of \( R_4 \) from the formula given will be about 3.0 megohms. The latter can be one of the minute resistors that take up almost no space in the set. In fact these little resistors can be used in a multitude of places in this autogain circuit, saving not only space but drain on the pocketbook, since they are a little less costly than the others. After the values of \( R_1 \) and \( R_4 \) are so determined, the others can quickly be found.

chosen to find the value of $X_e$, besides which it

<table>
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<th>Table I</th>
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<tr>
<td><strong>Reactance at Audio Frequencies, Meghms</strong></td>
</tr>
<tr>
<td><strong>Cap., $\mu$fd.</strong></td>
</tr>
<tr>
<td>0.00005</td>
</tr>
<tr>
<td>0.0001</td>
</tr>
<tr>
<td>0.00025</td>
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<tr>
<td>0.0002</td>
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<tr>
<td>0.002</td>
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and here it must be said that the action of this condenser is exceedingly complicated. Briefly, when the modulation percentage is high it causes the generation of excessive harmonic distortion at certain frequencies above the audio frequency.

One thing must be watched in applying this value, however. The circuit capacitance should be well considered, since this adds to the value of $C_1$, actually making it unnecessary to add quite this much capacitance. In fact the smallest practicable is this $50 \mu$fd. value. This will be

found satisfactory in any case, even though it isn’t perfection. The way this value of $C_1$ is chosen is as follows:

The highest audio note from the loudspeaker is, let us say, to be about 4000 cycles. A few sets will deliver better than this, but most are poorer, so that this is a safe value. Hence we may design the detector to pass, without distortion due to harmonic addition, say, 2000 cycles, because the second and higher harmonics of 2000 cycles will be inappreciable. They just naturally don’t get through the usual audio amplifiers. Sometimes sets will be found in which 1000 cycles can be used as the design frequency, although the 2000-cycle value is safe enough with the run of present-day commercial receivers and parts. You’ll know it, quickly enough, if there is over 10% harmonic distortion out of the speaker.

The next point to be considered is the value of the audio coupling condenser, $C_1$. This capacitance depends largely upon the value of the first audio grid-leak, $R_2$. Kilgour and Glessner 1 have shown that this circuit, $R_2C_1R_3$, being an audio shunt on the d.c. load $R_4$, will cause harmonic distortion at high-percentage modulation unless it is of extremely high impedance in comparison to $R_2$. For this reason $R_2$ is chosen as high as is practicable, about 10.0 megohms filling the bill, permitting about 90% modulation without excessive audio cut-off distortion.

Now $C_1$ reduces the upper audio response considerably, even when it is as small as 50 $\mu$fd., and it is necessary to make some correction in order to have nearly a flat frequency response for the voltage across $R_4$. To do this, the condenser $C_1$ is made to have about half the impedance of $R_4$ at 100 cycles, reducing the lower audio response to balance up the output to give a more nearly flat curve. For 'phone reception with a crystal filter in circuit, for instance, this arrangement will greatly improve the intelligibility of speech. When c.w. reception is desired, the switch $SW_3$ is closed, adding the capacity $C_4$ to that of $C_1$, increasing response to the lower notes and cutting out undesirable high-beat signals more completely. Thus the high selectivity of the crystal filter is made more useful for 'phone reception, as well as for code—and those 'phones can certainly jam at times.

Following out the formula, $C_1$ will turn out to be about 200 $\mu$fd. or so. While this may seem small, the audio output at 2000 cycles is still about 92% available, although the response at 100 cycles has been reduced to about 50%. With a 50-$\mu$fd. condenser across $R_4$, the results show that the whole output is much more nearly flat from the 100-cycle point to the 4000-cycle value although there is still some drop in output between 400 and 4000 cycles which cannot be corrected easily. 'Phone articulation is improved, however, and that is what is needed. The added effect of side-band cutting caused by the extreme

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selectivity of a crystal filter will, in effect, add so much more bass that we can even make $C_t$ as small as 50 µµfd, without doing any damage. The total volume loss is not serious even with so selective an intermediate amplifier, and the speech intelligibility is greatly improved.

The capacitance of $C_1$, $C_4$ and $C_5$ may be about 0.002 µµfd. Some may consider this small in comparison with what previously has been used, but trial shows that it is sufficient. The higher the frequency, the better the by-pass, so that even smaller capacitance could be used were it not that the tuning range of the h.f. section of the set might be affected too much. The second i.f. bypass, $C_t$, may be as small as 500 µµfd., thus increasing a.g.c. control speed.

The formula for $R_t$ depends upon the time factor of the a.g.c. circuit so it has been made dependent upon the total capacity of the entire set of by-passes, $C_t$, $C_4$ and $C_5$. The resistor $R_t$ also enters into this, and its value must be subtracted from the total permissible for optimum time factor. Then, by by-passing both the first detector and the first i.f. grid returns with the same condenser, (their respective voltages are out of phase, so don’t regenerate), the resistor $R_t$ is again increased, lowering the audio load on the i.c. load $R_m$, and lessening possibility of distortion reflecting back to the audio circuit. With all this, the effective time-factor, figured as usual by the time required to discharge a condenser 63% of, is equal to $RC$, in megohms and $C$ in microfarads. The 0.04 portion of the formula given is really the time-factor of this circuit. This seems satisfactory for most applications and makes $R_t$ (Fig. 3) take a value of about 4.0 megohms (exactly, 3.6) for the preferable value. Then $R_t$ and $R_s$, the filtering resistors between controlled circuits, can be anything from 0.1 megohm to 0.25 megohm. In order that tuning with or without the a.g.c. feature will not differ excessively, the control voltage is sufficiently shortened out through the resistor, $R_m$, which should be about 50,000 ohms, connected to ground through the switch $SW_1$, when a.g.c. is not wanted.

THE BETTER CIRCUIT

With all the important new features of the circuit shown in Fig. 3 taken care of, Fig. 4 comes up for scrutiny. In many ways it is the same, but introduction of the tuned transformer, $T_2$, makes it necessary to note a few essential differences. The first of these is the coupling of the transformer windings. With standard 450- to 525-kc. transformers having “universal” windings of equal inductance, the separation between the two coils should not be greater than 1/24th inch and is preferably set at 1/32nd-inch for best all-around operation. This will permit use of a better grade of manual volume control for $R_t$ and, by having this control a shielded unit, the condenser $C_t$ is done away with. Any of the manufacturers of such transformers can supply these with the proper value of $L_m$ to suit the requirements ($L_m$ approximately 80% or with nearly unity coupling); but if it should be impossible to buy one that is just right, any of the present transformers using a wooden or bakelite dowel can be rebuilt to these specifications. To do this, remove the coil assembly and drill lengthwise through the center of the dowel core with a number 36 drill. Then saw out a section of the dowel between the coils; as close to the coils as possible without danger of spoiling them. The ends of the form which are left can be further shortened by filing. A 1/16th-inch separation with the 500-kc. range intermediates will be found satisfactory, though, and this can be cut with the hack-saw, with care. When the forms are down to the required length, pin the two coils together with a match stick, cemented in place with celluloid dissolved in amyl acetate.

Capacitance across the control $R_t$ is no longer harmful. In fact, if this control is one of the shielded types, Electrad No. 206 for instance, no other capacitance will be needed. $C_t$, however, will remain the same, because 50 µµfd. is about all that can be used. All the other component values are the same, the only major change additional to replacement of the tube itself being that of replacing the plate chokes $L_6$ and $L_7$ of the original s.s. set with the tuned transformer. The transformer method of feeding the diodes will be found far more satisfactory in every respect than the choke-fed circuit arrangement, although good results will obtain with the latter if care is used in placing the parts to lessen capacity across the choice. This choke-feed system has been used several times with complete success in the writer’s work.

FURTHER AUTOGAIN CONSIDERATIONS

When it is properly applied, diode detection with automatic gain control at the higher radio frequencies is unquestionably beneficial. Some consider that autogain on code reception is impracticable, but this does not apply always. If there is provision for increasing the time-factor of the a.g.c. circuit, this can be set so as to prevent excessive background rise between the individual dots and dashes, at least. When the incoming signal is readable at all, this background can be no worse than will be encountered when operating with manual sensitivity control, and the advantage of lessened fading is certainly beneficial. The switch, $SW_2$, in the Figs. 3 and 4, is intended to accomplish this by adding resistance to the control circuit in 2-megohm steps, thus increasing the time constant. The switch $SW_2$ shorts out the fixed cathode bias for c.w. reception with a.g.c., since the operation of the c.w. beat oscillator places some r.f. voltage on the diode plates, thereby increasing the no-signal grid bias and reducing maxi-

(Continued on page 74)
LAST year the author bettered the depression by taking a job in Alaska, but was unable to take a transmitter for the trip because of the expense of what was thought to be adequate equipment. However, a good a.c.-d.c. short-wave receiver, employing a 36 detector and two 37’s for audio, was taken along. All “r.f.” was discarded for circuit simplicity. Five minutes after the receiver was put on the air the writer regretted he had not brought along a transmitter.

Under the Northern Lights the whole world pounded in. W’s from all districts were heard; ZL’s, VK’s, K6’s, J’s and countless others. It was an ideal spot—a veritable ham’s paradise, for reception at least. There was no local interference, no blanketing by neighbors, no “rock-crushers” filling the air with “gravel.”

The transmitter above is the successor to the original cigar-box model. The 201-A shown installed can be replaced by a 10 when suitable plate and filament supplies are available. At the right is the cigar-box transmitter that worked Japan—Australia and New Zealand from Alaska—with only 200 volts on the plate of a 201-A. The receiver at the right was used for press and ship work.

One evening while sitting in the radio shack and grouning because there was no transmitter available, in walked a fellow op, Charles Blair, full of optimism. We talked it over. Why not try out a custombuilt junk pile? It was finally decided to throw together a simple Hartley transmitter built entirely from “what have you”—or less. We did.

The most important need was, of course, for power. We were able to round up just 210 volts. It was thought that this would be sufficient for local or Alaskan communication—provided we could hear any locals. A tough, chesty 201-A which lighted up like the Aurora Borealis was pushed through four holes in a cigar box—the box in lieu of a socket.

A condenser of 43 plates, built for 600-meter work, was “borrowed” from a long-wave receiver. Real ingenuity had to be used to obtain copper tubing for the inductances. A machinist who thought we really wanted to do a bit of “bootlegging” on the side finally surrendered a few feet on our promise to give him some of the first “distillation.” Thus equipped we wound our inductances—believe it or not—around the peg-leg of a dock watchman. (The peg was just the right diameter.) The watchman held the tubing while we wound.

An Eskimo who owned a decrepit broadcast set loaned us a 250-µfd. condenser, and for a grid leak we used a discarded audio transformer. A commercial operator at a shore station contributed a 5,000-volt 0.001-µfd. blocking condenser to restrain our terrific plate voltage. An r.f. choke was wound by putting 120 turns of wire of unknown size on a clothespin borrowed from a squaw’s laundry-bag. Another Eskimo had acquired a vintage of ’76 telegraph key from some place, using it for a door clapper.

We acquired this for a package of cigarettes. Not having the slightest insulation of any kind we had none about which to worry. Since no one volunteered to supply an antenna condenser we left that out also. An antenna which ranged in length, as nearly as we could guess, from 150 to 200 feet was connected to one end of the antenna coil. A 33-foot feeder was tied to the other end. The job was done.

It was with set jaws and a pulse hammering...
at between 2 $\mu$fd. and 110 degrees Centigrade that we connected the 210 volts of "high voltage" power supply and pressed down on the door clapper. Nothing happened. Finally the curtains were pulled down, and a mechanic was requested to whistle elsewhere. We took a last look at the Arctic night. The stars were all in place. The

Aurora was winking. The wind was ice-cold. All was set. Blair connected a flashlight bulb in series with the antenna. Glory to Marconi! It lighted!

We estimated our power at approximately 2 watts, and they were thin, anaemic and underfed watts at that. But the first contact was VE5JA. He gave us R6. Then, in turn, W6BFZ with an R7, W7BHJ, R5; and VE4GM, R5. This was the start—and what a night it was!

During the month that followed our cigar-box transmitter—which took just twenty minutes to assemble, tune and get on the air—gave us the following contacts: K7CCL, K7IW, W5ATF, W6H0H, W7DBR, K7CFX, W7FS, W6FFP, W6AYQ, W9JKV, W5EHU, K6BOE, W7ALV, W7QI, W6F9Q, W6F9C, W6ENV, W6JX, W6AXF, VE5FE, W7CXL, W6HTQ, W6BYL, W6CLV, W6H0C, W6ZP, VK3HG, VE5EO, VK2IC, J1PO, ZL3LB, ZL3GU, W6AY, W6DE, W6BFZ, W6FMP, W6HUL, W6CDV, W6F9H, W6EPH, K7ABQ, W6IXY, W6GUN, K7HF, W6AAP.

A report of at least R6 was received from every district and country mentioned except Hawaii, which gave us R5. Many gave us better than R6 in subsequent QSO's. Our maximum DX was, of course, New Zealand, Australia and Japan.

The performance of the haywire set was so amazing, everything taken into consideration, that it was duplicated in essential details, upon the writer's return to California. It is now in the form shown in the photograph, with proper coils, insulation, and grid leak. A 10 with top plate contact has been substituted for the 201-A, permitting the use of higher plate voltage. The r.f. meter replaces the flash-light bulb. The set has more than justified itself.

Like its Alaskan brother, the new transmitter uses no variable antenna capacity. The tank condenser is turned to a suitable spot in the 40-meter band and locked. This leaves no parts to get out of adjustment. With plug-in coil and tube removed the entire transmitter is 2 inches high, 8 inches long and 4 inches wide. When used as a portable it slips into the battery compartment of the receiver. In case of extremely low power the meter is connected across the antenna coil to give a high reading.

It's a double-barreled nickel-plated cinch this little transmitter isn't going to ruin the night for a brother ham down the block, and when all is said and done it gets out just as far as anybody could want a transmitter to go. There is much more consideration and just as much thrill in a "flea-power" transmitter working efficiently as in a near-commercial job which drives everybody else off the air.

Indiana State Convention
(Central Division)
June 8, 9, 10 at South Bend, Ind.

The Hotel Oliver is the place. The cost $2.00. The old-timers who remember the last convention held in this city know what can be done, so make your plans to attend our affair and for which we extend to you all a cordial invitation.

Our speakers will be John L. Reinartz, Fred Schnell, Glenn West of Purdue University, Boyd Phelps, Director Windom and others. A good program is promised. Come over gang! More information may be obtained from S. J. Holland, Sec'y. St. Joseph Valley Amateur Radio club, 2101 Lincoln Way, West, South Bend, Ind., under whose auspices the convention will be held.

Another one for the believe-it-or-nots. A neighbor of W8CYJ's reported that he could not tune out CYJ's 75-meter telephone transmissions even with the b.c. receiver turned off. After hunting all over the house the voice was found to be loudest in the kitchen, and the "loud speaker" turned out to be the door bell!

W7CMF, after despairing of ever getting a WAC, discovered he already had one. His OW's initials are W.A.C.!

The real inventor of radio was Noah. He built an arc long before Hertz, Marconi, and the others ever were thought of!

---VESSA
A Ham Station Analyzer
A Multi-Purpose Gadget for R.F. and Audio Use
D. A. Griffin, W2AOE*

From time to time in the pages of QST a number of test instruments of more or less specialized nature have been described. However, the important measurements concerned in ham communication cannot be made in most amateur stations. Is the antenna the proper length? Is the amplifier completely neutralized? Was the proper harmonic selected? Is the modulation lop-sided? Just how does the phone signal sound as it leaves the shack? The amateur should be able to answer these and many other questions himself, without asking the opinion of others. Yet the amateur who can do so is as rare as a 56-mc. transcon.

For years, this amateur has done without a number of the facilities now provided by this analyzer. The satisfaction of being able to determine fairly precisely a number of things hitherto subject only to guess has been more than sufficient recompense for the time and money spent in its development. Let us look into the little black box.

The basic circuit of the analyzer, shown in Fig. 1, is that of an elemental vacuum tube voltmeter. Inasmuch as most amateurs are interested in comparative tests, it is not necessary to calibrate it. This immediately simplifies construction and operation. When the 1½-volt cell is connected as shown, it supplies sufficient positive voltage to the plate of the tube to cause a plate current of approximately 80 microamperes to flow. If any audio or r.f. voltage is impressed on the grid, the plate current will increase as the applied voltage increases. As the one-milliampere meter used has a resistance of approximately 30 ohms, by the \( V = IR \) law we find it takes only 0.00003 watt (30 microwatts) to give a full scale deflection. It is evident that it takes very little input to give an appreciable reading. In fact, full scale on the meter requires less input than it takes to give a one-division indication on a current-squared galvanometer. If a tuned circuit is connected to the grid-filament, resonant at a desired radio frequency, it becomes apparent that we have a neutralizing meter par excellence at that frequency. In fact, it is so sensitive that it is all but impossible to get a minimum reading on the meter. Another point of interest is that the plate current is limited, since the plate potential is supplied by the filament cell. This makes it practically impossible to burn out the meter in a strong field. This is not true with instruments of the thermo-couple type, as many amateurs have found out to their sorrow.

Another important use is the comparative measurement of antennas. Putting an ammeter in the center of a Hertz antenna and then giving it a haircut (the antenna, not the meter) is a laborious process. If the analyzer is set up near the free end of the antenna, in order to get as far as possible from the field of the transmitter and feeders, checking is much easier. If the amount of energy picked up is too small to give satisfactory readings, a short pick-up antenna may be connected to the grid side of the pick-up coil. The physical relation between the transmitting antenna and this wire should, of course, be kept constant during measurement. A crude indication of the field

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* Leeds, New York City.
pattern may also be obtained by making checks of the meter readings at various points around the radiating system, thus putting the gadget to work as a field-strength meter.

With a resonant circuit required to develop the maximum voltage to secure the greatest sensitivity, it is evident that a calibrated absorption-type wavemeter is also provided as a feature at no additional cost. Some time ago this type of indicating device was the only one available for frequency measurement. Since the advent of the heterodyne type of frequency meter it has met with disfavor due to limited accuracy. While the heterodyne type of meter supplies a precisely-known fundamental frequency and a flock of harmonics, it is often a problem to identify the proper one. For instance, one well-known radio engineer in the Hudson Division CQ'd for three days on 30 meters until rescued by a near-by amateur. He had mistaken the third harmonic of his crystal for the second—which would never have happened if an absorption type wavemeter had been available. With both types of instrument available, off frequency operation is practically impossible.

**BAND SPREAD**

With the ultra-high frequencies coming into favor more and more, it was felt that the tuning of the meter should cover all amateur bands. The problem of doing this with good band spread on all bands was solved in a unique manner. Although the various band-spread circuits used are well-known, the method of changing over is new in that the coils themselves automatically change the tuning arrangements when they are plugged in. Six different combinations are used, demonstrating the flexibility of the system. Application of the tuning method to receivers is suggested as a further possibility.

The 35-µfd. variable condenser and the two 50-µfd. fixed condensers are connected to the six prongs of the sockets used for the plug-in coils. The filament terminals of the socket also connect to the grid and filament of the tube and the winding, of course, always connects to the filament terminals of the coil forms. By use of straps inside the different coil forms, between the pins, a wide variety of combinations of series and parallel condenser connections is available. The various combinations and the bands for which they are used, together with the approximate spread of each, are shown in Fig. 2. When a large band spread is available, care must be taken with the turns spacing. After the proper spacing is determined, the coils should be doped so that the relation between turns will not change.

With this device the frequency to which a receiver is tuned may be determined by the familiar “resonance click” method. Conversely, this is the method used in calibrating the various coil ranges. For transmitter measurements, with tube turned on the milliammeter can be read with the analyzer at a considerable distance from the transmitter.

**MODULATION MONITOR**

Another important use is as an overmodulation indicator with which it is possible to determine

(Continued on page 16)
The Ultra-Midget
A 10-watt Transmitter of Miniature Dimensions

By Philip Rosenblatt, W2AKF* and Henry T. Miller, W2AIS**

Another midget? Yes! And truly a Lilliputian in comparison to most. When an iron shield-can measuring 5 by 5 by 6 inches can house a push-pull Hartley oscillator plus a 225-volt, well-filtered power supply, pretty nearly the ultimate in smallness for a practical transmitter has been achieved.

Carry it around in a small week-end bag, complete. Plug into a 115-volt a.c. supply, attach the antenna, insert the key and tubes and settle down to the best time you ever had with low power.

But getting down to dough, diagram and description: Cost, $8.00. Fig. 1 shows all. Oscillating without any load, the ether buster draws 25 milliamperes. The plate voltage at 25 ma. is 260 volts. When connected to a Zepp and tuned to resonance an r.f. ammeter in one of the feeders showed a deflection of ½ ampere. The plate current at maximum antenna current was 50 ma., plate voltage 225. Because of this small "keyed" voltage variation, the note was pure, minus chirps. The use of a plate milliammeter or r.f. ammeter was later found to be unnecessary, since resonance could be obtained by noting the increase or decrease in brilliancy of the mercury-vapor glow in the 82. This does not, however, serve as an excuse for dispensing with a monitor.

Rather skeptically the tiny mite was put on the air at W2AIS. A CQ by W2DXT was answered. He gave us p.d.c., Q5A5, R8. Another CQ from 2EPZ was attended to, and he came right back, giving a d.c. report, Q5A5, R7/8. Contact with W2EPZ held for a half hour, during which no changes were made on the transmitter. This lengthy contact was to determine the stability of the oscillator. W2EPZ gave us the encouraging report of a steady signal, no creeping.

Becoming a bit more bold. W9GPZ was called. Right back he came, giving the millimite a p.d.c. Q5A4, R4/6, and very steady note. The final contact of the evening was W6ISG. Enough to make strong on the 10-meter band, between 9 and 11 p.m. Oscillation was steady and strong over the entire band. On the 20-meter band, only the frequency and stability were checked. FB all around.

The wiring is simple though awkward. Care must be used in making the high frequency leads short and rather heavy. For that reason the top cover, upon which are mounted the coil and tube sockets, is fastened to the box. Direct leads can then be soldered to the variable condensers and antenna posts. Enough slack wire is left dangling from the bottom of the can so that the power supply can be attached last. All filament leads as well as the high-voltage leads from the power transformer, must be twisted in their entirety.

The laminations on transformer and choke coil must be screwed tight, and if convenient, dipped and baked in pitch to eliminate mechanical disturbance. Needless to say, all parts should be mounted securely and insulated properly where such insulation is needed. As an adjunct to quietness, the base of the transmitter may be equipped with small felt or rubber feet on each corner. The variable condensers, key jack and antenna posts must be insulated from the chassis. The easily procurable fiber washers handle the insulation problem.

Incidentally, in our model the can was left

* 334 Beck Street, Bronx, N. Y. C.
** 3110 Kingsbridge Terrace, Bronx, N. Y. C.
The box, measuring 5 by 5 by 6 inches, is made of sheet iron with removable top and bottom.

T—Midget power transformer of type used for 4- and 5-tube receivers. Has following windings: 2.5 volts, c.a.; 5 volts and 340-340 volts at 50 ma. Size: 3" x 2½" x 1¼".

Sw.—Small toggle switch, 3-amp. 125-volt.

J—Midget open circuit jack.

C2, C3—100-µfd. postage-stamp size mica condenser.

C4—10-µfd. postage-stamp size mica condenser.

C5—14-µfd. cardboard-case dry electrolytic condenser, 500-volt rating. Size: 1½ x ¼ x ¼¼".

R1—50,000-ohm, 1-watt non-inductive resistor.

L2—7 me.: 10 turns No. 18 e.c.c. wire, tapped at center.

14 me.: 6 turns No. 18 e.c.c. wire, tapped at center.

L2—7 me.: 8 turns each, same wire as L1, spaced one-half inch from ends of L1.

14 me.: 4 turns each, same wire as L1, spaced ½-inch from ends of L1.

L1 and L2 are wound on ribbed coil forms (Bud); all coils are close wound.

Floating in order to reduce capacity effects and loss of energy to ground. The overall power consumption at full load as indicated by a line wattmeter was 32 watts. However, the power input to the 45's was only 11.25 watts.

Our experience with this transmitter indicated there was so little hand capacity in tuning that we were able to dispense with an insulated tuning shaft. It will be noted, though, that the dials are slotted for use with an insulated screw driver if so desired.

Amateur Radio—A Century of Progress—1934

A new amateur exhibit, as new as the new A Century of Progress—1934, is being organized by the Chicago crowd this summer.

The World's Fair Radio Amateur Council, under the direction of Chairman Fred J. Hinds, has been re-modelling and re-decorating the entire exhibit during the past months. The same location will be used as in 1933, but the transmitters will be housed in the visitors' lounge, the main entrance will be in the east wall, and the entire physical layout will be modified.

W9USA will be the stellar attraction of the exhibit, but it will be run on a considerably different basis than W9USA-W9USB of last year. No attempt will be made to handle quantities of public messages; instead visiting amateurs, with their operator's licenses along, will be permitted to operate the transmitters. There will be a lot of them. The tentative list includes one with two 852's in the final, one with two 211's in the final, one 'phone-c.w. transmitter with two 800's in the final, modulated by two 800's Class B, one 'phone-c.w. using two 211's in the final, modulated by a pair of 203A's Class B (this transmitter to be operated from the Court of the Hall of Science), one 46 push pull 'phone transmitter, one 50 me. transmitter (stationary), and two 50 me. portable transmitters. A cathode ray oscilloscope will be used for checking modulation, etc.

There will be contests for all amateurs with a prize for each week of the Fair. A grand prize will be offered for the best manufacturer's display exhibit. At the time of writing, fourteen manufacturers have agreed to exhibit.

Again in 1934, then, the second floor of the Travel and Transport Building at A Century of Progress, Chicago, will be the ham's Mecca. May the traffic of the pilgrims be heavy, and their hearts light!

—C. B. D.

Atlantic Division Convention
Schenley Hotel, Pittsburgh, Pa.
June 22, 23, 1934

The several radio clubs in the greater Pittsburgh area have combined their efforts to make this year's convention the best the division ever had. The program committee has arranged for an instructive as well as entertaining two-day program which will be remembered by every "HAM" attending. Come and meet your old friends and make new ones. A cordial invitation is extended to all. Tickets, $3.00 per OM; $1.50 per OW or YL, and may be obtained from R. M. Francis, Sec'y Convention Committee, 3577 Elmhurst St., Pittsburgh, Pa.
WE HEREBY open a new department in QST. In it we shall attempt to bring together, each month, the items that heretofore have been printed throughout the magazine concerning the current activities of the League, and to supplement them with additional information that may be of interest to you fellows in seeing what A.R.R.L. is doing for you.

We propose to be informal, but frequently we'll have to be a bit brief, for an analysis of all the things the League has in hand at any one time would fill innumerable pages.

We wonder how many of you fellows realize the extent of A.R.R.L.'s contacts at Washington. We're down there so often that we sometimes feel more like local Washington representatives than we do Connecticut residents. Sometimes we stay for three or four days, with so many things to look after that we have to write out a list of them. We have close contact with every branch of the government concerned with radio. When something comes up and we can't get away immediately, General Counsel Segal is on the other end of a private telephone line—we can get him in twenty seconds. There's nothing new about this; it has been that way for years, but many A.R.R.L. members do not appreciate it. Scores of times a year there are problems that offer some threat to amateur radio. Most of these are small things, quickly disposed of and never mentioned, but capable of growing into real dangers if we did not have an A.R.R.L. Some of them are bigger problems which occasionally find their way into a QST article. All of them have consequences which are always reported promptly to the directors. One of the aims of this department will be to supplement the efforts of the directors in keeping members informed on these things.

TONE TELEGRAPHY BY 'PHONE STATIONS

A few months ago the F.R.C. ruled that amateur 'phone stations are licensed only for A3 transmission and therefore may not send telegraphy by means of a buzzer in front of the microphone (A2). The A.R.R.L. asked the Commission's reconsideration in view of the fact that this ruling would make impossible a continuation of the A.R.R.L. code lessons, which are still carried on by several dozen stations—and also because 'phone stations ought to have the right to sign their call letters in code before the microphone, for identification purposes. Acting upon our request, the Commission has now issued an amended statement saying that "the prohibition against the practice of amateur radiotelephone stations using buzzers or audio oscillators or any form of tone modulation shall not apply in the case of amateur radiotelephone stations transmitting instruction in the International Morse Code when alternate transmissions of voice and code characters must be received on the same frequency with the same receiver; nor in cases where such emission is used to aid in the identification of the call letters of the transmitting stations. In no case does the Commission authorize a signal to be modulated in excess of 100 percent."

That last sentence, by the way, deserves the examination of all the voice brethren.

CLUB TRUSTEES

Several clubs have made inquiry as to what they might do to retain their call when some chap, serving as trustee for their station license, gets tired of the job or moves out of town. The Commission maintains the assignment of a call to an amateur station regardless of change of trustee. In fact, they insist upon it. Supposing that the new trustee is already a licensed operator, it is only necessary to ask for modification of the station license with respect to the name of the trustee.

OFFICIAL INTERPRETATION OF MADRID VS. WASHINGTON

In connection with recent hearings on the question of the ratification of the Madrid treaty, representatives of the Department of State and of the Federal Radio Commission made official statements of the attitudes of their agencies as concerns any differences between the amateur provisions of Madrid and those of Washington. Said Dr. Irvin Stewart, a member of the American delegation to Madrid, and in charge of radio matters for the Department of State:

"Under the present radio regulations, amateur stations may exchange messages relating to their experiments and unimportant remarks of a private nature. The committee reports of the Washington conference which drafted the present regulations show that the most active members of the committee were intent upon protecting the revenues of the public telegraph service (in most countries a government monopoly) against competition by amateurs handling international messages free of charge. The official French term which was translated as 'private nature' is caractere personnel. The debates at the Madrid
conference showed that most governments interpreted this to mean remarks of a character personal to the two operators, i.e., as not permitting amateurs to exchange messages for third persons. The principal difference between the American interpretation of the present provisions, an amateur may exchange international third-party messages unless the exchange is prohibited by one of the interested governments; under the Madrid regulations he may exchange such messages only where both governments affirmatively permit. In both cases both governments must agree; the difference is in the way the agreement is indicated. In all other respects the language governing amateur stations is unchanged; and most governments insist that this is not a change but merely a clear statement of what is intended by the present regulations."

Dr. C. B. Jolliffe, chief engineer of the F.R.C., responded to interrogation as follows:

Question: "Under the present treaty, can amateurs of the United States transmit messages on behalf of third parties to amateurs of foreign countries?"

Answer: "If the foreign country has not notified the United States that amateurs of that country are prohibited from exchanging international messages, a liberal interpretation of the present treaty would permit an exchange of messages with third parties. European governments do not believe such an interpretation is justified under the Washington treaty."

This is just what A.R.R.L. and QST have said.

DELAyS

A.R.R.L. headquarters is receiving numerous complaints from members of delays in filling their orders for booklets, particularly where the fellow wants a License Manual immediately to prepare for an examination. The fault is not ours. We fill 95 percent of these orders the same day they are received, the balance not later than the following day. The delays are in the postal service, where economy measures and reduced personnel are causing wretched performance. We had a case recently where it took nearly three weeks for a License Manual to get to Nashville, another where it took eight days to Philadelphia, yet both were in our outgoing mail within 24 hours of receipt of the order. We are doing our best. What we need is a little facsimile service. We had a case recently where a License Manual was lost in the mail and we were next January before any of this deadwood is eliminated from the count, and meanwhile the figures have all that padding. We can do a much better job of where we are by examining the number of licensed amateur operators. This figure last year was a little over 30,000, and to-day is about 35,000. But for some years back our operator licenses also have been for a term of at least two years, so that again this total includes a large number of people who have become inactive but who still possess licenses. The figure again is fictionally high. The turn-over in amateur radio has always been great, and throughout the years there always have been thousands of licenses not renewed; it is necessary to make some allowance for those who have completely abandoned the game. We estimate that the number of hams in the United States, that is, the total of the persons to-day interested in practicing amateur radio, is approximately 25,000. Not all of A.R.R.L. membership is in the United States. We have about 900 Canadian members and perhaps 1500 foreign ones. Our newsstand distribution of QST, of course, is chiefly in the United States, and we alll know that it is absorbed chiefly by amateurs who, through the unfortunate economic times, are keeping themselves with us and through their hobby, instead of being able to afford the outlay of a year's dues. Last year the average monthly total paid distribution of QST in the United States and possessions alone was approximately 30,000 copies. While we all know of exceptional amateurs who profess not to be interested in A.R.R.L. or QST, and even occasionally encounter one who says he has never heard of our organization, A.R.R.L. "coverage" is substantially complete, and still growing. Everybody knows that only a third of the licensed stations of the country are in commission at any one time. Even during the period of one year's licenses, government surveys never found over 40 percent of us capable of operating at any given moment. Simply because amateur radio is a hobby, our practice of what it comes and goes with our pleasure—even though we always "come back." We have seen it suggested that A.R.R.L. is five-fifths a non-amateur association—that less than 20 percent of A.R.R.L. members are licensed amateurs. This is sheer twaddle. That would give us a non-amateur membership of, say, 16,000. Who do you suppose they might be? BCL or commercial engineers? We have some of each, but they are an infinitesimally small percentage of the whole. A.R.R.L. does not require actual ownership of a station or membership before accepting a member, but we all know that our League has no activities that appeal to other than the radio amateur and that QST concerns itself exclusively with amateur work. The percentage of amateurs still left to A.R.R.L. is so extremely heavy that it constitutes a perfectly swell showing.

BOARD MEETING

Complete report in this month's QST.
Typical Technical Questions Answered

Tuning for Maximum Power Output—Loading the Pentode Oscillator—
Class-A Plate Current Decrease—Autogain with T.R.F.—Automatic
Bias Resistance

ALTHOUGH the A.R.R.L. Technical Information Service answers all inquiries
directly by mail, certain questions commonly asked warrant publication of the answers
for the benefit of others who may have need of the same information. The following have been
selected for this month:

Q. No. 1:
In tuning the transmitter, maximum antenna
current and maximum plate current do not occur
simultaneously. The tuning is conducted in the
approved fashion, always retuning the tank
condenser for minimum plate current as the
last operation in the process. With maximum
feeder current, the plate current in the final
amplifier is about 275 ma., but further tuning
of the antenna circuit will cause the final to draw
300 ma. with a 0.2 ampere reduction in the feeder
current. What is the dope on this condition?
A. No. 1:
This trouble is probably due to overloading of
the amplifier. As the antenna is tuned towards
resonance, the plate current and feeder current
rise together until a point is reached at which the
amplifier is loaded to its limit and will deliver
no more power into the antenna. In this case, the
point of maximum power output is reached before
secondary resonance is reached. As a result, tuning
to complete resonance overloads the amplifier
and the feeder current falls off. If excitation is
insufficient an increase in the excitation should
result in increased feeder current with increase
in plate current; otherwise the coupling to the
antenna should be reduced.¹

Q. No. 2:
In operating a Tri-tet oscillator, trouble is
experienced when the pentode connection is used
for operation at the crystal frequency. It is
impossible to load the oscillator appreciably
without stopping oscillation. Is there a remedy
for this?
A. No. 2:
A reduction in the resistance value of the
oscillator grid leak should remedy this situation.
It is a good plan to provide two grid leaks in
series, one having a resistance of 5000 ohms and
the other 50,000 ohms. A switch may be provided
for short-circuiting the 50,000-ohm leak for
straight pentode operation. The coupling capacity
should also be kept low. A maximum of 50 µfd.
should be used.

Q. No. 3:
Regarding Question No. 184 in The Radio
Amateur's License Manual, it seems to me that
if the grid (of a Class-A speech amplifier) were
being driven positive, this positive grid would
accelerate the electron flow between the filament
and plate and, therefore, the plate current would
increase with excitation instead of decrease as
the answer states.
A. No. 3:
The failure to understand the answer given in
the License Manual lies in the fact that the
point has been overlooked that a.c. and not d.c.
is being applied to the grid. With correct adjust­
ment, the potential of the grid is swung to equal
amplitudes each side of a given operating point;
as a result, the average change in grid potential is
zero and the plate current remains steady at a
value dependent upon the value of the fixed bias.
However, with increased excitation, the grid tends
to go into the positive region. When this happens
the grid starts to draw current, requiring power.
If, as the answer states, the driver is of the
voltage amplifier type of high impedance, it can­
not supply the power and therefore the positive
peaks where power is drawn are of lower amplitude
than the negative peaks and the result is a shift in
the average grid potential in the negative direction
which will, of course, reduce the plate current.

Q. No. 4:
Is it possible to use a.v.c. to any advantage
with an ordinary regenerative receiver with a
single stage of tuned r.f.?
A. No. 4:
It is not practicable to attempt to use a.v.c.
in a receiver of this type. It would, of course,
be of no use whatsoever with the detector oscillat­
ing for c.w. reception. A regenerative detector
in itself provides a species of automatic volume
control which would make additional automatic
control in a single stage of tuned r.f. amplification
unnoticeable.

Q. No. 5:
When the automatic cathode resistor biasing
system is used, how is the value of resistance
determined? Is it possible to bias an amplifier
to plate current cut-off?
A. No. 5:
Since the cathode resistor of this system is

¹ For a more detailed explanation of this action, see "The
Operation of R. F. Power Amplifiers", by H. A. Robinson,
QST, April, 1934.
Specification of \( C \) inadvertently was omitted from Fig. 1 on page 47, May, QST, in the article "Completing the Three-Stage Transmitter." \( C \) is the neutralizing condenser for the 830, and has a maximum capacity of 2.5 \( \mu \)fd. The condenser used is a National Type SEU-25.

W9AFT, Millard Wyse, of Wayland, Iowa, would like to know how fellows who have cellar shacks keep dampness out during the summer months. His operating room is built of wallboard but has no special floor. The cellar is otherwise dry, but during hot weather moisture condensing on the apparatus keeps it from operating satisfactorily. Good suggestions will be welcomed.

A kink for 5- and 10-meter tuners: Twin phone-tip jacks, customarily sold riveted in a small piece of thin bakelite for "phono" connections, will mount very nicely across midget tuning condensers. Coils made of No. 14 wire will plug into them directly. Slight adjustment of inductance for tracking purposes in t.r.f. sets can be made by pushing the coils farther into the jacks.

K6HLP writes that about half the cards he gets from the States have two- or three-cent stamps on them. One-cent postage is enough.

W3CNS solved the problem of hanging QSL's on the concrete walls of his cellar shack by using old phonograph needles as tacks. The needles can be driven in where ordinary tacks or nails only would bend. Loud needles are best.

Eugene Davis of Salina, Kansas, writes that in connection with the article, "Getting Power From the Winds," in March, QST, the Oklahoma Agricultural and Mechanical College issues an interesting bulletin, "Oklahoma Wind-Electric Power," which gives data on wind movement by months and average kilowatt hours that can be generated per month for that state. It is Publication No. 10 of the Engineering Experiment Station, and is available on request.

In the midst of a QSO from OM1TB, W5CRS’s dad pulled the fuses from the a.c. line to get the distracted ham to come out and milk the cows!

W7CAP suggests forming a “Punk Operator Club” for the benefit of those aigs who use c.a.c., QRM S.F. transmissions, and make nuisances of themselves generally. Two nominations would be sufficient to make the offender eligible for POC if a reasonable explanation is not forthcoming.

From the Boston Herald: "When you hear a dah de dah, that is dot and dash code by voice for the letter K which means 'Go ahead.' You may hear some hi diddle de dit which is the same thing"!

Recently a QSO took place between W1HUG and W9PET. Despite rumors to the contrary, their transmitters are still said to be intact and in perfect working condition.

Confirming and adding to W1TX’s antenna dope (Experimenters’ Section, April, QST): When tuning up, adjust plate tank first, then antenna tank, but be sure to go back and retune the plate tank. Juggle the condenser settings until both tanks are correct, as shown by meters. Have also found that antenna length is rather critical for maximum output, though it will work with fair efficiency over a wide range. The best method of tuning is to cut the antenna over-long and then, with fieldmeter, chop off a foot at a time until the field is maximum.

Hamdom

(Continued from page 17)

he got his first ticket in '27—hadn’t heard of radio before then, but it didn’t take him long to reach the top. W3EC in 1927–28, then through Artillery School at Fort Monroe, and so to the Signal Corps. He’s known to hundreds of amateurs through his operation of the Army Amateur national net control station on drill nights. His traffic totals run well up into the thousands; it’s been over 3000 several times. And you can never call him but he’s ready for more.
The advantages of using a split-stator condenser to tune the final stage of the transmitter have been pointed out in past issues of *QST*, but many an aspiring amateur has been reluctant to try the system for several reasons. High-voltage split-stator condensers are not always readily available, and home-made adaptations are not always symmetrical over the whole scale, tending to throw the neutralization off at various points. A system in vogue among broadcast stations is readily adaptable to amateur use, and has, among others, the advantage of being inexpensive and simple.

As shown in the diagram, Fig. 1, two fixed condensers are shunted by the variable tuning condenser. The tuning condenser can be any well-spaced and well-insulated one, and the fixed condensers bring in the low cost and simplicity, as well as all the advantages of split-stator operation. The fixed condensers can be easily made from a few plates of aluminum and small porcelain stand-off insulators as shown in Fig. 2.

The capacity of the two fixed condensers in series should be of the same order as that of the variable one, and can easily be calculated from the formula:

\[ C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2}} \]

The *Handbook* gives the relations for calculating the capacity of a parallel plate condenser

\[ C = \frac{K A}{d} \left( n - 1 \right) \times 10^{-4}\mu \text{fd.} \]

where \( A \) = area of one side of one plate (sq. cm.),
\( n \) = total number of plates
\( d \) = separation of plates (cm.),
\( k \) = specific inductive capacity of dielectric

\[ = 1 \text{ for air} \]

An inspection of the circuit shows that once the system is neutralized, any irregularities in the variable condenser cannot affect the neutralization. An insulated shaft to the variable condenser should be used to eliminate any unbalance due to hand effects, etc. Somewhat lower \( C \) can be used with this system than with an ordinary split-stator condenser, since \( C_s \) need only be large enough to tune across the bands used, and this capacity plus the capacity of the fixed sections in series will usually be smaller than that of the ordinary split-stator condenser employed.

**Editor's Note:**—The use of a fixed split-stator condenser not only is justifiable as an economical proposition, but also in helping to maintain the neutralizing balance in single-ended amplifiers, especially those having tubes not designed especially for high-frequency work.

A skeleton diagram of the usual arrangement is given in Fig. 3A. The equivalent circuit, so far as tube capacities are concerned, appears as in 3B. It will be noted that the upper half of the split-stator tuning condenser is shunted by the plate-filament capacity of the amplifier tube; it is obvious that this extra tube capacity becomes part of the tuned circuit. It is equally apparent that if the setting of the tank condenser is changed the capacity ratio between the two sections likewise changes to a degree dependent upon the relative values of the \( g-p \) capacity of the tube and the actual condenser capacity in use. The capacity ratio between the two sections is the factor that

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*Simplifying Split-Stator Final Amplifiers*

Byron Goodman, W6CAL*

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*141 Alton Ave., San Francisco, Cal.*

June, 1934
determines the setting of the neutralizing condenser.

If the amplifier tube has a fairly large plate-filament capacity (as in the 203-A, for instance), a considerable change in the tank condenser setting will throw the circuit out of neutralization. The effect is especially noticeable if the tank condenser is being worked near its minimum capacity, where a small change in the condenser setting will cause a large change in the capacity ratio. The output capacity of a 203-A tube with its associated socket and wiring probably will run in the vicinity of 25 µfd. or more, which is of the same order as the minimum capacity of one section of a split-stator condenser of considerable maximum capacity. To a great degree the change in capacity ratio with tuning can be overcome by proportioning the tank coils so that the resonance setting of the tank condenser will be near the maximum-capacity end of the scale, where the change in capacity ratio will be smallest for a given amount of condenser rotation. If the maximum capacity of one section of the tank condenser is 250 µfd. or more a satisfactory balance can be maintained over the higher-capacity part of the tuning condenser scale so that for ordinary purposes the tube will be sufficiently well neutralized, although exact neutralization will occur at only one point on the condenser scale.

As a result of the constant change in capacity ratio with tuning, the neutralizing procedure is likely to become somewhat confusing to those who have become accustomed to judge accuracy of neutralizing by the usual indicators—neon bulbs, lumploops, and grid meters. Under the conditions mentioned above, a grid-meter reading will not remain perfectly steady as the tank condenser is swung through resonance, except in a narrow range either side. If the condenser is swung very far off resonance the grid current will drop, and, for the same setting, a neon bulb or other indicator is likely to show the presence of r.f. in the plate circuit. In such a case the amplifier should be neutralized at resonance. The fact that r.f. shows up off resonance is of little importance, since the amplifier always is operated with its plate circuit properly tuned—or at least of minimum capacity. The output capacities of these tubes are extremely low and—equally important—the plate leads to them do not have to go through sockets which in themselves can add considerable capacity to a circuit.

It can be readily appreciated that the fixed split-stator condenser arrangement suggested by W6CAL, shown in equivalent form in Fig. 4A, will overcome the varying-capacity-ratio with tank-condenser tuning, since only the fixed condensers affect the capacity ratio. This circuit should remain neutralized regardless of the setting of the variable tank condenser. A second method of accomplishing the same result is shown at 4B, where a small variable condenser, C1, is connected across the lower section of the ordinary split-stator variable and adjusted to equal the output capacity of the tube shunted across the upper section. The auxiliary condenser should have the same plate spacing as one section of the tank condenser and should be adjusted to the end that the circuit, when neutralized at resonance, will remain neutralized throughout the full range of tank-condenser tuning. Either arrangement should be useful with tubes of high interelectrode capacity if permanent neutralization is desired.

--- G. G. ---

In connection with Schnell's article in February, QST, several fellows have written in to suggest that the weight of the dots can be adjusted simply by observing the plate current of the keyed stage, without going to the trouble of connecting up a special circuit for the purpose. But do it some time when the band is dead!

Who says the old ham spirit is dying out? W5ACA rode forty-two miles on a bicycle to visit W5AFW!
A.C. Pre-Amplifier for Condenser Mike

The circuit diagram of Fig. 1, an all a.c.-operated head amplifier for a condenser microphone, has been used very successfully by Fay Harwood, W6BHO, Santa Paula, Calif. Standard 2.5-volt tubes are used, and humless amplification is secured with a well-filtered power pack. W6BHO uses a regular National type 5S80 supply.

FIG. 1—AN A.C.-OPERATED HEAD AMPLIFIER FOR A CONDENSER MICROPHONE

M—Microphone.
C1, C2—0.5 µfd.
C3—0.005 µfd. mica condenser.
C4—0.01 µfd. mica condenser.
C5, C6—5 µfd.
R1, R2—250,000 ohms.
R3—20,000 ohms.
R4—1 megohm.
R5—250,000 ohms.
R6—20,000 ohms.
R7—1000-ohm semi-variable resistor.
R8, R9—250,000 ohms.
R10—1 megohm.
R11—20 ohms, center-tapped.
T—Tube-to-line transformer, 500-ohm output, with electronic shield.

The first tube is a 2A6, which is combination tube having a triode with an amplification factor of 100 and a pair of diode plates, the latter being unused in this case. The second tube is a 56. Resistance coupling is used from the microphone up to the output of the 56, where a transformer couples the amplifier to a 500-ohm line.

The entire amplifier is enclosed in a metal box, with a metal shelf inside for mounting the tubes. Grid leads should be as short as possible. The a.c. leads inside the box are in shielded cable with the shields grounded; the four external power-supply leads are in a single cable, also shielded. A good grade of resistors and mica coupling condensers must be used to prevent noise. It should be noted that the negative "B" lead should not be grounded, since there is a potential difference of several volts between it and the common ground for the amplifier, which is attached to the tube cathodes.

The 1000-ohm bias resistor, R7, should be of the semi-variable type. W6BHO uses a 25-watt Electrad resistor with the sliders set to put 1.3 volts bias on the 2A6 grid, and 13 volts on the 56 grid. The bias adjustment should be made with the aid of a high-resistance voltmeter.

Freqmeter-Monitor with Dual-Purpose Tube

V. L. Daniels, W9IZL, Webster Electric Co., Racine, Wisconsin, has worked out an interesting

FIG. 2—FREQUENCY-METER-MONITOR USING THE 6F7 TUBE

L1, C1—Oscillator tank circuit. Preferably should be adjusted to cover the 1715-2000-kc. band with slight overlap at ends of tuning scale. Suggested constants are for L1, 90 turns No. 30 d.c.w. wire on 1-inch form, tapped 30th turn from lower end: for C1, band-spread condenser having a minimum capacity of 50 µµfd. and maximum of 80 µµfd. The number of turns on L1 should be adjusted to give suitable band-spread.

C2, C3—200 µµfd. mica condenser.
C4, C5—25 µµfd.
C6—0.002 µµfd. mica condenser.
C7—0.1µfd.
C8—8 µµfd. electrolytic filter condensers.
C9, C10—1-µfd. electrolytic filter condensers.
R1—100,000 ohms, 1 watt.
R2—300 ohms, 1 watt.
R3—1 megohm.
R4—100,000 ohms, 1 watt.
R5—20,000 ohms, 2 watt.
R6—10,000 ohms 2 watt.
L1—20- to 30-hourly, 25-ma. filter chokes.
T—Power transformer high-voltage winding, 150 volts each side center tap: also 5-volt winding for 80 rectifier and 6.3-volt winding for 6F7 tube.

June, 1934
application for the 6F7 tube as a combined electron-coupled oscillator and detector for the frequency-meter-monitor. The 6F7 is a new dual tube having a pentode and triode, entirely separate but using different sections of the same cathode, in one bulb. W9IZL uses the pentode portion of the tube as an electron-coupled oscillator and the triode as the detector. The circuit, complete with power supply, is given in Fig. 2. A little study of the diagram will show that it is equivalent to the two-tube frequency-monitor arrangements described in January, 1933, QST, and in the eleventh edition Handbook.

W9IZL's frequency meter is contained in a metal box of small dimensions. The power-supply apparatus can be kept down in size because the current drain is very low. Midget chokes and power transformers will do very well, the total current required by the tube being less than 10 milliamperes. The pilot lamp across the filament of the tube serves as a reminder to turn off the power when the frequency meter is not in use.

Tube-Base Crystal Holders

The drawing of Fig. 3 gives the details of a tube-base crystal holder which, as its builder, Wilson Oliver, 53 Smith St., Detroit, Mich., says, "is simple to make and may be of use to somebody as a spare, if not as the one-and-only."

Continuing his description: "A standard-size four-prong tube base is used. Cut a piece of sheet copper or brass to fit inside the base as shown in Fig. 3. This forms the stationary plate. A wire is soldered to this and connected to both the grid and plate prongs. The part of the base between the brass plate and the shell is filled with melted sealing wax, in which is embedded a small bolt to hold the cover.

"The top plate is made of another piece of brass or copper, held in place by brass springs soldered to small pieces of stiff wire projecting from both filament prongs. Both plates are ground flat.

"The cover is made from a disk of fibre or bakelite. The tube base I used was not quite one inch deep, so a piece of leather about ½-inch thick was cut as shown in drawing and glued to the back of the fibre disk. This keeps the cover from touching the crystal, which is one-inch square. A nut holds the cover in place.

"The holder is held in an ordinary tube socket, mounted vertically."

Another tube-base crystal holder, this one used by C. L. Tice, W7BEE, is shown in Fig. 4. It is intended to be used with a silvered crystal. W7BEE says this about it:

"This holder . . . should be FB for the ham who uses crystal control on a portable. No packing of the electrodes is necessary and shocks cannot do any damage unless they are hard enough to damage the tube base.

"The holder is one of the old 01-A tube bases, which are longer than the present bases—long enough to hold a 1½" crystal. The springs are brass wire, about 24 gauge. A single turn to the coil will give flexibility so the plates will make firm contact all along the crystal, and the end soldered to the plate is turned at right angles so as to make more contact surface to hold the solder. The plate can be anything thin: copper, brass or monel metal, about 0.015" thick. The cover is cemented on with Dupont Household Cement. Four springs are used, one in each prong, and the tension can be adjusted to a certain extent in the process of soldering the spring in the tube prong."

Link Coupling to the Antenna Tuner

The gang here in Nevada are using a stunt which may be of considerable interest to others. W6UO at Yerrington, Nev., first tried the scheme on his t.p.t.g. 852 rig and it worked beautifully, so others of us have tried it with good results.

It seems to me that the proper place to terminate a pair of tuned feeders is at the point where they enter the building. This usually permits greater antenna height and precludes the possibility of r.f. feeding into power wiring, water pipes, etc. It is not always possible to place the transmitter exactly at the place where the feeders
enter the building, however; in my case the transmitter is ten feet from the feeder terminus.

At W6AJP a single turn of wire around the cold turn of the output inductance and a single turn around the middle of the antenna tuning inductance are connected by a link of twisted lamp cord, as shown in Fig. 5. The twisted line has no external field and transfers more energy with less effect on tuning than the usual coupling coil. A small box mounted right at the point where the feeders enter the building contains the antenna tuning unit, with two series condensers, a parallel condenser, and the antenna coil of fourteen turns.

There seem to be so many advantages to this low-impedance coupling arrangement that many of the gang should try it. The twisted link can be run around picture molding, base boards, etc., since the length of the line doesn't affect its operation. For the experimenter, any number of transmitters can be built up using a common antenna tuning unit. With 100 watts output the r.f. voltage in the line is very low and the energy transfer is complete. With self-controlled rigs, critical coupling is eliminated, with greater stability and output. It is necessary, of course, that the antenna be of the proper length, otherwise r.f. will show in one or both of the twisted wires.

---Tom J. Boland, W6AJP

Keying the Link Circuit to Prevent Clicks

The keying arrangement shown in Fig. 6 is being used successfully by Bob Potter, VE3TO, to eliminate key clicks from an m.o.p.a. transmitter with a pair of 10's in the final stage. The keying relay is simply inserted in the twisted-pair coupling line between the final stage and its exciter. The keying is as clean as with other systems, and its efficacy in preventing clicks is demonstrated by the fact that VE3TO's transmitter causes no interference in a b.c. receiver whose antenna is parallel to and only seven feet away from the transmitting antenna.

The final amplifier must, of course, be provided with fixed bias to cut off the plate current when the excitation circuit is open. VE3TO also says that it is necessary to neutralize the amplifier carefully, otherwise the signals are likely to have "tails."

---Arbie Willis, W9NEY

An Economical Filter Arrangement

When a single power supply is used for a high-voltage amplifier and low-voltage buffers, the circuit of Fig. 7 will provide adequate filtering for the high-voltage circuit with only a single filter condenser of maximum voltage rating. Usually a single high-voltage condenser is insufficient to give pure d.c. on the amplifier stage, and in many cases the expense of extra condensers is too great for a slim pocketbook.

In Fig. 7, the output of the rectifier feeds into the high-voltage condenser, C1, thence to the choke and the bleeder resistor, R. A tap is taken off R for the low voltage, and additional filter, using condensers of lower rating, is provided by C2 and C3 in the low-voltage circuit. The low-voltage filter is thereby made to improve the smoothing in the high-voltage section. Condenser C1 normally will have a rating of 500 to 800 volts and should have a capacity of about 4µfd.

I have had this filter in operation for quite some time and can get the same T9 reports on either low or high voltage. With only one high-voltage condenser and choke, however, the note is harsh. The system is now in use at a number of St. Louis stations, and is a blessing to the ham who can't afford high-voltage filter equipment.

---Arbie Willis, W9NEY
Portable Power Supply Kinks

Since offering our attempt to get high power from a storage battery we have several letters from fellow members, and all have said, "No workie." After going into the rig here several interesting things have been found, so here's the dope.

1. There is a lot of difference in the current passed by different "Ford" coils. We've been suspecting shorted turns, so discarded the old TUBE FIL.

FIG. 8-REVISED CIRCUIT FOR THE PORTABLE POWER SUPPLY DESCRIBED IN THE EXPERIMENTERS' SECTION IN DECEMBER QST

It is necessary to determine how the coil primary is connected to the vibrator, since the current for the step-up transformer must go through the vibrator points. On some coils the top primary terminal is connected to the vibrating tongue and on others to the stationary contact; the connection to the 5-volt transformer winding in the above diagram must be made to the vibrator element which is not connected to the top post.

faithful and revamped the circuit for the new type that the rest of the gang seem to be wanting to use.

2. The coil change makes it impossible to pass enough current to use in the way described in the former article, so take the coil and hold open the points. Check the circuit from the top post on the side to the interrupter or vibrator and find which way to hook up the coil. The manufacturers vary, so find out first. Then follow Fig. 8, putting in a 6-ohm rheostat to limit the current. Connect the 5-volt winding as shown. If there is a low turns-per-volt ratio, don't use the transformer—six turns per volt is about as low as it is possible to go. Do not attempt to use a winding designed for a single 71-A tube either—this winding has to pass about six amps. If there is room on the high-voltage transformer put on a new primary of No. 14 d.c.e. using about 7 turns per volt. Then it will be possible to pass the necessary current.

3. If you must light the rectifier tube from the transformer, just remember that you can't pass more than six amperes through the coil points without burning and sticking. The best plan is to substitute the new type 84 tube (or 6Z4). Light it directly from the same battery that handles the other transmitter filaments. Let it warm up before you expect it to pass current, and also remember that its inverse peak rating is 1000 volts.

4. Limit the output and, if possible, use crystal control. A suitable portable set is the Tri-tet with 89's in place of 59's.

5. Use an a.c. voltmeter in the output of the interrupter circuit. Adjust the points to give maximum reading and then keep the pitch at about the same level. Also use a monitor, as some frequencies of the interrupter are more easily filtered than others.

—L. Brown, W3VJ-W8IDE

Increasing C.W. Selectivity

In tinkering around I have run across a little scheme that seems to me to have possibilities as an inexpensive way of increasing the selectivity of c.w. receivers.

The stunt is to take the audio output of an autodyne detector, put the beat note through a low-pass filter, then build up the pitch with one or more frequency doublers to a tone desirable to copy. If the low-pass filter cuts off at 200 cycles, we can then separate stations 200 cycles apart and two doublers will bring the maximum tone pitch up to 800 cycles. Fig. 9 shows a simple layout tried at W3C1J.

The low-pass filter was the common tone control carried to the extreme. A push-push doubler was used to cancel out the fundamental tone. Cathode resistor bias was used to get linear amplification. It might seem that the low-pass filter is unnecessary, but if it is not used there will be a beat between each two actual signals.

Results obtained here were about what would be expected. The audio transformer (or transform-

FIG. 9—AN AUDIO FREQUENCY-MULTIPLYING AMPLIFIER FOR USE WITH A LOW-PASS FILTER TO INCREASE SELECTIVITY IN C.W. RECEIVERS as another stage was ahead of the doubler) seemed to cut off at about 100 cycles. With the tone control cut down low there was a nice peak in this region. The 100-cycle tone, of course, doubled to 200 cycles with plenty of higher harmonics to make the pitch sound higher. The receiver when tuned sounded something like a single receiver with two crystals either side of zero beat, except that the tone of a pure c.w. signal was changed to something that sounded like the old rotary sparks and was pleasing to copy. This must have been due to the harmonics generated in the doubler. By jiggling the bias resistor and plate voltage on the doubler many changes in tone could be brought about.

—John P. Shanklin, W3C1J
W9DRD, Merriam, Kansas

A CHAMPION of low power is Herb Hollister, of Merriam, Kansas, who, in addition to keeping W9DRD on the air, finds it a pleasant job to do the same with WLBF, a Kansas City broadcasting station of which he is president and general manager. One of the pioneer 20-meter 'phone stations, W9DRD is well known to both 'phone and c.w. operators on that band. Hollister started in ham radio in 1914, did his share of spark work, and graduated like the rest of the old timers to c.w. The call W9DRD was acquired in 1925; two years later the station was crystal-controlled and was operating on 20-meter 'phone. The year '28 saw W9DRD's first 28-mc. contact (with a first district station) and the acquisition of a WAC certificate. All this was done with a single 210; in fact, Herb says that it is only this year that the high-power rage has forced him to go up in power—to the extent of adding a second 210 in the final stage!

In the accompanying photograph W9DRD occupies the table in the right foreground. At the extreme right is a Lampkin micrometer frequency meter; behind it is the metal rack which holds the audio-frequency equipment. On this rack is the speech amplifier, consisting of a 56 resistance-coupled to a second 56, with the latter transformer-coupled to a pair of 59's in push-pull. The last stage is the driver for a pair of 10's in Class B. Better than 60 watts of audio are available from the modulator.

Moving on to the left, next in line is the receiver, a Hammarlund Comet Pro. The microphone, a Western Electric 387-W, swings out on a telephone extension over the receiver. The radio-frequency end of the transmitter is at the left-hand edge of the table. It consists of a Tri-tet oscillator and 59 doubler (exciter unit) driving an 865 buffer stage. The final stage has a pair of 10's in push-pull, normally operated with an input of 55 watts. A seven-point switch selects any one of the same number of crystals for frequency changing. The antenna coupling and tuning apparatus is in the panel unit mounted on the wall above the transmitter. Switches on the panel of this unit change the condensers from series to parallel when changing bands. The antenna is 66 feet long, cut in the center and fed with 50-foot tuned feeders.

The racks for the transmitter assemblies are made of Duralumin. The panels are aluminum, the finish being applied with a cork and carborundum grain with the aid of a drill press.

On the far table are a grid-dip meter, an aluminum cabinet containing a midget b.c. receiver, a b.c.-range c.c. oscillator, and a test oscillator for checking crystals. Beside this cabinet is a crystal oven, with a universal voltmeter sitting on top of it. The rack in the far corner contains monitoring equipment for WLBF.

Altogether an attractive station—and one which proves that high power isn't a necessity for doing good work.

W8IDJ, Oneonta, New York

ALTHOUGH W8IDJ is comparatively a newcomer on the air, having started operation in December, 1932, it is evident from the photograph of the station that a lot of progress has been made in a short time. Chauncey B. Moore, of 11 Hazel St., Oneonta, is the owner. The layout shown has developed from a 210 outfit with which all districts were worked soon after the station opened up.
For the lower-frequency band the antenna is slightly more than 131 feet long and has 35-foot feeders. The 7-mc. Zepp is approximately 65 feet long and has 33-foot feeders. A doublet with transposed feeders is used for receiving.

W8IDJ works mostly on 3530, 3784, and 7060 kc., but expects to put in a 75-meter 'phone in the near future. Cards reporting reception of the 80-meter sigs have been received from New Zealand and several European countries. The usual run of DX has been worked on 40. W8IDJ is a member of the U.S.N.R. and also holds an ORS certificate.

A Western Florida Station

A view of W4BGA, owned by M. S. Moore, of Pensacola, Florida, W4BGA opened up in the spring of 1932, snaffled a WAC certificate on 7 megacycles using a pair of 10's in push-pull and an SW-3 receiver, and then built a new outfit. The transmitter now in use consists of a 10 crystal oscillator, 10 doubler, and 860 final, the latter normally running with 135 watts input. The antenna is a 7-mc. Zepp supported between a 60-foot lattice mast and a 20-foot pole. An FB7A takes care of the receiving at W4BGA.

W4BGA operates chiefly on 7 megacycles, with an occasional excursion to 14 mc. Moore held the call 4QT in '23 and '24, but dropped out of the game for about eight years before getting back with W4BGA. Appointments as ORS and OBS are held.

W6ETX, Los Angeles, California

W6ETX is owned by Earle C. Ward, of 639 No. Lafayette Park Place, Los Angeles. The

(Continued on page 80)
R.S.G.B.’s 21st:

On July 5th the R.S.G.B. will celebrate its “coming of age”—its 21st anniversary. The traditional British custom of celebrating a year and two decades of existence will be observed by a special June issue of the T & R Bulletin, and suitable activities in London.

On July 5, 1913, the Wireless Club of London was formed. It was from this small local club that the R.S.G.B. sprang. In 1925 a Transmitter’s Section was formed within the distinguished parent society, and this section grew until now it is the whole of the R.S.G.B., and the Society has become truly transmitting amateur in character.

The special June issue will celebrate this important milestone in an appropriate manner. It will contain contributions from many early pioneer amateurs in Britain, and will do much to illustrate the enormous strides the Society has made in recent years. Copies will be sent free of charge to interested non-members.

Field Day:

For several years, now, the summer months have brought recurring excursions into the highways and byways on the part of radio amateurs, bearing transmitters and receivers, in an attempt to show amateur radio in the field as useful and diverting as amateur radio in the home.

In the United States 56-mc. field days are slowly growing into a tide. Elsewhere in this issue, a national field day is announced. Every amateur should investigate this event, participate if possible.

The R.S.G.B. announces that its Second Annual National Field Day will begin at 1600 G.T. June 9th, and will run until 1900 G.T. June 10th.

Over 30 British stations will be in operation, half on 1.7 and 3.5 mc., and the remainder on 7 and 14 mc. looking for international contacts. A special certificate will be awarded the overseas portable station giving the largest number of points to British portable stations taking part in the event.

British N.F.D. stations will call “Test NFD de ______”. Claims for the special certificates must reach R.S.G.B. headquarters 58 Victoria St., London, S.W. 1, not later than June 30th.

They will use a maximum power of 10 watts on 1.7 mc., and 25 watts on the other three bands. The cooperation of the Egyptian B.E.R.U. group and the U.S.K.A. in having portables in the field during this event has already been offered, according to J. Claricoats, secretary of the R.S.G.B., and it is hoped that other organizations and individuals will follow their example.

Tourists:

From Mogens Kunst, OZ5MK, comes a list of the English-speaking Danish hams, with the assurance that any of them will be delighted to welcome overseas visitors, to show them the delightful country of Denmark, and in general to exercise the traditional ham hospitality we have been preaching in these pages. The list:

- OZ2H Haldor Berthelsen, Ulfborg St. (Jutland)
- OZ2K E. Bork, Tagensvej 112, Copenhagen L
- OZ3K Paul Andersen, Salthavet, Kerteminde (Funen)
- OZ5J Kund Hans-Jensen, Vejle (Funen)
- OZ9P Erik Petersen, (Radio Battalion), Ingeniorkasernen, Copenhagen

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OZ5MK Mogens Kunst (Radio Battalion), Ingeniørkasernen, Copenhagen

OZ7T Steen Hasselbalch (Radio Battalion), Ingeniørkasernen, Copenhagen

In Saltillo, Mexico, the newly formed Club Radio Experimentadores de Saltillo says hasta la vista to the amateur world, and adds the magic words, “feed and drink gratis!” Get in touch with the secretary, Hipolito Aguirre, X2X, Hidalgo Norte No. 6, Saltillo, Coah, Mexico. Other officers are X2B, president, X2AM, treasurer, and X2AS, X2AO and X2U.

From an anonymous contributor come these “Hints to Travelling Hams”:

“Happy were my thoughts, filled with visions of tall poles and a shack away from QRM and the congestion of hams and electrical noises. Ah, truly, Europe would be the ideal place for an amateur station.

“But, as always, there was a dinge in the cordwood, a reptile in the flora.

“Trying to buy junk to make up a decent-like rig began to remind me of the 1922 days back home. Most of the parts here are handmade. Meters may be bought at a price or borrowed from schools. The prices on other parts are similar to those in the U.S.; the difference is in the quality of the stuff. France and Holland rank first. The others are passable.

“The ham near the borders can smuggle in stuff. Crossing the border more than twice in the same place is about as good as walking into the jug. I had the experience in Hitler-land. Bread and sausage, with water to quench the gaps. Trying to convince the Nazi’s that the 56 mc. get rid of the mice in the jugs was like telling it to a guard in a bughouse. It was as bad as trying to sleep in a car in the state of Mississippi. Or on the fields of Texas, where skeeters abound. Mice pick on the choice parts, while skeeters aren’t so particular.

“But enough natural history. If more foreign hams would have confidence in the leading advertisers in QST I can say that it would be easier to send their orders direct to them, with a remittance large enough to cover postage and a small duty charge. The U.S. firm will be glad to cooperate, and to follow instructions in order to make the rate as low as possible. I tried it with satisfaction. If you can’t write W language, use your own.

“Acquiring a ticket here isn’t so easy, either. Some demand an examination. The Postoffice Department sends a bird out to look your stuff over and has you fill out an application blank which looks like a thesis, but the matter is finally closed by $3.50 and you’re good for a year.

“To the new ham arriving in port: Be sure to put the stuff on the bottom of the trunk and fork over a few dimes or marks or what have you to the porter before he takes the luggage to the revenue agent. He’ll know what to do. Situation is pretty amiable in Italy; variable condensers, resistors, and small fixed condensers may be passed as oil filters for cars. (A hint to that section of the peninsula.)

“The wisest countries are Spain, France, Poland and Bohemia, which are hard to get through. This does not apply to G, SM, or U.S.S.R., as I have had no experience there. I had a swell time in Bohemia with the wholesale dealers. With the aid of a few chemicals (beer, etc.), I bought a complete receiver. Wholesale dealers are under the supervision of the government, but cash payment means a lot to them these days. I found receivers made in 3- or 4-tube portables, like the SW3 or monitor size, will pass at a revenue fee of $20 to $40. Advise them it’s for personal use. Transmitters made to appear like receivers are O.K. but otherwise will bring complications and confiscation.

“Good variables and blocking condensers are lacking in Europe. Since the dollar went down more foreign hams can buy U.S. parts, but confidence is lacking. I find QST in every country, even where the hams can’t read it! The diagrams, and a dictionary, are enough.

“Hoping to see the gang at the Cairo convention . . . .”

The Polish postmark is authentic. Probably the dope is, too. At any rate, it’s an intriguing document.

General:

PAODC’s 3725 signals have been coming through each evening starting at 11:00 p.m. E.S.T. . . . . . In connection with the claim of G. E. King, ZE1JF, for the low-power ‘phone record, W1ABG recalls the report in this department of the November, 1929 issue of QST concerning the exploits of R. Picton, F8AXQ . . . . . With inputs of 5 watts or less he was QSO all Europe, Algeria, Egypt, U.S.A., Australia and New Zealand—this all with “loop” modulation! . . . . . Down in Uruguay a number of 14 mc. stations are getting active again, after layoffs amounting to as much as two or three years . . . . . CX2AF (ex-CX1CI), CX2AK, CX2AM, CX1AN, CX1AZ, CX1EZ, CX1CG, CX2BM, and CX1CX are the stations now active . . . . . The best time for W QSO’s seems to be between 2000 and 0100 G.T., although stations have been heard during the day at odd moments . . . . . QSL’s should go to the U.S.W.C.G. (Uruguayan Short Wave Code Gang), Box 37, Montevideo, Uruguay . . . . . Speaking of QSL Bureaus, G6YL informs us that J. H. Knowles, Y17RK, has been transferred from Iraq, and can no longer handle cards for that country . . . . . His equipment has been taken over by Cunningham, Y17LC, who will probably handle cards as well . . . . . The address is the same: W/T Section, Squadron 70 (BT), R.A.F., Hinaidi, Iraq . . . . .
CALLS HEARD

J2GX (Ex-J1DO), T. Yagi, 109 Omotcmachi, Koishikawa, Tokyo, Japan
(7-mc. band between Dec. 18, 1933 and Jan. 25, 1934)

J2HZ (Ex-J1FF), M. Oshima, 19 Nihon-Enoki, Kanagawa, Yokohama, Japan
(7000-kc. band)

W6DO, Jack Kilpatrick (Ex-W2EV), 703 Kensington Rd., Ocean Park, Calif.

BRS 1338, D. W. Morgan, 15 Grange Rd., Renton, Middlesex, England
(14-mc. "phones"

ON4CSL, Carroll R. Stegall, Lubondai via Tshimbulu, Kasai, Belgian Congo, Central Africa
(14-mc. 'phone)

W5ADZ, 2411 Crawford St., Houston, Texas
(8.5-mc. c.w.)

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(9-11-mc. band between Dec. 18, 1933 and Jan. 25, 1934)
He believes that a bug in the hand is worth two meters in the set.

He abhors the idea of trying anything new until after some other local ham tries it out.

He thinks "3 x 3" is some new kind of beer.

He always says "QRM" when he really means "QRS."

He says "rrr" when he really thinks "sorri but didn't get a word."

He thinks because he has a crystal that his sigs are just perfect.

He thinks that an Old Timer is a feller who has been in ham radio a couple or three years.

He still believes that certain circuits are the only ones which will work at his place.

He believes that a sked for 8 a.m. means anything from 8:45 to 9:30.

He believes in letting the other fellow QSL first.

He still tunes his transmitter during local rush periods.

He rarely knows the legends of the Wouff Hong and the Rettsnitch, and cares less for the real traditions of Ham Radio.

He still says in response to a QRG—"Sorri OM bats dead in freqmeter."

He still believes that a multiplicity of switches adds to the glamor of ham radio.

He believes that hay wire still works better than a shipshape layout.

--- A. D. M. ---
Radiophone Traffic Handling

By K. G. Morrison, W6SQ-K7CJ

The handling of traffic by radiophone is rapidly becoming an important factor in amateur communications. Proper procedure is important and many phone men may profit by observing a few simple rules. It is the simplest thing in the world to send a message by radiophone. Receiving this message is another question and discretion must be used. More deliberation and increased clarity of enunciation make better voice communication possible as well as permits of traffic exchange which requires "real communication" ability.

The transmitter speech quality should be as fine as possible. A drummy signal is hard to copy through QRM and fading, particularly when distortion fading is encountered and excessive "lows" should be avoided. Most intelligence is transmitted in the higher frequencies. Since the ear will replace missing fundamentals below 250 cycles a signal cutting the "lows" and transmitting 250 to 3000 cycles is best. Intelligibility is what counts most in message handling and amateur voice communication.

In speaking do not approach the microphone closer than a foot. This also tends to eliminate drummy quality and breath noises. The gain may be slightly increased to obtain normal output and modulation. Speak in a natural tone of voice, slowly, enunciating each character or syllable clearly. This is important. The push-button system of control (QST's "Push-to-talk" system) should be used if possible for break-in. This will put snap in your operating procedure and speed up traffic handling or general communication.

The preamble of the message should contain all the usual information (city, station-of-origin, number, date) so a message may be traced back if necessary. Between the preamble and the address the word "to" should be spoken, allowing a pause for the receiving operator to drop down a line or two on the blank. The text should be sent in groups of three or four words which are spoken slowly and then repeated slowly, enough time being allowed between each group for the receiving operator to catch up. Each group should preferably contain a small phrase, if possible, so that the reception of the message is made more simple by the transmission of a complete intelligence. A sample sentence may be divided as follows: "Especially important work—that has a news value—should be sent direct to League Headquarters—at Hartford." In the text, also, numbers, proper names and unusual words should be repeated and if necessary, be spelled out. The signature is given in the usual manner with the word "signed" mentioned before it.

Whenever the QRM or fading is especially bad the whole message may have to be spelled out using W.U. code words. This may seen a very laborious process but after once memorizing the code words, a word may be spelled rapidly. The words "as in," between the letter and the code word, are unnecessary. To spell the word RADIO, you say, "R, Robert A Adam D Denver I Ida O Ocean." Soon you will be able to spell words in the code as fast as you can roll the code words off your tongue.

If messages are transmitted in groups, sufficient time should be allowed between the signature of one message and the preamble of the succeeding, for the receiving operator to insert a new blank in his "mill." This is one thing that transmitting operators very often forget. More time between messages will avoid fills and errors in the receiving operator's copy. The correct copy of the message is obtained without counting the words. Fills may be asked for by the number of the word desired. This is good procedure in either phone or C.W. work and speeds up operating considerably. When using "radio" count in checks, as in A.R.R.L. procedure, the address should be included in the first group of ten

THE COMMUNICATIONS DEPARTMENT

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

Radiophone Traffic Handling

By K. G. Morrison, W6SQ-K7CJ

The handling of traffic by radiophone is rapidly becoming an important factor in amateur communications. Proper procedure is important and many phone men may profit by observing a few simple rules. It is the simplest thing in the world to send a message by radiophone. Receiving this message is another question and discretion must be used. More deliberation and increased clarity of enunciation make better voice communication possible as well as permits of traffic exchange which requires "real communication" ability.

The transmitter speech quality should be as fine as possible. A drummy signal is hard to copy through QRM and fading, particularly when distortion fading is encountered and excessive "lows" should be avoided. Most intelligence is transmitted in the higher frequencies. Since the ear will replace missing fundamentals below 250 cycles a signal cutting the "lows" and transmitting 250 to 3000 cycles is best. Intelligibility is what counts most in message handling and amateur voice communication.

In speaking do not approach the microphone closer than a foot. This also tends to eliminate drummy quality and breath noises. The gain may be slightly increased to obtain normal output and modulation. Speak in a natural tone of voice, slowly, enunciating each character or syllable clearly. This is important. The push-button system of control (QST's "Push-to-talk" system) should be used if possible for break-in. This will put snap in your operating procedure and speed up traffic handling or general communication.

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words. When the text is reached the grouping is continued, but the first line appearing in the text contains only enough words to fill out the group of ten. Of course, the receiving operator should not write down or count the words "to," "the," or "and," as these are spoken only for the purpose of assisting him in typing out the message in its proper form.

Although the procedure described may seem complicated as you read it, Waziel's practice in this use will prove it superior to any other method in accuracy and speed, because fills are very seldom asked by the receiving operator. It has been used for the past three years on a six-station commercial net in Alaska, where over one thousand paid multiphone messages are handled each month in English, Italian, German, Russian, and Spanish. It was rarely necessary to repeat back the messages to the sending station, and fills were cut to a minimum.

Editor's Note: Mr. Morrison's contribution contains suggestions which should assist phone operators in achieving more."
"Honesty - - - ?"

By Clyde C. Anderson, W6FFP*

The heading is peculiar, but - - - just how many hams realize that they are not honest when they send one little letter that can mean so much if properly used, and can cause some mighty hard feelings if improperly used? So many articles and comments have been written about it, and in fact every radio ham that has a license has it because he is supposed to understand what that letter is, what it means, how it is sent, and of course its proper use. That little letter is one of the mainstays of radio communication and its significance is so much important that, with its use, time, power and money are saved. Hard feelings are saved, too. Can you guess what that letter is? Do you use it properly? Have you done otherwise and wondered why some ham with whom you were working said, "NM 73 QSO" or something like that, what looked at the start, prospects of a fine rag chew? The all important letter is dit dah <lit, "R," a dot dash and a dot! Let's reread the above again, recalling at the same time that its International significance is - acknowledgment. Webster says, "Acknowledgment - the act of acknowledging; a receipt" (QSL). He further states about acknowledgment . . . admit the receipt of." Hence "R" means - - - "everything received okay" in ham and commercial radio vernacular. Let us suppose you are QSO a new ham station; by that I mean, someone that is new to you and you haven't worked him before. He comes back at you "R"-say OM pee QIXX a few minutes something has come up that I must leave you but will be back in few minutes and we can rag chew all you want hw? Maybe he sent it a little too fast for you because he was rushed, or QRM was so bad you got only the latter part about "rag chew all you want." But, nevertheless, you go back at him with an "R OK OM (and about your xmitter and receiver)" for about ten minutes. When you sign over to him he doesn't come back. What do you think of him? Also what does he think of you? Has he heard your "R," he hears you start on your life history; he tries to BK you, but finally gives up and has to leave anyhow. Were you honest when you gave that "R"? You were not, for when you received your right to operate an amateur transmitter you swore that you were of the ability to understand, and did understand, International operating procedure, hence you were bluffing when you gave him that little big letter. At that instant, had you been honest, time, power and money could have been saved as well as the hard feelings. And that is just one instance where those three things could have been saved.

Now in case some of you are newcomers in the ham game, let us go over what you should know. "R," dit dash dit or any other sound that you use for it, when following your call on a comeback, should mean, "everything received and copied OK." Leave off the OK, for it distinguishes you, changes you from a lid to an operator in the other fellow's mind. So let's put down a few rules on what to say when we do not receive anyone solid:

R -- -- - solid copy, everything received OK and understood!

Those four users will cover everything and will certainly show that you are honest. Be mixerly with the use of R.

In a direct bearing with the use of R is the use of the QSA numerals. Why give someone a QSA5 even if he is R9 when he is QRMed so badly that you can't read him? Thousands of you have experienced receiving—"Sorry OM QRM bad, or sign QSA3R7 br etc." Every time a QSA5 report is received one naturally does not repeat each word twice even if he is only R3 or 4. That is, unless that one is a new ham. How many of you have listened to two follows QSO each other and one give the other a QSA5R report, and he dared if the first guy doesn't come back sending double and everything else. And what do you think? You write down his call and are careful that you don't work him sometime.

QSA5 - - - "perfectly readable" (even though R2 in audibility). Don't repeat each word twice when you receive a QSA5! Don't give one unless he is perfectly readable. QSA4—"Good; readable." Don't repeat each word twice. Don't report a station QSA4 unless the signal is readable. QSA3—"Fairly good; readable with difficulty." Don't repeat each word unless it is requested. Use this when intermittent QRM is on the signal you are working, QSA2—"Weak; readable now and then." Repeat each word twice. Expect a poor QSO even if the audibility is R9. QSA1—"unreadable." Enough said! Even if you are R9 it means that receiving conditions make communication prospects unsatisfactory.

Now let's be honest and use "R" and the QSA signals honestly.

Coming Meetings

Second Annual Inland Empire Hamfest, Spokane, Wash., June 9th-10th, auspices of Spokane Radio Operator's Club, Wilbur L. Miller, Hamfest Chairman, 323 West 17th Street, Spokane, Wash.

Fifteenth Anniversary Celebration Landaowne Radio Association, Landaowne, Ta., June 16th, at clubhouse 16 No. Wycombe Avenue.

Alberta Hamfest, June 16th, auspices Lethbridge Amateur Radio Club. Write VE4OOG or VE4EO for details.

Oklahoma Hamfest, or joint meeting of Tulsa Amateur Radio Club and Key Klickers Club of Ponca City, June 16th-17th, Hotel Alvin, Tulsa, Okla.

Hamfest of Tri-City Amateur Radio Club, June 17th, Blackhawk State Park, Rock Island, Ill. J. Keith Hunter, Chairman, 531 19th Street, Rock Island.

Connecticut Hamfest, June 24th, Oasis Club, East Hartford, Conn., auspices Hartford County Amateur Radio Association, Inc., in cooperation with the Manchester Radio Club.

Hamfest of Mississippi Valley Amateur Radio Club, June 24th, Carthage College Campus, Carthage, III.

Third Annual Hamfest Kennebunk (Maine) Amateur Association, June 30th, Narragansett Hotel, Kennebunk Beach, Maine. Activities start at 3:00 p.m. All amateurs invited. Banquet at 6:00 p.m. (daylight time). Tickets should be procured in advance to insure a seat at banquet—subscription $1.50. Address all communications and make checks payable to Mrs. Roland Emery (Mrs. W1HN), Grove Street, Kennebunk, Maine.

W1MK is now regularly on the air from 7:00 p.m. until 1:30 a.m. (Eastern Daylight Saving Time) each night except Wednesday and Saturday. In addition, quite some unscheduled "operating" is maintained at other times throughout each week, and the station is on the air for all special activities (RMNITE, ORS Parties, etc.). The frequencies generally used are as follows: 3375-kcs. (Mon. and Tues.), 3825-kcs. (Sun. and Thurs. and each night of operation). Schedules are maintained with W1EF, W1FIO, W2BZQ, W2DBQ, W3BT, W5CXL, W4ATY, W4AYY, W4DWW, W6AM, W6GUF, W6BZ, W8FO, W9ILH, W9QX, NY1AA and VP5MK.

Addressed messages to all A.R.R.L. members are sent "QST" from W1MK on the following schedules (all time EST): Sundays, 8:30 p.m. and midnight (3825- and 7150-kcs.); Mondays, 8:30 and 10:30 p.m. (3375- and 7150-kcs.); Tuesdays, 8:30 p.m. only (3375- and 7100-kcs.); Thursdays, 8:30 p.m. and midnight (3825- and 7150-kcs.); Fridays, 8:30 and 10:30 p.m. (3375- and 7150-kcs.).

THE "CHAIN GANG"

Here is a description of the work done by a group of 1.75-me. phones—I take off my hat to them! This "chain" was originally conceived by Jimmy Frye, W8IY, in early 1935, and has developed into the following system. The following stations are in the net: W8FVC, Bol-Inca, N.Y.; W8FSY, Norwood, N. Y.; W1DQK, North Troy, Vt.; W1DM1, Lebanon, N. H.; W8EOL, Ithaca, N. Y.; W8FMF, Perry, N. Y.; and W8BSH, Brasher Falls, N. Y. Only at 9:00 a.m. this group goes on the air on 110-kcs. As they start up, W8IY says, "Here eight messages" (or as many as he happens to have). Then he sends them all and all the rest of the gang copy. Suppose that two of the messages were going to Maine, three to Buffalo, N. Y., and three to Philadelphia. W1DQK or W1DM1 would ask the Maine messages and attend to relaying them, W8FPM might OK the Buffalo traffic, and someone else would accept the three for Philadelphia. By the time each station has had his turn at sending traffic, there are usually about thirty messages on the chain. The percentage of deliveries is high because each station maintains good schedules. Each member of this gang holds A.R.R.L. Official Phone Station appointment, and their outlets are clean, dressy and efficient. They are all real hams.

The Chain Gang wants more outlets down east, in the Mohawk Valley, the New York City Area and in Philadelphia. 1.75-me. phone men who wish to join the gang should write W8IY, 61 No. Main St., Homer, N. Y.

—ARNOLO M. WRIGHT, W8AOW,
Route Manager, Western New York.

BOL-INCA EXPEDITION

The Bol-Inca Mining Corporation is attempting to develop a series of placer gold claims on the east side of the Andes in the embattled country of Bolivia. These gold deposits are those whose owners mined the treasure which was robbed from them by Pizzaro and the Conquistadores when they conquered Peru in the 16th century. Gordon Barbour, ex-W1ASB, ex-W5DHI, is radio operator with this expedition. Besides a Bolivian call issued for local company work it is expected an amateur call will be issued for personal correspondence with the United States. It is possible that amateur radio will be the only link with the outside world. If possible, the call CSIBM will be used. Addresses of U. S. hams will be made as follows: Saturday, June 2d, 9th, 16th, 23d: 7300-kcs. noon to 4 p.m. and 7 to 11 p.m. EST; Sunday, June 3d, 10th, 17th, 24th: 7300-kcs. 5 a.m. to 8 a.m. and 5 to 10 p.m. EST, 14,400-kcs. 8 a.m. to 12 noon and 2 to 4 p.m. EST; Tuesday, June 5th, 12th, 19th, 26th; 14,400-kcs. 1 p.m. to 4 p.m. EST and 7300-kcs. 7 p.m. to 10 p.m. EST; Thursday, June 7th, 14th, 21st, 28th: 14,400-kcs. 5 a.m. to 9 a.m. EST, and 7300-kcs. 7 p.m. to 10 p.m. EST. Operator will be 90 mile NNE of La Paz. Address any mail to Gordon Barbour, Bol-Inca Expedition, Care Senor Carlos Bonilla, Guanay, Provincia Larecaja, Bolivia. Please report contacts or reception of this expedition to A.R.R.L. Headquarters.

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**New W1MK Operator**

There is a new "fist" at W1MK. Mr. Harold A. Bubb, W6DES/W3DPV of Jamestown, N. Y., and Sperryville, Va., has taken on the duties of Chief Operator of the A.R.R.L. Headquarters station. He operates the W1MK stations, is HAL, and he needs no introduction to SCAs and RMs, having made a name for himself during two years as Route Manager of the Western New York Section, A.R.R.L., and a short term as Chief RM, Virginia.
New DX Records

Flash!! Word received under date of May 1st advises of the establishment of a new record for "Working All Continents"—"W6FYT". Ontario, Calif., smashed the following within 48 minutes: VK5HQ, Oceania, 7 mc., 6:15 a.m.; LU6DD, South America, 7 mc., 6:25 a.m.; J3CX, Asia, 7 mc., 6:30 a.m.; Z65R, Africa, 7 mc., 6:40 a.m.; OK1LM, Europe, 14 mc., 6:55 a.m.; W1DCI, North America, 14 mc., 7:00 a.m.; all PST. An enviable achievement—W6FYT!

W4EF claims to be the station on this end of the first Netherlands-U. S. A. 'phone contact (two-way). This took place on April 10th between PA2ZD and W4EF and lasted almost 40 minutes.

Believed to be the first CR6/W6 and HB/W6 QSOs are W6FYT's contacts, on February 6th with CR6AC, and on March 17th with HB8J.

A number of operators of 1.7-mc. 'phone stations have been experimenting in "rebroadcasting" each other's signals. W2DT's 'phone was recently successfully rebroadcast by both W2GJR and W2DXX, and was picked up by these stations by WS4CH, W2DTF, 44 Court Street, Brooklyn, N. Y., is particularly interested in this work; others wishing to get in on some of these "rebroadcasts" should get in touch with him.

W4CI—FLORIDA STATE FAIR

Conducting an Amateur Radio Exhibit at a normal-sized exposition or fair is a problem, but running one at an affair that 500,000 people attend is hard work!! The amateurs of Tampa, Fla., knew that the Florida State Fair drew approximately half a million people, but that did not frighten them—not a bit! They installed and operated W4CI at the fair grounds during the eleven-day period, January 30th—February 10th. The primary purpose was to acquaint the general public with amateur radio activities—and the Tampa gang did a bang-up good job. The first few days brought so many weird questions that it was found necessary to have pamphlets printed explaining briefly the story of Amateur Radio. This did wonders! Traffic? They were literally "wading in it," to quote W4ALP. W4CI handled a total of 252.5—some of which should get in touch with him.

O. B. S.

The following is a supplement to the list of A.R.R.L. Official Broadcasting Stations in September QST (page 44): W2BLU, W3CWL, W6IIK, W9LWK, W9PSP, W9TW, VE3MX.

Special Calls—A.A.R.S.

The holders of the following special calls in the Army Amateur Radio System are authorized by the Chief Signal Officer, U. S. A., to use these calls on the special Army channels, 2947.5- and 6890-kc. The corresponding amateur calls are given so that these operators may be identified by their ham friends.


- HAWAIIAN DEPARTMENT: WQVB/KE6WQ Department Net Control.

June, 1934 55
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, 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, the incumbents remain in office, as provided in our Constitution and By-Laws, and at the meeting of the Section, the incumbent continues to hold his official position subject, of course, to a challenge by another member through the process of filling of proper nominating petitions and the holding of an election by the Section. Notice of challenge must be made in writing at least three months in advance of the Section meeting and mailed to the A.R.R.L. Headquarters in Hartford or before noon of the date specified.

In California, Texas, and Nevada, San Francisco, Los Angeles, and Las Vegas, Section nominating petitions are hereby solicited for the office of Communications Manager in those Sections. Petitions must be received in the office of Section Communications Manager as the Sections specified above, as of the date specified.

The elections will take place in the different Sections immediately after the closing date for receipt of nominating petitions. The list gives the Sections, closing date for receipt of nominating petitions, and the date of expiration of his term of office.

Member are urged to take initiative immediately, filling petitions for the office for which they wish to seek office. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

ELECTION RESULTS

Valid petitions nominating a single candidate as Manager were filed in a number of Sections. In each of our Constitution and By-Laws, it is provided that the Section shall vote on the slate as a whole. This notice supersedes previous notices.

In all Sections, the incumbent of office is declared elected unless a challenge was received prior to the date specified above. This is your opportunity to put the man of your choice in office to carry on the work of the organization in your Section.

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Atlantic Division

EASTERN PENNSYLVANIA—SCM, Jack Wagenseil-ler, W3GS—RM's 3MC-345 and ALX. Do not forget to QSO your RM's and SCM every Sunday between noon and 1:30 p.m. daylight time. See May QST for details. SCM's will have your suggestions. SCM's have been contacted by the SCM's, RM's 3MC-345 and ALX. Do not forget to QSO your RM's and SCM every Sunday between noon and 1:30 p.m. daylight time. See May QST for details. SCM's will have your suggestions. SCM's have been contacted by the SCM's, RM's 3MC-345 and ALX.

COLUMBIA—SCM, E. L. Hudson, W3BK—W3CXL, W3QS, RM's; W3BWT, Chief RM. The Washington Convention went over fine, SCM's have been contacted by the SCM's, RM's 3MC-345 and ALX. Do not forget to QSO your RM's and SCM every Sunday between noon and 1:30 p.m. daylight time. See May QST for details. SCM's will have your suggestions.
gets a bunch of DX cards. S8CW-35 reports C6DK has transmitter on exhibit at Electrical Show in Jiamestown.

A3E-SC3 is on 56 mc. SAQE-6 is working on wind-driven generator. 8CEB is on 5.3 mc. 8CQJ moved to Newark. 8F8T runs 500 watts input ’03As. 8BR-12 canceled all schedules. 8QEM-12 is QSOing with DIANA—80. 8MXG is on 1.7 mc. 8PDL-1 joined Signal Corps. 8KMC-140 and KRS want ORS. 8AYD is teaching eight SWL’s the code. 8AXE-4 has a pair of 800s. SJQE-3 is joining. AAR-52.

8EAC-33 is on 56 mc. SAQE-6 is working on wind-on 1.7 mc. 8FDY joined Signal Corps. SKMC-140 and SKMK-32 wants a bunch of DX cards. 8CQW-35 reports CDK has transmitter on exhibit at Electrical Show in Jaimestown.

r•elled schedules. SGWY-47 wants schedules. SFMX-38 is from. 8GJM-2 says a bunch of SHBP&M boys attended fast trunk line. 8A WX-270 is building up his old traffic of traffic. SYA-200 says spring fever is getting the boys.

SCPC is our new Assistant publisher and editor of “Radio Scout.” SAGS-3 is on type-59 tri-tet. 8EUY is on with a 60. SIMR is working on.”

QRA. SFSY-653, GWT-136, FUG-70, KRC-30, GPV-134 and KBS are new reporters. SBJO changed ORS. 8FZG-8 is rebuilding. 8ITK-5

6th Corps Area have amateur stations. Grinding crystals seems to hear 9FTX-5. 9FXE-15 has worked all continents. 9GKH-11 wants to know what CCC camps in Hartley works better than MOPA! SCUG-22 is trying to organize "Radio Scout." SGWY-47 wants schedules. SFMX-38 is from. 8GJM-2 says a bunch of SHBP&M boys attended fast trunk line. 8A WX-270 is building up his old traffic of traffic. SYA-200 says spring fever is getting the boys.

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QST for
in his rig. 5CCW is on 14 mc. 5DXY-11 relayed an important death message. 5AJJ-13 sent the news from his section. 5MJF is c.o. 5CZA uses 71 with "B" batteries. Following are on phone in L.R.: 5AXU-3 has new rig going. 5DAW-13 likes e.c. job going at home. 5AJJ-13 says SS report is settled.

5UL makes do on U.S.N.R. 5AAI handled c.c. rig.

LOUISIANA-SCM, W. J. Wilkinson, Jr., W5DWW-Wanted: Real live wire ORS and OPS. Drop a line to ant. Best death message. 5AAJ-113 sent the news from his rig. 5AXU-3 has new rig going. 5DAW-13 likes e.c. job going at home. 5AJJ-13 says SS report is settled.

5UL makes do on U.S.N.R. 5AAI handled c.c. rig.

TENNESSEE-SCM, F. F. Purdy, W4AFM-4PL-14 is work after several weeks fishing at our favorite fishing lakes. Our daily symphony to our friends, 5HR, who recently lost his father. 4KA and CBS opened a radio service shop.

145 is manufacturing 7 meter receiving rigs. 4RBD of Knoxville was visitor at meeting of Chattanooga club. 4LBC, 4NB, 4EF, 4JK, and PL were present. Dunn of 4BIZ transferred to 4RNI.

4CRO is Senior operator at Airway Radio Station, Donelson. 4ASC has new Young Squirt operator. 4AXN is looking for any old '46s; send them to him, gang. 4BPR is in the fruit business. 2BVL plays the piano. 2BPL is handling phone band traffic. 2FRZ, FJN, EXI are employed by telegraph company. 2GTR spends his time announcing at B.C. station. 2GIY is main switch thrower at N.Y.C. police station. 2AU is chief engineer at WAAT. 2QQ is a Wall Street man. 2BCD says c.c. is the thing. 2DLP is trying grid modulation. 2DOG-1 is one of the ORS parties. 2BFL is doing active duty with N.C.R. 2ACG-4 says SS reports are FB. 2EKL is needed on c.c. 2EKF is looking for any old '46s; send them to him, gang. 2EKM-2133 does a wonderful one-man job in traffic. Four stations make BPL: 2EKM, BXC-1029, EZN-595, and FOP-203. 2DUL is back with 500 watt job. 2DTP-114 has new MOPA. 2DPB-16 is on 14 mc. 2DVL-10 scores heavily in dx tests. 2EKF-25 and GWW-37 reports come via 2FKM. 2DVN-10 needs more time for traffic. 2CTT-9 has new MOPA. 2EKL-9 is in New York City at the Naval Military Armory, Perth Amboy, by the Tri-County Amateur Radio Association. It is being held in honor of the League's 20th Anniversary and will be a most unusual affair. Souvenirs for everyone and a mob of big prizes. Admission only the skin.

Hudson Division:

EASTERN NEW YORK-SCM, R. E. Haight, W2LU -2EFP-59 is high traffic man. 2BJA-209 reports CBJ-4 on 7 mc. 2BJX-80 is back on 3.5 mc. for traffic. 2DPM-57 does a wonderful job on CQ. 2DOM-54 has several different crystals. 2EKN-53 says ENG is on 3900 kc. 2FAM knocks off W6. 23Z seeks WAC. 2IX is on 3.9 mc. phone. 2G1G has 300 watts input. 2CBM-53 finds crystals break. 2CQD-20 moved rig to Sun Parlor. 2FRG-2 joins A.A.R.S. 2GNI handles the a.m. schedules. 2BHI-16 reports via radio. 2GRY-16 is Ex-2WJGE. 2KW-11 has 25 lb. tuner unit for swap. 2DQ-10 says FDN has completed 14 mc. tri-tet rig. 1EKM-55 does a wonderful job on CQ. 2ACT-2 is active with N.C.R. 2AQN-3 delivered three messages for K5AA. 2DJK-3 new N.C.R is 7 Jones St., Rochelle. 2AJE-3 spends lunch hour as code instructor. 2DVC-3 reports c.c. perking life. 2DQT is tuning up for summer vacation. 2UL reports for Mt. Vernon. 2DQV-10 triple-tet. 2ECF puts hole in 7 mc. 2ED5 reports arrival of new Junior op. 2BPH is looking for VK's. 2E1MK uses c.o. on 5906.1 kc. 2ESO will be back on the air June 15th. 2QY QRT's code for season. 2CVL-2 reports that the Tri State Radio Club plans to broadcast "QST1" on 56 mc. every Sunday at 3 p.m.

June, 1934
in. 1BE-11 handles Norfolk traffic in County Net. 1BSO-50
is Master County Station in new net. 1FRO-162 rides up
to the top with the crack stations. 1GCL-45 is doing FB
job as ORS. 1FPQ-52 re-applied for ORS. 1HLO is a YL
op. 1AZF-153 sends in some Army traffic. How about you
other Army Net men? lDOF-8 has matched impedance
op. lAZF-153 sends in some Army traffic. How about you
mast raising when the gang raised his 85' lattice job.

Secty., lSN; Treas., Pro. Tern, H. L. Rinaldi, acting in
dio Club elected officers: Pres., lFSK; Vice-Pres., lHFX;
W AAB's transmitter is running under the call 1
watches," but how does IZK listen on 1.75, 3.5 and 56 me.
transceiver. The Ultra High-Freq. job installed at WNAC­
working portable
has a pair of '71s. lDNF has plans for multi-stag:e c.c.
17 days. lBFR-19 has been DXing. lBEF-25 had a gala
scope in his antenna. lEAX-51 is after ORS. lBSJ-18
all at the same time? lBIO is teaching Radio Service at
the air with brand-new rig. lAVJ is building Tri-tet. The
important message from K6CIB was delivered by lCCM-5
in less than 24 hours after its start! Our dentist, lSK, is
busy pulling molars. lAVL has the p:o!f bug. !AVG is on
---------

WESTERN MASSACHUSETTS—SCM, Earl G. Hew­
inson, WlASY-WlRH—17R-714 strikes a high total for
this Section. 1FPY-506 sure put the steam on this
month. 1DDW-241 says trans con flow freely. Transcon
traffic is handled by lEOB-101. 1FMW-3 is a traffic pusher. 1EOF-109 is Unit Com'dr for U.S.N.R.
traffic good. lEOF-109 is Unit Com'dr for U.S.N.R.

NORTHERN DIVISION

ALASKA—SCM, Richard J. Fox, K7PQ—7FF-66 re­
ports transcon. report on 3.5 me. on his pair of "71s.
7BZX-30 tried 14 me. 7CSZ is building c.e. 'phone.
7EGC-13 is new ham at Anm. 7BOB-86 says amateur
radio prevents him from getting enough sleep. 7BOB
changed crystal stage to type 59. 7BNW-6, DJA-9,

Vt. 7BBK-8 put up a new "bird percher." 7AVM has 10-
tube receiver. CRM TMY-155 finally went c.e. 7DN-1-272

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June, 1934
a blow about everything blowable. 7ECX-3 annexes a c.c.

rig. 7AFA-19 has new joint op. 7BEV-8 bought 20-ft. cabin cruiser. 7BBY gets RS from Europe. 7BGR-18 won Spokane's QST Logo contest, 7BFC-24 and 7BHC-24 are still at Yakima. Following report by radio: 7CWM-1, BYT-1,

8G-1, CQI-101, CQJ-1, BBB-85, DPU-16, AWJ-23, DJA-1, DDY-1 and UF-15. 7CAM-7 has 1/4 kw. 'phone. 7AUF-3 clicked J, VK and KAI. 7ATO-201 was heading for the RPL, 11/26 west west. 7TAQ-2 is operated by CVO-1, AFQ and DWC-1. 7AJF and QW are QRL KT. 7DJE-1 and BUX-1 are together a lot. 7DUJ-1 visited the Yakima gang. 7AYC-1 is working DX. Attention is called to the big Spokane hamfest in June... for more details write W7NM. Also, please note the next VENTON at Seattle in August. For more information write WTRT, 1021 Atlantic St., Seattle. 7AF-7 will be known as 7AFJ in BT in Alaska this summer. 7APS-53, LUN-12, CDC-6, CNO-2, NZ-DXH-1, AIT-5, DLN-6, AWF-82.

PACIFIC DIVISION

HAWAII—SCM, C. D. Slaton, 6C6CG—6JRN-3 has a new

Gros rig. 6HZH on is high power. 6SKC purchased ELN's rig. New hams at Fort Kam: 6KCK-225, 6BUK-11 worked a different African every 5.

purchased ELN's rig, New hams at Fort Kam: 6KCK-

blew about everything blowable. 7ECX-3 annexes a c.c.

receiver and trasmittcr, 0A,TP-49, UO-36, GYX-13, JVH-

first time. New officers San Pedro, 6IVG Pres., IIK-15

where portable. 6BYB blew another 1KW jug. 6GDJ lost a

receiver. 6CKF is attending school in L. A. 6JYQ can-

sister donated a crystal. 6YJ's-9 traffic manager is now
cs. 6BOS-4 has nothing to squawk about! 6DBB-4

threatens to put his "50" on 1.7 mc. phone. 6GCOZ-2

works DX with 1.75 mc. 6PM-21 is 100 watt 1.75 mc. 'phone. 6GYM had portable at Big Bar C.C. camp. 6FMT schedules her brother from San Diego. 6BCF is putting an "04A on 3.5 mc. 6H2W is c.c. on phone. 6JSB left the section for C.C.C. Job. Fellows: Please send your reports on the 16s—no later. Please send on grades.


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QST for
евые к МОПА. 6ERP tries to work three stations. 6HJQ has 28 mc. rig. 6IRK uses 700 volts on '45a. 6JW changed QRA. 6GJC has 25 cycle worries. 6GZU-88 rebuilt c.q. rig. 6KOQ is now ham. 6KKE has daily schedules with his son, DPS. 6LU renames schedules with DSH. 9LR-176, EEX-95, MA-N 554, CM-414, LG-293, CS-129, FS-97, JR-55, XA-40, TS-38, 4G-46, WV-9X-3.

SAN DIEGO—SCM, Harry Ambler, W6EOP—RMs: 6FQU, 6QA. Phone RM 6IBK. About 30 from San Diego Station attended Bancuet at Whittier. The San Diego Radio Club is affiliated with A.R.R.L. 6MBO-1356 and DQN-544 make the BPL. 6FQU-200 says RM net working FB. 6EFK-170 has two schedules. 6HBF-60 says Phone Net working PB. 6CTM-59 and AXY were visited by DJFCE. 6BW is on Phone. 6BOW-33 works 7 mc. and 1.7 mc. Phone. 6B1K-23 will soon try 14 mc. Phone. 6WAXN-17 rebuilt. 6BLB-9 has now portable. 6KEX-2 works PB. 6GN-1-1 has 8 tube. 6FCT has new crystal transmitter with parents. 5BM made 83 points in DX contest. 6CNF, BYZ, CMT, VT, are now Ops at KGHX police radio. 6IOA moved to Nuevo. 6EOP-3.

ROANOKE DIVISION


VIRGINIA—SCM, R. N. Eubanks, WSAJ-33—DFS-22 and 4DD-9 handled important traffic. New reporters: 3AH, AJJ, DHL, DZW-1, EHL-7, ELA-3, EJL-5, WO-4, DWW, BRA, AHCH-20. New calls: 3CQW, ENO, ENQ, ENR, EMX, ELA, ELJ, EKK, EMM. Rebuilding: 3DER-10, ELA, DFU-1, BW, EMX, EBM, BTR, BRA, AZU. 3CA has been very ill. New transmitters: 3DFE, BZE-13, EBE-10, CBE-9, WO, DZZ, COO-2. New receivers: 3ALF-8, AKN-6. Added c.q.: 3CFV-15, CEY, CPN-2, EAP-2, DZW-1, EBD, EBM, AJJ, DHL-1, AJJ, WM-1, ZU. New antenna: 3DWS-2, CH-8, DEX, EMX, BYA-40, DAZ-18, B delay, DX bounds: 5SRN-41, ECQ-24, AG-16, BZ, CCOU-10, DEH, AKN, CZC-4, BBR, BSL-2, DSH, DRK-1, AJJ, WM-1, BWA-2, EAP, AU-04. Experimenters: 3CBY, AKN, DSH, AJJ, DFU, AJJ, EBM, CQV, AXY, BKS-1, 4XK, AKS-1, AJJ, AMT, AXY, DEX-10, 4B, 3MO-101, BAD-30, ECQ, EBD, AJJ, DFM (c.f.), CFI-3. New QRA: 3AAE, Portrait, DUG, Narwood. All men in Va. with 55 mc. rigs please advise on next card. On 56 mc. ‘phone: 3JF-69, CGR, DAM, GE-1, AJJ, DAB, BPS, A0Y, DXL. 14 mc. has plenty of opening for DXing in the 56 mc. tests with club. Send stamped envelope to 30GE, Washington, D. C., for Heard QSL cards. 3ALF and CPN have new freq. equipment. 1.75 mc. ‘phone: 3HJQ, AJJ, DSH, 3AMC, EJQ, DZ, BLJ-4, AMF, DDG-20, 3.9 mc. ‘phones: 3AHQ-68, ASK-18, CJJ, CNY-6, BIG-4, CJZ-4, ZA-4, AJJ, P1, ADJ, AKZ, AZU, BIRD, 3GY’s-13 OPS Net is doing fine Sundays 9:45 a.m. — 3:30 a.m. 3AHC’s ‘phone net is doing fine, Sundays 1:30 p.m. — 1:75 mc. Net—CW — 2 p.m.—5 p.m. Sundays 3:35 mc. 3CII visited CMJ. 3C2Z wants OPS. 3AEW-10 uses ‘4A, 3WO is working in Roanoke. 3BTR worked Egypt. 3EMX, Dot Lemon, is now 71 YL Ops, is out in the ‘phone nets. 3AEI moved shop to Appalachia. 3BWA worked HAFSD. 3UVA has gone to West Coast. 3AG worked Siberia. 3EHI, blew power supply. 3BAN-2 is still doing fine 56 mc. work. 3BII is now QRA. 3AKZ is now OPS. 3CZX is Traffic Mgr. Roanoke Club. 3CSI is op. at CC Camp at Clifton Forge. 3BXX has Class A ticket. 3DWP-4, DVO-2, CXM-41, DOC-14, FE-75, DPV-54, BRY-19, BGD-9, BGS-4, APJ-3U, DQ-2, AMB-1, WUG-20, ADD-5, M1-1.

WEST VIRGINIA—SCM, C. G. Hoffman, Jr.—W2HFD/WLHF—The W. Va. A.A.R.S. held Hamfest at 8ELJ, April 15th, with 8OKQ, EIK-282, ELLJ-22, EGR, BDU-70, DMF-15, JSU, CHK-10, BZ, KDP-38, KIB, KZT, LNX, EWM-9, present also Mrs. 30K, EGR, BHD, EKL. Reports go that the next A.A.R.S. Hamfest will be held in Charleston. 8KSJ-3 uses collector radiation antenna on receiver. 5EOL-HCL-6, JWU: rebuilding. 8US is leaving state to live in British Columbia with parents. 8BDM made 1500 points in DX contest. 6CNF, BYZ, CMT, VT, are now Ops at KGHX police radio. 6IOA moved to Nuevo. 6EOP-3.

JUNE 1934

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and two non-hams. 6FYR-564 leads Section again. Handling traffic great sport at 7CSE-43. 6HVU-2 is new fi
7CBL
n•porter. Tri-tet "the berries" at 6DTB and 7CO0.
6FYP-24 7AMU-41, CPB-1.
4BMM, 'phone RM, is rebuilding. 4AJC-22 is now 4COA is now a member of the B'ham bunch. 4AJY works KJB-9, GQM-8, lTW-6, JVB-AFN-GQR-4, DGR
1.75-mc. 'phone. 4GP and OA are on fone. 4BXV is on phone. 4AIH-25 made a good score with low power. 1.75-mc. 'phone. 4CBI is rebuilding for c.c. 4CQV puts LDVF, portable, was at Daytona all winter. 4AGB-14 Class B 'phone. 4ASR-18 reports 4.AS moved to Daytona transmitter. 4UX is sailing Pacific. 4AKH is working trons. 4APU-40 wins QSO Party Contest and is new RM for Southern Section. 4BOU-108 was runner-up. 4GLL-115 is new RM for Southern Section. 4BLL is busy with the CIQ amplifier. 4GP and OA are on fone. 4BXV is on 1.75-mc. 'phone. 4CHJ-190, COU-127, 4ACB, 4AUW. The Hamfest at Valparaiso to be
QRL State Road Dept. •!RFD installed remote control. "W5AUL-5BII Chief RM. 5SP-8 Phone Activities Mgr. RM's 5ABS, BKE. The SCM, 5AUL-6, finally attained "gold braid" in the Fire Dept.; the new QRA is 1133 Amarillo St., Abilene. We regret the loss of RM 5A and P.A.M. 5BAY; these fellows are QRL. 5BII-19 leads Section as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America." 5CMS-9 is rebuilding. 5COY-519 leads as usual, with 5AW-240 second. 5CJI-161 may join the Army. The "gold dust twins," 5CPB-144 and CPT-82, are going strong. 5NW-14 has schedule with "Little America."
NEW MEXICO—SCM, Dan W. De Lay, W5DUI—5ZM-215 rides first place in traffic. SCM-84 sneaked in second. 5DLG-40 boasts of new 5W3. 5AOP-4 wants some schedules. SCM-84 is building receivers. 5QOL new Jr. op. 5DZH new ham in Madrid. 5QAX-15 worked Spain. 5EAO has bugs in C.C. rig. 8JWTX-30, DSN-1.

ONTARIO MARITIME DIVISION

NOVA SCOTIA—SCM, A. L. Crowell, VE1DQ—1ID-77-27 was heard in VE during B.E.R.U. tests. 1GL-60 keeps five schedules daily. 1BV-10 is trying vertical antenna. 1EX-45 schedules 1CF daily. Daily ragchews are held by 1AI, CV, FE, GR on 1.75-mc. 'phone. 1EO is on 7 mc. 1AQ is 100% for 1.75 mc. 1BB is active on 3.5. 1AG-9 schedules ICA and CI daily on 3.5-mc. 'phone. Active on 3.9-mc. 'phone. 1EI, CO, FW, GT. 1FB-1, QSL Mr. this dist., reports new ham, 1GY. 1EF-11 worked TM4ZO. 1DQ-4 worked a YI in DX tests. 1E7 is busy with R.C.M.P. 1EA-15 works Europe regularly. 1FE is active on 7 mc. and 1.75 mc. 1NEW BRUNSWICK—1ICL is going to rebuild the 1.75-mc. 'phone. 1AIJ is building new receiver. 1IBX is on 7 mc. 1BO lost power packs during flood in cellar. 1FP is building 1MY for 1.75-mc. 'phone. 1GO is on the air at Summerside, P. E. I., with c.e. on 3.5 mc.

NEWFOUNDLAND—via VOSY—VOSY piled up 2604 points in contest on 14 mc. Following are active "VQ" stations: 1VQ, 1RC, 1SLC, 1SM, 1SHX, 1A9T. VOSY says QRM phone experiments. Drop a card to 1DQ and have your station included in our Division report.

ONTARIO DIVISION

ONTARIO—SCM, S. B. Trainer, Jr., VE8GT—3JT-458 leads in traffic. 3S2-18 and MB-21 are looking for schedules. 3TM-231 is going to get even. 3UJ worked VQ4. 3DU-1 and AD moved. 3GT-291 and WB-1 were heard in Moscow, and VX in Poland. 3GI-29 is after commercial ticket. 3WR-68 plus away at traffic. 9AL-39 never fails to report. 3GII's wife "April-fooled" him—baby girl. 3Q8-58 and YB get out with flea power. 3PH is new opp in Beaumont. 3QX-1 is the flea on the hot griddle. 3WO and WJ are rebuilding. 3WA is now WAC. 3PT, IH and BZ like 7 mc. Present at 1st Annual No. Ont. Convention were: 3CX, CH, DX, RA, GB, LY, FW, FQ, GS, UE, UA, and RI, KN, QP, OZ, GG and HA. 3QI-4's antenna has become a ground. 3XO-52 wanders between Orleans and Toronto. 3QM-8 is after a better rig. 3DJ, HY, and BG pound away at 3Hw's. 3SG-22 has been making out our income tax bills. 3HW played the golda. 3O0 is cruising in southern waters. 3QG, RL, NU, PM, LJ, LF, and LL are working on 5 mc. 3KJ and ZA-2 are at party at 3IB's. 3DC is experimenting with the radio knife. 3ZA, 3R are new stations in Seaford. 3NX will be on 3.5 mc. during the summer. 3DD has gone into training for Old Forestry Job. 3LX won a crystal in a grab bag. 3CX-72 pounds away on schedules. 3BH the works. 3GS has 1/4 KW on 3.5 mc. 30Z gives DX and RA a chance to work out. 3KN is QRL the ivories in his hand. 3FW knocked enough off crystal to fit small holder. 3TP lapped into 3ZF, 3HA-5, GB, and LY are working on 5 mc. transceivers. 3GG entertained the dub with amusing tests. Interesting tests were carried out on April 14th and 15th on 56 mc. at St. Hubert Airport. A plane piloted by 2AI with EM as operator experimented with 2HI—our lady "ham"—who was in charge of ground station. Two-way contact was maintained over distances up to 40 miles; 2BG and LIW were also worked. 2AX and EE made excellent showing in DX contest. 2AB-23 building 200-watt rig. 2HQ works plenty DX. 2HK-401 is star traffic man and makes BPL1 FBSA's at 2BG, AB, FE, HM, EM and DU. 2CA works DX with antenna down. 2DR-80 relayed traffic for Mr. Maxim. 2FS is selling out on account of health, 2HT handles traffic on 3.5 mc. 'phone. 2DQ flew out of Anticosti and visited local hams. 2GO and DG-7 work VK's and ZL's. 2EX is selling high-power equipment. 2GA burnt out generator. 2DY and HN are on 3.5-mc. 'phone. 2CG-46, ORS appointment pending. 2EM is building 50-watt rig for summer residence. 2AP-11 reigns ORS appointment. 2AW is building c.e. rig. 2BU-17 keeps in daily touch with wife by radio while she visits Toronto. 2BB-37, DG-7, AC-19, BU-17, CX-53.

VANALTA DIVISION

ALBERTA—SCM, J. Smalley, Jr., VE4GD—46W and EA are with CFTF. 4GY uses c.e. 4QX-15 works traffic and DX. 4PH-6 worked three K6's. 4EX is the Edmonton YL. 4HM is Alberta's first OPS. 4FI and JW have gone 'phone. 4DX-3 is resting his tonsils. 4GD-64 is once more in traffic column. 4AX, NH, and KG-20 are working for ORS. 4CY returned to 14-mc. 'phone. 4K4 uses low power. 4AW-10 likes 486. 4CG and 4G are building c.e. 4AP-78 sees new ORS. 4AA-7 is new ham. 4E0-4 wants answers to his QRZ after OBS schedule. 4OF likes 14 mc. 4OZ leads up his '10. 4OF is experimenting. 4JL added a pair of '10s. Extr4UP is organizing the Medicine Hat Club. 4FS-11 finds time between schedules to work 'phone. 4GM lives, eats and sleeps Pattersons. 4DB has DX cards awaiting envelopes. 4LX-8 has high-power c.e. rig. 4DQ is building super. 4NB has battery-powered c.e. rig. 4AS is active at Milk River. 4IP is ringing for c.e. rig. 5LNE—C. T. Pratte, VE2BP—5DX-144 is in charge of ground station. Two-way contact was main-
The Old Geezer Is Still Alive
A.R.R.L. RADIOGRAM
from somewhere west of Connecticut
(Preamble deleted)
APRIL 27, 1934
K B WARNER
A R R L
WESTHARTFORD CONN
SAY SON I HAND IT TO YOU ON THAT TWENTIETH ANNIVERSARY NUMBER ITS A HOOTIN' TOOTIN' RINGTAILED SNORTER AND SURE DID BRING BACK MEMORIES OF THE OLD DAYS IT DOES YOU CREDIT DONT LET THE MUDSLINGERS BOTHER YOU I WILL ATTEND TO THEM IN DUE TIME.

THE OLD MAN

More Birthday Greetings
Department of Marine,
Radio Branch,
Ottawa, Canada

Dear Mr. Warner:
I am pleased to note that the American Radio Relay League is about to celebrate its twentieth birthday.

Owing to their geographical situation amateurs in both our countries have a great deal in common, and there would seem to be no better proof of the harmonious relations that exist, than the set-up of your organization which includes a Canadian on its board of directors and which has stood the test of time from the "pioneer" years of amateur radio until to-day.

I feel that your organization and especially its official organ QST, which by the way we have always found time to scan ever since it was first garbed in blue and edited by Mr. Tuska, has exerted a beneficial influence in the amateur field, particularly with newcomers to the game who being for the most part of the younger generation are not always amenable to regulation.

I am very glad to take this opportunity of congratulating the American Radio Relay League on attaining its twentieth anniversary and of extending my best wishes for its continued success.

C. P. Edwards, Director of Radio

Good Idea

Editor, QST:

Several nights ago, while listening on the 80-meter 'phone band, I heard what seemed to me an excellent stunt. This station announced "This is WS-- testing for broadcast interference. If anyone hears this .. announcement on their regular broadcast receivers, will they please call (telephone number). Your trouble can be eliminated."

Would not a more general use of such an announcement eliminate many complaints from broadcast listeners and enhance the amateur's standing in his community?

E. C. Hughes, Jr., W3EHS

56-Mc. QRM

Editor, QST:

Many years ago, I recall an article by T.O.M. entitled "Rotten QRM," and it occurs to me that a new form of this has arisen on the 56-mc. band. . . .

56-mc. work is of strictly local character and the average station knows the radius of its transmitter. It would seem only fair that with the number of stations increasing daily and with receivers only quasi-selective, that the men would pick a "hole" in the band which would not QRM other stations. If all would do this the duplex feature for which the band is famous would not be lost. At my station some twenty 56-mc. stations can be heard almost every night, and most of them, for some unknown reason, "gang up" at
During the past few months we have been aware of a rapidly increasing interest in the 56-megacycle band. Most newcomers are using transceivers. Undoubtedly this is the easiest and most inexpensive way to get started. While this is nice for us, as manufacturers of transceivers, we think it only fair to say that they are not suitable for permanent station equipment. They are portables, pure and simple, and much is sacrificed to that end. Having only two tubes, during reception they radiate badly and lack selectivity. During transmission they lack frequency stability and show an unfortunate degree of frequency modulation. When used in remote locations these points can be overlooked. But as permanent equipment in metropolitan districts transceivers produce QRMs of undesirable proportions.

Fortunately, the majority of active five meter amateurs are constructing more pretentious equipment, and the results seem to justify the effort. One circuit we have developed in our laboratories has been used by a number of local amateurs with excellent results. A single 53, used as two separate triodes each doubling or tripling, acts as the frequency multiplier. This arrangement makes possible the use of a 20-, 30- or 45-meter crystal for 56-m.c. control. — And used with one of the new transmitting pentodes like the RK-20, we have a 50-watt crystal-controlled phone reduced to four tubes. Try it!

Another thing — the Pickard antenna seems to be universally regarded as independent of feeder length, spacing, etc. Our experience does not bear this out, and we suggest trying tuned feeders, or even just altering length and spacing. The results are generally startling.

Our interest in 56-m.c. crystal transmitters may seem noble and unselfish, as we don’t make them. Honesty compels us to say our interest is not unselfish. We are looking forward to making a really good 56-m.c. receiver, — a sensitive, selective superhet, — when conditions warrant. Three years ago we placed such a receiver on the market but it was much too far ahead of its time. While it gave almost unbelievable results with stable transmitters, it was the “bad news” with the universally-used modulated oscillators. But the day of the stabilized 56-m.c. transmitter is coming, and with it the 56-m.c. superhet. We hope that day will be soon, — for everybody’s sake.

JAMES MILLEN
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THE LIST given below shows many exceptions, and as time goes on each yearly list becomes more incomplete. You'll be sorry some day if you don't stop, look and ACT now — Right Now!

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AMERICAN RADIO RELAY LEAGUE

West Hartford « » Connecticut

one particular part of the band in spite of the fact that there are large "dead spaces.".

It will be found in almost every location that some station has logged every other station, and simple cooperation between that station and the new transmitter ought to help put the newcomer in a spot which he can enjoy by himself. . . .

—Karl A. Kopetzky, W2GOW

Rotten Humor

Editor, QST:

Occasionally there springs up in the amateur ranks a pest — or better, a parasite. . . .

The latest one is the fellow who proceeds to hunt out a pure T9 CQ and then answer it, telling the sender that he is "way out" of the band, that his signal is anything from "r.a.c. 60 cycle" to a T6, and that his signal creeps and what not.

On a few occasions, I have had a fellow-amateur call and ask me to give him a report on his signal, and then he would tell me that W9-so-and-so had given him a punk report. And then, on a careful check, absolutely nothing was wrong — just gave the fellow something to worry about.

One morning not long ago I had just sent a CQ hoping to raise some far and distant land . . . when lo and behold here comes a W9 — (whose location, by the way, is Minneapolis), who proceeded to tell me my T4 signal was out of the band and wobbling back and forth, besides a few other discrepencies. . . . Now my own frequency meter and monitor told me, even while I was working this bird, that my note was T9 and that my wave was very near 7138 kc., and I later verified it by further communication with other hams . . . Now, when a fellow gets literally hundreds of T9 reports and several "OK frequency" checks, why does some joy killer have to come along and try to see how much worry he can deal out to a fellow who is trying to play the game? . . .

I would like to hear from some of the boys who have had this experience, as I want to make a list of all the stations guilty of such a contemptible act. . . .

—Roy E. Finley, W5DDX

"Brother! Are You a Duck?"

Editor, QST:

The fact that too many hams give you "QRU" after having reported what kind of a signal you are putting out grieves many of us rag chewers, for they remove most of the personal interest from radio communication.

Let's break a good many of them of that characteristic by giving them a name. A name easy to transmit would be good. For instance, when you want to talk to them they duck. Then, if I didn't want one of their kind to answer me I
The Delta Manufacturing Company has moved into its new factory at Waltham, Massachusetts. It is about nine times the size of the former Delta plant.

Ever since the old Acme Apparatus Company was taken over by Delta about two and a half years ago, Delta has worked hard in its own chosen field — that of turning A.C. into D.C. This work began in the laboratory, and among the fundamental developments already pioneered and published for the benefit of the Fraternity, under the direction of Delta's president and chief engineer, Frederick S. Dellenbaugh, Jr., have been:

Determination of voltage, current and power relations in rectifier circuits (QST, Feb. '32) and from these relations establishment of input choke design fundamentals (QST, Mar. '32); development of the Swinging Choke (QST, Mar. '32); establishment of allowable ripple and methods of ripple calculation and measurement (QST, April '32); plate transformer rating in terms of D.C. output (Delta Bul. 200-A, May '32), new procedure for economical design of smoothing filters (QST, April '32 and Feb. '33); design of choke coils and their rating by bridge measurements giving actual inductance under stated conditions (Delta Bul. 200-A, May '32), and a study of tunable hum and of methods for its elimination (QST, Jan. '33).

There has been a gratifying recognition of the fundamental soundness of Delta research and of the newer and better Delta products which have followed from it.

Delta's new plant is needed to supply the increasing demand from Amateurs for Acme-Delta Transformers, Chokes, Coupling Transformers, and Rectifiers; — to build Delta Rectifiers for Broadcast Stations, Theatres, and other users, — and to make Delta Voltage Regulators for a wide range of technical and industrial applications.

In its new laboratories, larger than Delta's entire former plant, Dr. Dellenbaugh with new facilities and equipment can work still more effectively toward a better understanding of power supply problems. And the new factory with its machinery of the latest type, its modern layout and improved working conditions will aid in turning this research into still better power-equipment for the Amateur.

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AMATEURS: Send for Delta Bulletin DL48-13, which lists new Delta Coupling Transformers for use with the new tubes and developed since the publication of our catalogue in QST, Dec. '33. We are ready with new transformers for use with the new sensational RK-20. Ask us about them.


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“Ah, my dear Watson, ...”

There’s no mystery about the popularity of this new RADIOHM for replacement jobs. You’ll detect it at once for it offers smoother, easier, better attenuation than ever before. Try a RADIOHM on that next job.

Note the protecting metal strip that “makes contact” with the resistance strip — noiselessly, smoothly, surely.

Centralab
RADIOHM

Central Radio Laboratories
Milwaukee, Wis.

would make it “CQ CQ de W8KQZ. No ducks, ark.” Soon it would be “No dux” and you would hear it on every band if the idea is sound enough to work out. That is the question. Anyway this is a start, and maybe some one can perfect it so that we can eliminate a few of these “engineers’ reports” and get a little communication started.

—R. F. Cutting, W8KQZ

A Plea for a Sense of Humor

Hanna, Alta.

Editor, QST:

Since Warner’s reproof to ‘phone hams using Philip’s code appeared in QST, the doleful chorus has been taken up by hams who suffer from ... an irrepressible desire to act as a ... “corrective” influence bent on the uplift of the base notions, mannerisms and ethics of hams in general. The latest thing of this sort appears in a recent O.P.S. bulletin. We are told not to ask the usual questions on hum, modulation. ... We must not use abbreviations used in code work. We must not tease, kid, laugh, rag-chew nonsensically because the BCL and SWL will get the impression the hams are not the serious, useful members of society that they should be. ... We are told traffic’s the thing.

Now traffic has its place. I’ve handled lots of it. One percent of it was useful to somebody while the rest was plain bunk and a waste of time and money. However, if a ham wants to make the BPL I’m not getting in his way. That’s his business. Emergency work is different. I take my hat off to any ham who does his stuff when the pinch comes. But the point is, the rag-chewing, nonsensical, laughing, kidding ham is every whit as valuable to his community when emergency work is to be done. In the recent flood work in the northwest states ‘phone hams whose names have never appeared in traffic total lists rendered yeoman service.

Amateur radio is my hobby. In its pursuit I find the balm of Gilead. The ordinary life of the ordinary people from whence springs the great majority of hams is a dull, drab and somewhat dreary struggle. ... There’s seldom anything funny in it. It’s too darn serious! To escape from it for a short time we all eagerly pursue various avenues of pleasurable enjoyment. ... And so, please, Messrs. Warner and Handy, and a few others, please allow us to play our game our way so long as we abide by the rules. Let us laugh, live and have our being. The ham game is for hams. If the SWL doesn’t understand the meaning of QRX or QRM let him become a ham and find out.

... The plain truth is that the SWL gets a bigger kick out of a couple of hams rag-chewing nonsensically than he does out of a highly “proper” or traffic QSO. ... The most popular programs on the b.c. band are the nonsensicals—Amos and Andy, the Baron, Cantor, the Fire-chief. ... The leopard doesn’t change his spots, and neither does the BCL lose his sense of hu-
The GROSS "CW-25" Crystal Control Transmitter Kit . . . . $13.95

The "CW-25" transmitter kit due to its low cost makes it possible for anyone to own a modern crystal controlled station. A schematic hook-up and parts layout sheet as well as tuning instructions are furnished, thus enabling the most inexperienced operator to wire and put the set on the air, for real results. The "CW-25" is supplied with a shrivel finished sturdy metal chassis which all parts are mounted, making the wiring and components dustproof. A plug-in crystal holder is furnished with the kit. Only one milliammeter is required for tuning the transmitter and each stage is provided with a jack for this purpose. The "CW-25" uses one '47 as crystal oscillator, one '46 as buffer or doubler and two '46's in the amplifier stage. One set of three coils is supplied with the kit for 20, 40, 80 or 160 meter band. Any additional coils are 75 cents each.

The "EAGLE" Three-Tube Short Wave Receiver

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

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

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71
For Beginners' RECEIVERS

The Eveready Air Cell "A" Battery is the best form of primary battery energy for use with beginners' receivers. Used with the beginner's TRF receiver*, it will give over 1300 hours service at a lower cost per hour than dry cells. And it eliminates continual adjusting of the rheostat because of falling "A" battery voltage.

*Described in March QST.

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A patented Eveready feature. Protects against leakage, bulging, breakage and insures long service life.

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mor when he becomes a SWL. So why frown upon ourselves? Let's be natural! Let's be human!

— W. R. Roberts, VE4GM

GBA

3645 Rowena Ave., Los Angeles, Calif.

Editor, QST:

I feel the urge to get a few words off my chest in regard to an evil in amateur traffic handling. Too many messages come through with no other address than a 'phone number!! It is the duty of every station originating a message to get the complete name and address — plus the telephone number, if it's available — on each message he accepts for transmission.

A few weeks ago a W9 gave me a message addressed: "Mr. G. Brown, Phone Morningside 1254," neglecting to give the street address or even the city of destination! When asked about the rest of the address he repeated the text four more times, and wound up by asking if my QRA is Los Angeles. He could not GBA, and the message is still undelivered because of an incorrect 'phone number. I still have 347 Browns to call and ask if they know anyone in Podunk who might send them a radiogram. If I connect with the right one, the message will be too old to be of any value. Give the man at the delivery end a chance.

— Robert O. Cook, W6WV

Practical Transmitting Circuits for Suppressor-Type Screen-Grid Tubes

(Continued from page 16)

volts. With the later box-type plate models, however, the bias is approximately — 45 volts. The carrier power output is now quartered, as with a Class-B linear amplifier — and modulation is in order. There are no other adjustments to be made in the r.f. circuits.

HIGH-POWER TRI-TET OSCILLATOR

The small excitation requirement previously mentioned especially fits this tube as a high-power Tri-tet oscillator that is actually easier on the crystal than the usual circuits using small tubes. The circuit of the arrangement shown in the photograph, from which we obtain 65 watts on the fundamental and 30 watts on the second harmonic with a 3500-kc. crystal, is given in Fig. 3. Except for its grid-filament portion, it is identical with the amplifier arrangement. This is a conventional Tri-tet circuit adapted for a filament-type tube, the cathode coil consisting of two sections effectively in parallel for r.f. As with any Tri-tet, the cathode tuning should be adjusted for maximum plate output (not for maximum cathode tank current or for maximum grid r.f. voltage). Maximum output occurs with d.c. grid current of only 5 ma. and crystal r.f. current of less than 50 ma., by actual measurement. And the output is free from frequency modulation when used for 'phone, with the same adjustment procedure just given for the amplifier. Could a completely modern and perfectly legal 15-to-20-watt 'phone be much simpler?
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**DUPLEX POWER SUPPLY**

1100 v. 250 ma. and 550 v. 250 ma. ............. $35.00

Uses four 83's in a bridge rectifier—completely filtered in both voltage legs.

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Lives there a ham with soul so dead
Who never to himself has said:
“What in heck has that mailman done
With the card from Contact Number One?”

—W1ABG

Among the articles carried by Col. Lindbergh on his recent tour of the countries bordering on the North and South Atlantic, and now on display at the American Museum of Natural History in New York, is a red-covered copy of The Radio Amateur's Handbook.

—Harry J. Johann

**Automatic G. C. With Diode Detection**

(Continued from page 88)

maximum sensitivity. It may be found that it is advantageous to make \(R_4\) adjustable, with \(SW_1\) shorting out all but part of it. All sets will not be alike in this respect, so a trial will be necessary to determine, by using the tuning meter, the exact change in cathode bias required to keep the meter reading the same with the c.w. beat oscillator on and off.

This reminds us of one feature, the tuning meter, which manufacturers have discontinued in the scramble for cheaper sets. The tuning meter is absolutely essential to obtaining the utmost from a set using a.g.c. Tuning without one is mostly guess-work on 'phone reception. The meter doesn't need to be highly accurate, either. One of the higher-resistance type (sold as voltmeters) which will carry the proper current (approximately 10 ma.) at full scale will do quite nicely. For a 58 or 78 tube this can be a Readrite Type 55 (No. 310) or its equivalent. The screen bias of the tube with which it operates can be varied a little until the desired reading is obtained at full sensitivity. Since it is not the purpose of this article to sell anything, it might be well to say that if there is a more expensive 10-ma. meter around that you don’t mind tying up this way, why go to it. The mechanical placing of the meter on the panel of the set is a matter of personal preference, but it is advisable to have it as close as possible to the tuning dial, so that it can be seen simultaneously with the latter.

There is another use for the tuning meter which should appeal to all. It makes an excellent
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NATICO transceivers can be supplied in three models, all of which have the same outward appearance.

**Type TR-1: Battery Model $10.95**

(less tubes and batteries)

This NATICO 5 meter transceiver is strictly portable, allowing two way communication even when being carried. This is accomplished by the fact that the two dry cells and 90 to 135 volt B battery are self contained in the one case.

**TUBES REQUIRED:** One 30 and One 33

**Type TR-2: Mobile Model $11.95**

(less tubes, battery or eliminator)

Specially designed for automobile use or wherever a 6 volt battery is available. The case has sufficient space to hold the 135 to 180 volts of B battery or a 6 volt B Eliminator which eliminates the necessity of all B batteries.

**TUBES REQUIRED:** One 76 and One 41

**Type TR-3: A.C. Model $16.95**

(including power supply, less tubes)

Here you have a portable A.C. transceiver which includes power supply in the same case (size only 6¼” x 7¼” x 12¼”). It can be operated anywhere that 110 volt A.C. is available.

**TUBES REQUIRED:** One 76, One 41 and One 80.

**ACCESSORIES:**

- Matched Tube Kits for —
  - TR-1: $1.95
  - TR-2: $1.75
  - TR-3: $2.15
  - 6 VOLT B Eliminator for TR-2: $11.50

- Natico’s Exclusive Distributors:
  - GROSS RADIO INC.
    - 51 VESEY ST.
    - NEW YORK CITY

R-meter for making carrier strength comparisons. For this purpose the maximum-signal plate current of the tube with which it is operated is “9” on the meter scale, with just enough points between here and 0 (maximum sensitivity) to give the required R-calibration. To mark the scale, remove the glass with its retainer just in front of the panel bezel with a small screw driver. With a little care, this can be accomplished without scratching the meter, leaving no visible marks to show that the instrument was ever apart. Then, when John Jones over in Jonesburg asks how he’s coming through, you can tell him he’s only R7 to-day instead of his usual R8, and know it’s so.

In conclusion, it is sincerely hoped that the diode-pentode system with automatic gain control has been explained here so that others will be able to use it and to go ahead with further improvements. The footnote references given, if carefully studied and coördinated, will be found to give essentially the same results as have been shown in this article.

Ham Station Analyzer
(Continued from page 38)

...easily whether the modulated amplifier or linear output amplifier is being operated properly. This is the reason for the cathode or filament bias resistor and the closed circuit jack which normally shorts out this resistor. If 135 volts of B battery are plugged into the jack, the bias resistor is automatically connected in the circuit and we have a linear detector. The plug should be in the jack before the battery is connected, as otherwise the batteries will short-circuit when the plug is inserted. Close coupling of the analyzer to the transmitter must now be avoided as the added plate potential supplies an ever-waiting current capable of wrapping the needle around the pin. “Kicks” with modulation show that there is over-shooting. It is obvious that by connecting ’phones in series with the batteries, an excellent listening monitor for ’phone is provided. It is no longer necessary to get the other fellow’s opinion of the transmitted signal. He may be confused by fading, static, or interference. In all likelihood, he doesn’t know as much as you do about good quality anyway.

**OUTPUT METER**

Still another use is as an output meter for receiver testing. By removing the coil and substituting a suitable resistance coupling unit, receivers of the superhet type may be readily aligned. Hum level may be checked and any improvement read directly on the meter. In fact, most any kind of vacuum-tube voltmeter measurement can be made. As stated before, most amateurs are interested in comparative rather than quantitative measurements. It is quite easy, however, to calibrate the instrument and secure accurate readings which may be kept for reference.

Constructional details require little comment due to the simplicity of the analyzer. The only precaution necessary in the wiring to the coil socket, tube, and tuning condensers is to make all
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Say You Saw It in QST — It Identifies You and Helps QST 77
leads as short and direct as possible. The various
pin straps within the coils should also be short,
particularly in the high-frequency coils. The
meter should be mounted and wired in last to
eliminate chance of damage to the meter during
construction. The circuit should be carefully
checked before inserting the tube and turning
on the battery, as one mistake will convert the
meter into a corpse for lamentation.

We have in the completed instrument a com­
 pact device, completely self-contained for most
measurements. External connections to the milli­
ammeter alone are provided by means of the two
insulated binding posts. All of the uses men­
tioned concern radio or audio frequencies. But
every amateur is also interested in the various d.c.
currents and voltages around the shack, not for­
getting resistances which have a habit of losing
their labels. Hence the one-mil meter used is a
stock Triplett type which has, in addition to the
usual linear scale, a number of voltage scales,
together with an ohmmeter scale. A companion
unit, also utilizing this meter, provides voltage,
current, and resistance measurements covering
practically every amateur requirement.

\[ \text{Strays} \]

If bakelite rod is not available, celluloid knitt­
ing needles, purchasable at any dry-goods store,
will make a good substitute. They can be ob­
tained in thicknesses from one-eighth to one­
quarter inch.

Dry-goods store also can furnish darning
needles, which are a great help in chasing fine
wires through the pins in coil forms.

\[ - T. \text{ Bruce Kingsford} \]

Weird wireless wisdom is not confined to this
country. ON4MO reports that the head man of
his local b.c. station explained the wobble in the
carrier frequency by the fact that two pow­
ful stations on either side of him were trying to el­
bow him out of the b.c. band. His weak carrier
couldn't stand the pressure and was wiggled
back and forth!

\[ \text{Low-Cost Crystal Control} \]

(Continued from page 80)
tained. However, it is not recommended that
the system be adjusted with no load and then the
load applied for, although it may not shift the
frequency of the TNT tank out of the allowable
band; it may place such a strain on the system
that any additional strain may throw the system
out of synchronism. Once the system is adjusted
it does not need the "retouching" at the begin­
ing of every working period that some fellows
give their crystal transmitters. At W5VU the
transmitter stays in synchronism from day to
day with as much, if not more, fidelity than the
ordinary crystal system. As a safeguard the fre­
quency is checked at the beginning of each trans­
mision, of course. The rougher the TNT's own
note the easier it synchronizes.
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Of course we sell our merchandise at a profit, otherwise we could not stay in business, BUT we keep our prices as low as is possible.

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1934 CATALOG

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— the result of 5 years of specializing in this field

When you want efficiency in your transmitter — start at the crystal stage by using PRECISION CRYSTALS. They give more power from the crystal oscillator unit which is so important with the transmitter of just a few stages.

Don’t practice false economy by purchasing ordinary crystals — it will pay you to buy PRECISION CRYSTALS.

PRECISION CRYSTALS are X-cut, one inch square from the best grade of Brazilian quartz, scientifically ground for maximum power output and thoroughly tested.

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The crystal note obtained from a crystal transmitter of this type is governed by the same factors that govern any other crystal set. The outfit has been in operation since early in August and it has never failed during a transmission; and ninety-five per cent of the contacts have been “XPDC” and the remaining five per cent “PDC.” The number of QSA5 R8 and R9 reports has increased about twenty per cent and ease of contacting has improved. The wave is much sharper. Local stations that had trouble working at all while the TNT was in operation report that the crystal controlled TNT covers only a small portion of the dial.

In summing up the results it can be said that the system has proved itself beyond all skeptical expectations. It is not “tricky” and is just as reliable as any other crystal system if care is used in its adjustment. Since the TNT oscillator furnishes most of its own excitation, the doubler does not furnish any great excitation to the TNT oscillator. For this reason the ’46 would probably control a one-kilowatt transmitter just as easily as it controls the 212-D and there is no worry about sufficient excitation. The subsequent locking of the two circuits in synchronism slightly increases the plate current of both tubes.

If any difficulty is experienced in keeping the TNT synchronized with the crystal, and the crystal and doubler have been checked and found to be functioning properly, the trouble can probably be attributed to insufficient radio frequency synchronizing current. This can be remedied by increasing the coupling between the doubler tank and TNT grid circuits.

W6ETX

(Continued from page 46)

XYL, who also holds the call W6CTZ, is second operator. The transmitter is a 40-meter crystal-controlled rig using a 47 oscillator, 47 doubler, 10 buffer and 203-A final. A 1500-volt plate supply for the last stage permits inputs in the neighborhood of 300 watts. A 40-meter Zepp, 40 feet high, gets the signals out into space. The receiver is a tuned-r.f. outfit using two-volt tubes—32 r.f., 30 detector, and two audio stages with 30’s.

DX worked on 7 mc. includes all states, Mexico, Cuba, Japan, Canada, Hawaii, and New Zealand.

Technical Questions Answered

(Continued from page 37)

connected between cathode (or filament center-tap) and negative high voltage, the total plate current of the tube flows through the resistor, causing a voltage drop across the resistor. If the grid return is connected to the negative high voltage end of the resistor, there will be a difference of potential between grid and filament equal
NEW! Wing produces an improved 5-meter transmitter-receiver, available shortly. Built with the basic features of earlier models yet improved to give still better performance. Porcelain antenna bushings with direct connections. Same model may be used with DC or AC. Higher output. No connections to back of case and complete unit may be lifted by unscrewing four thumb screws. Same solid aluminum box and attractive black wrinkled lacquer finish. An improved outfit at the same cost — only $16.50 less tubes.

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Radio Servicing
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NEW GAMMATRON
TRANSMITTING TUBE
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Bulletin on Weston Radio Instruments. __________
Address ____________________________
City and State ____________________________

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The Radio Amateur's HANDBOOK
in stiff Buckram covers
$2.00 postpaid

THE AMERICAN RADIO RELAY LEAGUE, INC.
West Hartford, Conn.

NEW FEATURES OF EARLIER MODELS YET IMPROVED TO GIVE STILL BETTER PERFORMANCE. PORCELAIN ANTENNA BUSHINGS WITH DIRECT CONNECTIONS. SAME MODEL MAY BE USED WITH DC OR AC. HIGHER OUTPUT. NO CONNECTIONS TO BACK OF CASE AND COMPLETE UNIT MAY BE LIFTED BY UNSCREWING FOUR THUMB SCREWS. SAME SOLID ALUMINUM BOX AND ATTRACTIVE BLACK WRINKLED LACQUER FINISH. AN IMPROVED OUTFIT AT THE SAME COST — ONLY $16.50 LESS TUBES.
A.R.R.L. EMBLEM
— insignia of the radio amateur

In the January, 1920, issue of QST there appeared an editorial requesting suggestions for the design of an A.R.R.L. emblem—a device whereby every amateur could know his brother amateur when they met, an insignia he could wear proudly wherever he went. There was need for such a device. The post-war boom of amateur radio brought thousands of new amateurs on the air, many of whose were neighbors but did not know each other. In the July, 1920, issue of QST the design was announced—the familiar diamond that greets you at the top of this page—adopted by the Board of Directors at its annual meeting. It met with universal acceptance and use. For fourteen years it has been the unchallenged emblem of amateur radio, found wherever amateurs gathered, a symbol of the traditional greatness of that thing which we call Amateur Spirit—treasured, revered, idealized.

DO YOU WEAR THE A.R.R.L. EMBLEM?
The League emblem, in heavy rolled gold and black enamel, is available in either pin or button type.

There are three special colors for Communications Department appointees...

- Red background for the SCM
- Blue background for the ORS
- Green background for the RM

Red and green available in pin type only; blue may be had in either pin or button style. All Emblems priced the same...

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American Radio Relay League
West Hartford, Connecticut

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SPECIAL
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$115

Something New!
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Price $2.50
Specify Round or Square Shank
BLAN, the Radio Man, Inc.
1776 Greenwich Street
New York City

to the voltage drop across the resistor and the grid will be negative by this amount in respect to the filament. Neglecting grid current which also flows through the resistor, the voltage drop across the resistor, in other words the grid bias voltage, will be equal to the product of the value of the resistance in ohms and the plate current in amperes. The actual bias will be somewhat higher than this calculated value due to the grid current previously mentioned in the case of all but Class-C amplifiers. The calculated value, will, however, be satisfactory for all practical purposes.

From the above, it follows that bias to complete plate current cut-off cannot be obtained, since at cut-off the plate current is zero and with zero plate current no voltage drop could be developed across the biasing resistor. The proper resistance in ohms for Class-C operation will be equal to the biasing voltage necessary for Class-C operation divided by the plate current in amperes; and the necessary wattage rating for the resistor may be determined from the product of the plate current in amperes squared and the resistance of the resistor in ohms. This method may be used, of course, for either transmitters or receivers. For transmitters, it is usually advisable to make the resistor variable for final adjustment. It should be remembered that, when using this system of biasing, the available plate voltage is lowered by the amount of biasing voltage used.

-D. H. M.

What About the Simple Receiver?

(Continued from page 13)

that the plate power-supply, if an eliminator, is free from tunable hums. If the receiver is quiet and stable throughout the entire range, the antenna may be connected. If hum and body capacity now appear at some part of the range, the antenna length should be investigated, as described previously. It should not be difficult to find a length which will permit stable operation in the amateur bands at least.

RESULTS

Despite inherent shortcomings, particularly with respect to selectivity, the service-per-dollar ratio of a two-tube receiver of this type can be satisfyingly high. Listening in on the gadget restores one’s faith in the ability of inexpensive apparatus to do a good job for the amateur who makes up in enthusiasm and operating ability what he lacks in cash. The operating ability, in fact, is bound to be acquired; one can’t do the concentrating required to pull a wanted signal out of a mess of QRM without learning something. There are plenty of times, though, when QRM is not much of a problem, and at such times the two-tuber can hold its own with the best of them. Don’t be surprised if the signal strength is considerably more than “comfortable” headphone volume; modern receiving tubes have a real punch. And the DX still rolls in on a detector-and-one-step.
HOW’S YOUR SUPPLY OF —

Write your radio letters on League stationery — it identifies you. Lithographed on 8½ x 11 heavy bond paper. Postpaid. 100 sheets, 50c; 250 sheets, $1.00; 500 sheets, $1.75.

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Recognized Standard in Radio Instruction Since 1909

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Franklin filament transformers: 2½ v. c. t. 6 A.; 2½ v. c. t. 9 A.; 7½ v. c. t. 3 A.; and 6½ v. c. t. 3 A., each .......... $2.89
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Bruno condenser microphone kits .............................. $2.94
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KEEPING A LOG

FEDERAL Radio Commission regulations require that every amateur station keep an accurate log of each transmission. The well-kept log is invaluable in checking your station operation. It is a permanent record and is a source of enjoyment in reviewing. The ARRL Log Book has been designed to meet all requirements. As will be seen by the illustration below, it provides for everything.

DELCIVERING MESSAGES

GOOD operating practice demands neatness in message deliveries. We believe there is no better way to accomplish this than to make deliveries on official ARRL radiogram blanks. Designed by the Communications Department, they meet your needs. If a message is worth taking it is worth delivering in the best possible manner. Use the ARRL message blanks for deliveries and they will contribute to the prestige of your station.

"Marker" Stations

FOR calibration of a frequency meter, the accurate transmissions scheduled for this purpose by A.R.R.L. Standard Frequency Stations (W1XP, W9XAN and W6XK) and the Bureau of Standards 5000-kc. transmissions from WWV serve amateurs most excellently. Many broadcasting station standards of frequency are also kept in excellent condition and check-measurements may, therefore, be based on some broadcast band transmissions with expectation of only very small deviations.

Some, not all, commercial and government stations, especially some of those operating adjacent to the amateur bands, likewise serve as most useful guideposts, for checking receiver and frequency meter calibrations. Those stations which identify themselves frequently, whose transmissions may be widely heard because of consistent regular operation (and dependent on power and frequency, too), make the best "markers" of this type. A.R.R.L. recently submitted a long list of stations to the League's Official Observers requesting comments as to which stations could be heard in each section of the country, as well as information on the observed constancy of frequency, which is, of course, a matter of vital concern in making up a list of the best marker stations. Thanks are due all O.O.'s, with particular credit to Mr. Hannah of W2US for helpful data on "marker stations." — F. E. H.

Skeleton List

<table>
<thead>
<tr>
<th>Call Frequency</th>
<th>Call Frequency</th>
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<tbody>
<tr>
<td>NAA 3475</td>
<td>WLY 13867</td>
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<tr>
<td>NAA 4015 ±½ kc.</td>
<td>WQP 13900</td>
</tr>
<tr>
<td>GBS 6905 ±½ kc.</td>
<td>WIK 13929</td>
</tr>
<tr>
<td>WEE 6920 ±1 kc.</td>
<td>KWT 13950 ±3 kc.</td>
</tr>
<tr>
<td>WKP 6950 ±1 kc.</td>
<td>GMR 14415 ±1 kc.</td>
</tr>
<tr>
<td>WIZ 6965 Good.</td>
<td>GBW 14440 ±¾ kc.</td>
</tr>
<tr>
<td>WLM 6990 Good.</td>
<td>WNC 14470 ±½ kc.</td>
</tr>
<tr>
<td>DHE 7324</td>
<td>WQL 14815 ±½ kc.</td>
</tr>
<tr>
<td>WEM 7400 ±1 kc.</td>
<td>HHA 16040 ±½ kc.</td>
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<tr>
<td>WEV 7780 ±1 kc.</td>
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Supplementary List

<table>
<thead>
<tr>
<th>Police Stations 1712</th>
<th>WEA 10610</th>
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<tbody>
<tr>
<td>CGZ/CGH 2020</td>
<td>WEX 13450</td>
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<tr>
<td>WED 3275</td>
<td>WHR 13420</td>
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<td>W1XJ 3492.5</td>
<td>WKD 13435</td>
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<td>WQN 5260</td>
<td>WEX 13450</td>
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<td>WQO 6725</td>
<td>WKC 13465</td>
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<td>WEJ 6740</td>
<td>WGT 13705</td>
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<td>KEN 6845</td>
<td>WAJ 13480</td>
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<tr>
<td>KEB 6890</td>
<td>WEB 14770</td>
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<tr>
<td>TIR 6980 ±6 kc.</td>
<td>WQV 14800</td>
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<tr>
<td>HPC 6985 ±6 kc.</td>
<td>WQL 14815</td>
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<td>WEZ 6075</td>
<td>WKM 15860</td>
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<td>WEC 6930</td>
<td>WDS 18900</td>
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<td>WTT 18940</td>
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<td>WKW 19020</td>
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<td>WES 6950</td>
<td>WQQ 20260</td>
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<td>WJK 6960</td>
<td>WQA 21220</td>
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<tr>
<td>WET 6970</td>
<td>WQW 21300</td>
</tr>
</tbody>
</table>

American Radio Relay League
West Hartford, Connecticut
ALL Dressed Up
... and Going Places

NEW Type TD OIL* X-mitting Condensers

*Special high-voltage breakdown oil impregnation; large glazed porcelain insulators; handsome silver-finished case. In a word, a real "ham" job!

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Cap, Mfd.</th>
<th>Size (H-W-D)</th>
<th>List Price</th>
<th>Your Cost*</th>
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<td>TD-6010</td>
<td>1</td>
<td>2 x 2 x 2</td>
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<td>TD-10010</td>
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<td>2 x 6 x 6</td>
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<td>$2.50</td>
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<td>2 x 6 x 6</td>
<td>1/2 x 1/2</td>
<td>4.50</td>
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<td>4</td>
<td>2 x 6 x 6</td>
<td>1/2 x 1/2</td>
<td>7.00</td>
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<tr>
<td>TD-15010</td>
<td>1</td>
<td>2 x 8 x 8</td>
<td>1/2 x 1/2</td>
<td>$3.75</td>
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<td>2</td>
<td>2 x 8 x 8</td>
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<td>4</td>
<td>2 x 8 x 8</td>
<td>1/2 x 1/2</td>
<td>16.00</td>
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</tbody>
</table>

NOW AVAILABLE—"Ham" Catalog No. 126—Write for it
CORNELL-DUBILIER CORPORATION
JOBBER'S DIVISION
4373 Bronx Blvd. New York City

FOR CLEAN MODULATION

You can check modulation patterns as easily as current or voltage with an electron oscillograph.

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therefore may be used as a Bleeder, Voltage Divider, Grid Bias, Blocked Grid Keying, Grid Leak, or Voltage Dropper. Loosening the screw on the band permits adjustment of the resistance. Potentiometer connections can be obtained by using end terminals and band connections. Send for FREE descriptive booklet 507.

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City and State ............................................
Call Signal ..............................................

SEND FOR CATALOG

To Our Readers who are not A.R.R.L. members

YOU should become a member of the League! That you are interested in amateur radio is shown by your reading of QST. From it you have gained a knowledge of the nature of the League and what it does, and you have read its purposes as set forth on the page opposite the editorial page of this issue. We should like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio. You will have QST delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

A bona fide interest in amateur radio is the only essential qualification for membership

AMERICAN RADIO RELAY LEAGUE
West Hartford, Conn., U.S.A.

I hereby apply for membership in the American Radio Relay League, and enclose $2.50 ($3.00 outside of the United States and its Possessions, and Canada) in payment of one year’s dues, $1.25 of which is for a subscription to QST for the same period. Please begin my subscription with the issue. Mail my Certificate of Membership and send QST to the following name and address.

Standard Frequency Transmissions

<table>
<thead>
<tr>
<th>Date</th>
<th>Schedule Frequency</th>
<th>Date</th>
<th>Schedule Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 1</td>
<td>B W9XAN</td>
<td>July 4</td>
<td>(Holiday—No transmission)</td>
</tr>
<tr>
<td>June 6</td>
<td>C W9XAN</td>
<td>July 6</td>
<td>B W9XAN</td>
</tr>
<tr>
<td>June 8</td>
<td>B W9XAN</td>
<td>July 8</td>
<td>BB W9XAN</td>
</tr>
<tr>
<td>June 13</td>
<td>BB W9XAN</td>
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<td>June 15</td>
<td>BB W6XK</td>
<td>July 15</td>
<td>A W9XAN</td>
</tr>
<tr>
<td>June 16</td>
<td>BX W6XK</td>
<td>July 16</td>
<td>W6XK</td>
</tr>
<tr>
<td>June 17</td>
<td>C W6XK</td>
<td>July 17</td>
<td>A W9XAN</td>
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<tr>
<td>June 22</td>
<td>A W6XK</td>
<td>July 22</td>
<td>B W9XAN</td>
</tr>
<tr>
<td>June 29</td>
<td>B W9XAN</td>
<td>July 29</td>
<td>B W6XK</td>
</tr>
</tbody>
</table>

STANDARD FREQUENCY SCHEDULES

<table>
<thead>
<tr>
<th>Time (a.m.)</th>
<th>Sched. and Freq. (kc.)</th>
<th>Time (p.m.)</th>
<th>Sched. and Freq. (kc.)</th>
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</thead>
<tbody>
<tr>
<td>6:00</td>
<td>7000</td>
<td>4:00</td>
<td>7000</td>
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<tr>
<td>6:08</td>
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<tr>
<td>6:32</td>
<td></td>
<td>4:32</td>
<td></td>
</tr>
</tbody>
</table>

The time specified in the schedules is local standard time at the transmitting station. W1XP uses Eastern Standard Time, W9XAN, Central Standard Time, and W6XK, Pacific Standard Time.

TRANSMITTING PROCEDURE

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

2 minutes—QST QST QST de (station call letters).
3 minutes—Characteristic letter of station followed by call letters and statement of frequency. The characteristic letter of W1XP is “G”; that of W9XAN is “O”; and that of W6XK is “M.”

A Medium Power 56-Mc. Transceiver

(Continued from page 88)

insertion of the battery cable prongs. If more than 3 volts are required for the microphone, a five-wire cable with five-prong sockets and the tube bases should be used—the extra wire being employed for the higher microphone voltage.

The total filament current is 0.56 amperes and the microphone current anywhere from 20 to 60 milliamperes, depending on the resistance of the microphone used. If long periods of operation are contemplated in a semi-portable setting an air-cell battery might be used, or it might be desirable to replace the 30 with a 19, connect all filaments in series, and operate them from a four-cell, 6-volt, hot-shot dry battery, or from a storage battery. Two dry cells will have a life of about 60 hours with interrupted use however—all that is needed for portable work.

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Type "O" Antenna System

forelliclenttransmlsslon

"Twisted pair and tuned feeders worked poorly here. With the installation of the 'O' and transposed line, DX results have suddenly become very gratifying." W1ZD.

W6FOY says, "East coast reports 1 to 2 R's better with the 'O.'"

A new portable 5-Meter "Q" is described in Bulletin 101.

Bulletins describing these and other Johnson products are available from Authorized Johnson Distributors.

Transposition Insulators
(Patents Pending)

For receiving and transmitting feeders. Light weight, easy to install, efficient. Insulation resistance more than 150 megohms, measured WET! Coax no more than inferior imitations. List Price 15c.

E. F. Johnson Company
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New Classes New Forming! Send for 40-page catalog, explains fully. 180 licensed graduates placed in past 2½ years in broadcasting, shipping, police radio, aviation, etc. We teach all branches. Oldest, largest and best equipped school in New England. Equipped with Western Electric sound and broadcasting equipment and RCA marine transmitter. Course prepares for United States Government telegraph or telephone license.

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READ CODE LIKE AN EXPERT!

Learn Quickly at Home; Get Real Speed

It's easy, fascinating, to become a good op with the New MASTER TELEPLEX Code Teacher to help you. Only instrument ever produced which records your sending in visible dots and dashes - then sends back to you. Also sends practice work, recorded by an expert, at any speed you want. Thousands agree this method is surest, quickest. Used by U.S. Army, Navy, A. T. & T., R. C. A., and others. We furnish Complete Course, lend you Master Teleplex, give you personal instruction with a MONEY-BACK GUARANTEE. Low cost. Send today for booklet Q. 18; no obligation; post card will do.

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NEW YORK, N. Y.

FREE BOOK

HARVEY TRANSCEIVER
Compare Before You Buy

The most compact 56 Mc. unit on the market embodying the following outstanding FEATURES:

1. Rugged, yet light in weight — only 4½ lbs.
2. SMALL in size — easily portable — 6½x3½x3½ inches.
3. Can be furnished for 8.6 and 10 meter bands.
4. Completely shielded in attractive wrinkle finished metal case.
5. Established results — 50 miles auto to auto — 95 miles from mountain top — 150 miles in airplane tests.
6. Choice of 3 models, and the price is right.

2-volt... $18.75 6-volt... $17.95 A.C... $19.50

Tubes.... 2.A 1.68 1.68

We supply selected Raytheon tubes especially tested for 56 Mc. operation.

Special Pickard type antenna system... $2.25

French type handset available with 2000 ohm receiving unit.

Requires no special transformer.

All prices are net f.o.b. Brookline and subject to change without notice. Write for literature on the above apparatus. Your inquiry will receive personal attention.

HARVEY RADIO LABORATORIES
12 Boylston Street, Brookline, Mass.

HOW’S YOUR GOLF?
SEE INSIDE FRONT COVER
FOR AMATEURS ONLY!

Here you are—the Ross Jupiter—a set designed specifically for the radio amateur. NOT an all-wave receiver with a few concessions to the amateur but a true precision instrument that will bring you a new thrill in reception on the four popular amateur bands.

You’ll get a real kick out of operating it. You’ll be proud to show it to friends. Moderately priced.

Write for free descriptive folder

A. H. ROSS AND COMPANY
Keswick Ave. & Waverly Rd.
GLENSIDE, PENNA.
(Suburb of Philadelphia)

1 minute—Statement of frequency in kilocycles and announcement of next frequency.

2 minutes—Time allowed to change to next frequency.

W1XBP: Massachusetts Institute of Technology, Round Hill Research, South Dartmouth, Mass., Henry G. Houghton in charge.


W6XK: Don Lee Broadcasting System, Los Angeles, Calif., Harold Peery in charge.

WWV 5000-Kc. Transmissions

The 5000-kc. transmissions of the Bureau of Standards’ station, WWV, are given every Tuesday continuously from 1200 noon to 200 p.m., and from 1000 p.m. to midnight, E.S.T. These transmissions are accurate to 1/2 cycle (one in ten million).

—J. J. L.

A Simple Mounting for the Cathode-Ray Tube

(Continued from page 18)

a precaution a piece of three-ply wood served as a base for the tube socket. This is shown in the photograph. Shielded ignition cables carry the socket connections from the tube to four Fahnstock clips on the breadboard base.

It is now time for a coat of black Duco over the entire exterior of the mount. The inside of the hood is also given a coat to keep from reflecting light on the tube screen.

A “doped” piece (for rigidity) of heavy cardboard serves as a ring to center the tube in the barrel. Our tube needed a ring with an outside diameter of 17/8 inches and 25/8 inches inside diameter with slots to slide over the deflecting plate terminals of the 905. The 906 tube has these terminals at the base. The external connections of the deflecting plates are 2 sets of Type 274-Y and 138-VD GR bushings and terminals. The center or fifth terminal is the grounded positive high voltage terminal which grounds to the metal shield. The high resistance resistors are connected inside the barrel at the base of the GR terminals. Unshielded ignition cable is used between the tube deflecting plate terminals and the terminals on the barrel. With the 906 tube this would not be necessary, for these terminals would be at the base of the tube, logically mounted on the back of the barrel cover.

The swivel joint is just an added feature and, while convenient, is not absolutely essential. It is mounted on a block of wood above and screwed into a block of wood mounted on the breadboard at the base. A “saddle” of aluminum strip is formed to go partially around the barrel and bolted to the latter, serving to fasten the swivel to the barrel.

With the addition of the rectangular bakelite panel to carry the two control resistors of the oscilloscope, the mounting is complete. The separate power-supply and sweep-circuit units are conventional, following designs given in March and April QST.

—C. C. R.
Oscillating Crystals

"SUPERIOR BY COMPARISON"

All "Scientific Radio Service Crystals" are accurately ground to an accuracy better than .03% on equipment tested regularly by the U. S. Bureau of Standards standard frequency signals.

BROADCAST and COMMERCIAL BANDS

Mounted in our Standard Holder and ground to our usual high degree of accuracy $35.00 each. Mounted in our NEW Isolantite Monel Metal Crystal Holder $45.00 (adjustable air gap). Prices for other Frequency Bands quoted upon application.

AMATEUR BAND

Ground to within FIVE Kilo-cycles of your specified frequency in either 80 or 160 meter bands $15.00 each. Accurate calibration with each crystal. Free! Send for New Illustrated Folder—Free!

PROMPT SHIPMENTS ASSURED

Scientific Radio Service

"The Crystal Specialists" Since 1925

124 Jackson Ave., University Park
Hyattsville, Maryland Dept. Q-6

THE INSTRUCTOGRAPH

(Code Teacher)

The Scientific, easy and quick way to learn the code. Send a post card today for literature. Machines, tapes and complete instructions for sale or rent. Terms as low as $3.00 per month. Rental may be applied on purchase price if desired. Rent for a month. If the Instructograph meets every requirement, buy it. If not, send it back.

INSTRUCTOGRAPH CO., 912 Lakeside Place, Chicago

NEW ULTRA-HIGH FREQUENCY PORTABLE COMBINATION TRANSMITTER-RECEIVER

NEW HIGHLY EFFICIENT CIRCUIT

Many New Built-In Features

Tone Telegraph and Voice—Sidetone in Phones on Transmission—Rheostat, On-Off Switch, Real Jacks—Complete Instruction Book—Uses One Type 30 and One Type 33-Sizes 7 3/4" square, go deep. Weight 7 lbs. —Black Wrinkle Finish

PRICE $17.40 NET

At Your Nearest Dealer or Our Factory

The HAIGIS LABORATORIES, INC.

MAPLE SHADE, N. J.
Pioneers in the Ultra-High Frequency Field

Say You Saw It in QST — It Identifies You and Helps QST
(1) Advertising shall pertain to radio and shall be of nature of interest to radio amateurs or experimenters in both the new and old art.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters be used which would tend to make one advertisement stand out from the others.

(3) The HAM-ADS rate is 60¢ per word, except as noted in paragraph (6) below.

(4) Closing date for HAM-ADS is the last day of the second month preceding publication date.

(5) A special discount will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League.

(6) Remittance in full must accompany copy. No cash or contract discount or agency commission will be allowed.

(7) Copy for HAM-ADS must be submitted in typescript, typewriter, or typewriter carbon copy.

(8) All forms used will apply to advertising which, in our judgment, is obviously non-commercial in nature and is placed and signed by a member of the American Radio Relay League.

(9) The rate is subject to change without notice.

(10) HAM-ADS will be printed regardless of which rate may apply.

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.


Wheeler 25/275 Volt generator, $7.50. Henry Kienzle, 501 East 18th St., Brooklyn, N. Y.

SELL-----new 160 meter phone transmitter: 25 watt carrier; 100% modulation. Stamp for description. R. Howard, W9UW, 4712 East 4th St., Tulsa, Okla.

NEW Universal "KK" mike complete with chrome stand, $25. Standard 5 foot inch red rubber and tipped, $11. Siberly, 9208 Frankstown Road, Wilkinsburg, Penna.


TRADING—new automatic record changer pickup in carrying case for amplifier, radio or sound recording equipment. Also have UX552, Write Plattten Radio, Green Bay, Wis.

QSL by Maleco. Finest in country. Free samples. Maleco, 1512 Eastern Parkway, Brooklyn, N. Y.

SALE or trade. All or any section of unit transmitter. Photographs. All letters answered. W5CIN, Childress, Texas.

BROADCAST quality condenser microphone for your phone transmitter only $55.00 net. Factory-assembled and tested-head (same head used Shure Model 40C Studio Type Condenser Microphone) and all essential parts (no case, chassis or cable) for two-stage condenser amplifiers using 200K. Includes factory-assembled head, two marked sockets, all necessary resistors, couplers and by-pass condensers, 200/60 ohm output transformer, wiring diagram and complete instructions. Fully guaranteed. Half cash with order, balance C. O. D. Shure Brothers Company, "Microphone Headquarters," 215 West Huron Street, Chicago, Ill.

SELL--long wave receiver. W9DIB, Mitchellville, Iowa.

TRANSMITTERS manufactured to order. Transmitters re-constructed. Holmes C. Miller, Box 105, Palo Alto, California.

SWAP aluminum for fone equipment, etc. WBBCH.


QSLs, cards, two color, cartoons, message blanks, stationery, supply service. Write for free samples to-day. W1BEF, 16 Stockbridge Ave., Lowell, Mass.

STAMP collecting amateurs, American and foreign, write W9WEL.

PHOTO stamps—lickem, stickem on any card. 25¢, 50¢; 50, 75¢; 100, $1. Samples 3¢. prepaid. W8KY, 441 Prospect St., Muskegon, Mich.

SELLING—pp-t.p.t.g. 10 transmitter. Write for details. W6FWL.

CLASS B transformers—Universal for two or four 450, 219's, 800's, RK18's, etc. $1.75. Perfect working condition. All-transmitter transformers re-priced. Prices for broadcast station use. W5WZ, 4021 Davis Ave., Cheviot, Ohio.

WANTED: old radio magazines, also engineering subjects. Write list and price. W9LBI.

QSTs, complete file from December 1925 to December 1930. Make offer. Bates Radio, 274 Main St., Worcester, Mass.

QSTs back issues. List and prices on request. W9LBI.


NEW Universal "KK" mike complete with chrome stand, $25. Standard 5 foot inch red rubber and tipped, $11. Siberly, 9208 Frankstown Road, Wilkinsburg, Penna.


Sell out all equipment of W2DYJ—need cash—Bargains in meters, chokes, tubes, transformers, condensers, crystals, etc. Send for list. Michael Solomon, 24 East 23 Street, N. Y. C.

TRANSMITTER, ral controlled, Cross-built GC-100, three stages, 50 watt final with three Watson meters. In black metal can. Less tubes and power supply. First $23 money order takes it. Michael Solomon, 24 East Street, N. Y. C.

PHOTOGRAPHIC QSLs. $2.15 per hundred. W2FJE, 151 Fifth Ave., Pittsburgh, Pa.

Send for list. Michael Solomon, 24 East 23 Street, N. Y. C.


TRANSMITTING and rectifying tubes restored normal operation. Our 25 years experience at your disposal in designing circuits. Lots of ham supplies, new low prices, catalog. Lyon-Watt Rectifier Engineering Service.

New half wave mercury vapor rectifiers 10,000 volt peak in stock—shipped prepaid: Patterson PR-10s complete, $112.50; Patterson All-wave (15 to 400) ten tube super-beats beautiful consoles $59.70; Sargent, Cardwell, Universal, Johnson, Ohmite, others. Code machines rented. Write Henry's Radio Shop, Butler, Mo.

In stock—shipped prepaid: Patterson PR-10s complete, $70.25; Patterson prefabricators, tube 16-650 meters, complete $15; Comet Pros, $122.50 extra. A V.O. $17.40 extra. Astatic crystal miles $104.12 $25. Trimman featherweight phones, $5.88; Sprague transmitting condensers; all Biddle crystals and holders. The following not prepaid: National Oscillographs, $17.70; FBMAs, $34.20; FBMXs, $47.70, coils $6, 5897As, $15.90; SWs $17.70, coils $3, prefabricators $11.40, coils $3.60; AS-600D Supers, $11.25. Trade in your old receiver, 40%, off secondhand, Hammarlund, Meurinolt, Silver, Cardwell, Universal, Johnson, Ohmite, others. Code machines rented. Write Henry's Radio Shop, Butler, Mo.

UNIVERSITY COURSE IN RADIO COMMUNICATION

Open to high school graduates. Complete in nine months. High standard of instruction and equipment. Fall term opens September 14.

UNIVERSITY OF WISCONSIN—Extension Division

623 West State Street

Milwaukee, Wisconsin

LOW RANGE FUSES

LittleFuse for Instruments: Ampm. 1/100, 1132, 1/16—20ca. 1/8, 1/4, 5/8, 1/2—15ca. 1, 2—10ca. For milliammeters, oscilloscopes, etc. 1/3 for circuits. High Voltage

LittleFuse: 1000, 5990, 10,000 volt ranges (in 1/4, 1/2, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/512, 1/1024, 1/2048, 1/4096, 1/8192, 1/16384, 1/32768, 1/65536, 1/131072 volt ranges)

NOW—$100 PROTECTION GUARANTY. Get New Cat. J.

LITTLEFUSE LABS. 4509 Rensselaer Ave., Chicago

Are You "Stuck"? LEARN CODE QUICKLY AND EASILY and become a Skilled Amateur or Radio Operator... AT HOME

Watson, W1BGL, op Bear of Oakland, Byrd Expedition, says: "Candie training enabled me to pass rigid competitive tests for this position."

Many instructors and ops in U. S. Army, Navy and Aviation are Candie trained.

The FASTEST and most SKILLED Amateurs and Commercial operators of the past 22 years were Candie trained. 9 year old girl wins championship in Class "E" 3 months after beginning our Code Course for Beginners.

If you're wise you'll get your SPEED where the champions get theirs and prepare for that Amateur or Commercial Ticket the CANDLER SCIENTIFIC WAY. It's EASY and INTERESTING.

CANDLER STUDENTS NEVER FLUNK. Tell us what ticket you're preparing for and we'll show you how easy it is to get.

SEND FOR BOOK OF FACTS for Radio Ops, Amateurs and Beginners. Your questions answered promptly. No obligation.

CANDLER SYSTEM CO.
Dept. O-6
6343 S. Kedzie Avenue, Chicago

LOW RANGE FUSES

LittleFuse for Instruments: Ampm. 1/100, 1132, 1/16—20ca. 1/8, 1/4, 5/8, 1/2—15ca. 1, 2—10ca. For milliammeters, oscilloscopes, etc. 1/3 for circuits. High Voltage

LittleFuse: 1000, 5990, 10,000 volt ranges (in 1/4, 1/2, 1/8, 1/16, 1/32, 1/64, 1/128, 1/256, 1/512, 1/1024, 1/2048, 1/4096, 1/8192, 1/16384, 1/32768, 1/65536, 1/131072 volt ranges)

NOW—$100 PROTECTION GUARANTY. Get New Cat. J.

LITTLEFUSE LABS. 4509 Rensselaer Ave., Chicago
Your Nearest Dealer

Your nearest dealer is entitled to your patronage. You can trust him. He is equipped with a knowledge and understanding of amateur radio. He is your logical and safe source of advice and counsel on what equipment to purchase.

Patronize the dealer nearest you—

<table>
<thead>
<tr>
<th>Location</th>
<th>Dealer Name</th>
<th>Address</th>
<th>Specialties</th>
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</thead>
<tbody>
<tr>
<td>Allentown, Pennsylvania</td>
<td>Radio Electric Service Co.</td>
<td>1024 Hamilton Street</td>
<td>Complete stocks transmitting equipment</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>Northern Ohio Laboratories</td>
<td>2073 West 85 Street</td>
<td>Wholesale Distr. for National, Hammarlund, Thordarson, Cardwell</td>
</tr>
<tr>
<td>Baltimore, Maryland</td>
<td>Radio Electric Service Co.</td>
<td>303 W. Baltimore Street</td>
<td>Everything for the amateur</td>
</tr>
<tr>
<td>Cleveland, Ohio</td>
<td>Radio Servicemen's Supply Co.</td>
<td>206 Prospect Street</td>
<td>Wholesale Distributors catering to Amateurs, Dealers, Servicemen</td>
</tr>
<tr>
<td>Boston, Massachusetts</td>
<td>Nutter &amp; Cross, Inc.</td>
<td>99A Milk Street</td>
<td>All OMs, OWs, and YLs welcome — W1HRF</td>
</tr>
<tr>
<td>Denver, Colorado</td>
<td>Inter-State Radio &amp; Supply Co.</td>
<td>1639 Tremont Place</td>
<td>Amateur Radio Headquarters in the Rocky Mountain Region</td>
</tr>
<tr>
<td>Brockton, Massachusetts</td>
<td>Ware Radio Supply Company</td>
<td>913 Centre Street</td>
<td>Everything in parts. Comet Pro in stock with crystal filter</td>
</tr>
<tr>
<td>Buffalo, New York</td>
<td>Kronson Service Company</td>
<td>143 East Genesee Street</td>
<td>Western New York's largest wholesale distributors — W8EHF</td>
</tr>
<tr>
<td>Charlotte, Michigan</td>
<td>General Engineering Corporation</td>
<td></td>
<td>Everything for the Transmitter Station</td>
</tr>
<tr>
<td>Detroit, Michigan</td>
<td>Radio Equipment Sales Co.</td>
<td>14036 Woodward Avenue, Highland Park</td>
<td>A complete stock of amateur, shortwave and service parts</td>
</tr>
<tr>
<td>Erie, Pennsylvania</td>
<td>Jordan Radio Laboratory</td>
<td>1019 East Fifth Street</td>
<td>Amateur service parts, including Bliley, National, Raytheon. W8CXG</td>
</tr>
<tr>
<td>Hartford, Connecticut</td>
<td>Radio Inspection Service Company</td>
<td>227 Asylum Street</td>
<td>Yes, we'll take your old set in trade</td>
</tr>
<tr>
<td>Houston, Texas</td>
<td>Straus-Frank Company</td>
<td></td>
<td>Distributors for nationally advertised amateur products</td>
</tr>
<tr>
<td>Kansas City, Missouri</td>
<td>Burstein-Applebee Company</td>
<td>1012-14 McGee Street</td>
<td>RCA-DeForest transmitting tubes</td>
</tr>
<tr>
<td>Kansas City, Missouri</td>
<td>Radio Laboratories</td>
<td>1515 Grand Avenue</td>
<td>&quot;Specialists&quot; in supplies for the Amateur and Serviceman</td>
</tr>
<tr>
<td>Los Angeles, California</td>
<td>Radio Manufacturers Supply Co., Inc.</td>
<td>1000 S. Broadway</td>
<td>Amateur Headquarters — Complete Stock — Quality Parts</td>
</tr>
<tr>
<td>Manchester, New Hampshire</td>
<td>Radio Service Lab. of N. H.</td>
<td>1008 Elm Street</td>
<td>Amateur Headquarters of the Pacific Coast</td>
</tr>
</tbody>
</table>

This advertisement is paid for by the firms listed above. Qualified dealers.
Is Your Best Friend

you should buy. His stock is complete. He can supply your needs without delay. His prices are fair and consistent with the high quality of the goods he carries. He is responsible to you and interested in you.

You can have confidence in him

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<tr>
<th>MILWAUKEE, WISCONSIN</th>
<th>SAN ANTONIO, TEXAS</th>
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<tr>
<td>Radio Parts Company, Inc.</td>
<td>Straus-Frank Company</td>
</tr>
<tr>
<td>332 West State Street</td>
<td>Distributors for nationally advertised amateur products</td>
</tr>
<tr>
<td>Complete stock Nationally Known products</td>
<td>RCA-DeForest transmitting tubes</td>
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<tr>
<th>NEWARK, NEW JERSEY</th>
<th>SAN FRANCISCO, CALIFORNIA</th>
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<tbody>
<tr>
<td>Kaltman &amp; Romander</td>
<td>Offenbach Electric Company, Ltd.</td>
</tr>
<tr>
<td>62 Court Street</td>
<td>1452 Market Street</td>
</tr>
<tr>
<td>Drop in for an over-counter QSO</td>
<td>&quot;The House of a Million Radio Parts&quot;</td>
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<tr>
<th>PHILADELPHIA, PENNSYLVANIA</th>
<th>SHANGHAI, CHINA</th>
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<tbody>
<tr>
<td>Freeland Radio Supply Co.</td>
<td>Amateur's Home, Ltd.</td>
</tr>
<tr>
<td>5 N. 7th Street</td>
<td>323 Kiangse Road</td>
</tr>
<tr>
<td>&quot;If it's radio we have it&quot;</td>
<td>Radio Manufacturer, Wholesaler and Retailer</td>
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<tr>
<th>PHILADELPHIA, PENNSYLVANIA</th>
<th>SPRINGFIELD, MASSACHUSETTS</th>
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<tr>
<td>Radio Electric Service Co., Inc.</td>
<td>T. F. Cushing</td>
</tr>
<tr>
<td>N. E. Cor. Seventh &amp; Arch Sts.</td>
<td>345 Worthington Street</td>
</tr>
<tr>
<td>All nationally advertised lines in stock</td>
<td>An amateur, endeavoring to sell good parts</td>
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<tr>
<th>PHILADELPHIA, PENNSYLVANIA</th>
<th>SYRACUSE, NEW YORK</th>
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<tr>
<td>Eugene G. Wile</td>
<td>Roy C. Stage, W81GF</td>
</tr>
<tr>
<td>10 S. Tenth Street</td>
<td>Complete stock of standard Ham &amp; BCL parts</td>
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<tr>
<th>PITTSBURGH, PENNSYLVANIA</th>
<th>T. F. Cushing</th>
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<tbody>
<tr>
<td>Cameradio Company</td>
<td>101 Queen Street, West</td>
</tr>
<tr>
<td>603 Grant Street</td>
<td>We specialize in service! Try it!</td>
</tr>
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<tr>
<th>PROVIDENCE, RHODE ISLAND</th>
<th>TORONTO, CANADA</th>
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<tbody>
<tr>
<td>32 Broadway, Room 23</td>
<td>101 Queen Street, West</td>
</tr>
<tr>
<td>Amateur Equipment — National, Hammarlund, RCA Tubes</td>
<td>We specialize in service! Try it!</td>
</tr>
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<tr>
<th>ST. LOUIS, MISSOURI</th>
<th>TORONTO, CANADA</th>
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<tbody>
<tr>
<td>Walter Ashe Radio Company</td>
<td>Wholesale Radio Company, Limited</td>
</tr>
<tr>
<td>1100 Pine Street</td>
<td>355 Danforth Avenue</td>
</tr>
<tr>
<td>W9FIS in charge of the oldest and largest parts store in St. Louis</td>
<td>Canada's Largest Amateur Supply House</td>
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<tr>
<th>ST. PAUL, MINNESOTA</th>
<th>TRENTON, NEW JERSEY</th>
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<tr>
<td>Lew Bonn Company</td>
<td>American Radio Co.</td>
</tr>
<tr>
<td>2484 University Avenue</td>
<td>5 N. Broad Street</td>
</tr>
<tr>
<td>Rex L. Munger, W9LIP, Sales Engineer</td>
<td>Central Jersey's leading radio parts store</td>
</tr>
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<tr>
<th>WILMINGTON, DELAWARE</th>
<th>WASHINGTON, D. C.</th>
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<tbody>
<tr>
<td>Wilmington Electric Specialty Co., Inc.</td>
<td>George's Radio Co.</td>
</tr>
<tr>
<td>405 Delaware Avenue</td>
<td>816 F Street, N.W.</td>
</tr>
<tr>
<td>Amateur headquarters — Collins, Hammarlund, National, etc.</td>
<td>Washington's largest distributor of radio parts</td>
</tr>
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<tr>
<th>ZANESVILLE, OHIO</th>
<th>WILMINGTON, DELAWARE</th>
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<tbody>
<tr>
<td>Thompson Battery &amp; Radio Service</td>
<td>Wilmington Electric Specialty Co., Inc.</td>
</tr>
<tr>
<td>393 West Main Street</td>
<td>405 Delaware Avenue</td>
</tr>
<tr>
<td>Distributor radio equipment for amateurs and servicemen</td>
<td>Amateur headquarters — Collins, Hammarlund, National, etc.</td>
</tr>
</tbody>
</table>

are invited to apply for rates, etc., to Advertising Department, QST

Say You Saw It in QST — It Identifies You and Helps QST
You Are Protected When You Buy From QST Advertisers

"Advertising for QST is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

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.
HERE THEY ARE! Our first "deml·base" units. A new form of unit construction that is bound to set new standards.

First we have a 5- and 10-meter oscillator and amplifier combination. Use them "bread-board" style if you wish, mount them in a wooden frame or bolt them together and fasten them to a standard 19" rack panel as shown with the speech amplifier and modulator units, for a real "commercial" job. No lost motion or parts to discard.

DB-5 AMPLIFIER
designed for 210 tubes in push pull with class B modulator. Split stator tuning of both grid and plate circuits. Double spaced plate and neutralizing condensers eliminate possibility of "flashover." Ceramic insulation of course.

DB-5 Amplifier $14.50
10-meter coils... $1.00

PUSH-PULL TNT HI C OSCILLATOR
for 245 tubes. Ceramic insulation throughout insuring lowest losses. Plug-in coils permit operation on 5 or 10 meters. Start in with this unit and add the amplifier later to secure frequency stability. DB-5 Oscillator wired and tested $7.75
10-meter coils... $1.00

WE ARE PROUD of our new speech amplifier, because it does so much with so little. A 53 cascade resistance coupled audio (2 tubes in one) drives a pair of push pull 45 tubes class "A." A double button mike easily overloads the 45's as the 53 has a voltage gain of 720! Slight modification will permit the use of a crystal or other low level microphone without pre-amplification. DB-5 Speech Amplifier with double button microphone input transformer less 45 output transformer, wired and tested $12.25

PERHAPS YOU WANT TO "ROLL YOUR OWN"
LEEDS demi-bases, 20-gauge steel 8 x 8½ x 2" with bottom cover plate, black finish. 55c
Full base units, 18-gauge steel, 8 x 17 x 2" for... $1.00
LEEDS standard 19" rack panels 1/4" aluminum black cryanine finished front, plain black on back with standard slots for mounting.
5¾ x 19 — $2.15
8¾ x 19 — $2.45

Special RELAY Bargain
Operates on one dry cell, two pole, one pole make and break, the other break with limits with handle 250 MA.
A BUY at, each... $.95

NAVY TYPE TELEGRAF KEY
List $3.60. Navy knob — 1/4" Tungsten contacts. Only a few left at... $1.15
With regular knob... $.95
Leads transmitting key, spec... $.65

All sizes unmounted Honeycomb coils In stock.

LEEDS CRYSTALS are being supplied by the "stretchless" kind described in the May issue.

"RUBBER WIRE" — Pump for Antennas — that's why we sell plenty of the "stretchless" kind described in the May issue.

45 VESEY STREET, NEW YORK CITY
New York Headquarters for Transmitting Apparatus and Short Wave Equipment
Say You Saw It in QST — It Identifies You and Helps QST
READY TO "Go places"
THE INSTANT IT'S INSTALLED

These features are "standard equipment" with the G-E K-80 All-wave Radio.
- Range (540 to 18,000 kc.)
- Speaker (high-grade dynamic)
- Power pack (humless)
- Pre-selector (image-erasing cascade type)
- Doublet-antenna provision
- Super-vernier tuning
- Full set of tubes

The K-80 receiver is 100 per cent complete for
- amateur phone
- broadcast
- S. W. broadcast

For C. W.?
You bet!—adapted without cutting a wire.
See the coupon.

General Electric All-purpose receiver, Model K-80. Price $92.50.
Prices slightly higher in West, Mid-west and South. Subject to change without notice.
"Now is the time to buy"

GENERAL ELECTRIC COMPANY
Radio Sales Section, R-676, Bridgeport, Conn.
Kindly send me, without charge, full technical details of the K-80 receiver.
My special interests are checked below.
☐ New receiver antenna data ☐ Using the K-80 for C. W.
☐ I do radio service work

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GENERAL ELECTRIC RADIO

Say You Saw It in QST — It Identifies You and Helps QST
"AGS" and "AGS-X" Communication Type Receivers

GENERAL DESCRIPTION. A professional receiver in which considerations of price are entirely subordinate to those of performance and reliability, the AGS has been designed in co-operation with the Airways Division of the U. S. Department of Commerce, to provide high usable sensitivity and selectivity, easy operation, and permanent frequency calibration.

Particularly important is its unusual preselector circuit, which is largely responsible for its exceptionally high frequency signal-to-noise ratio and almost complete image suppression.

CIRCUIT. Both AGS and AGS-X employ nine tubes in a superheterodyne circuit, comprising a preselector stage of tuned R.F. amplification, a first detector, a high frequency oscillator; two stages of high-gain I.F. amplification; I.F. power detector; and Pentode output with provision for either phones or loudspeaker. Details typical of its electrical refinements are the use of electron-coupled air-padded oscillators, air-dielectric tuning condensers in I.F. amplifier, single dial tuning, automatic or manual volume control, C.W. beat-frequency oscillator and calibrated band-spreading.

The AGS-X illustrated above offers a still further refinement in the use of a Lamb single signal circuit preceding the I.F. amplifier. With this device selectivity is measured in cycles rather than kilocycles, resulting in an almost complete elimination of interference from unwanted signals, and a marked reduction in static. Front-of-panel controls provide for smooth variation of single-signal selectivity, as well as rejection of the filter for phone reception.

CONSTRUCTION. The mechanical construction of the AGS Receivers is particularly rugged, heavy aluminum plate being used throughout. All parts are designed for continuous duty under commercial operating conditions, and are easily accessible for inspection. The panel is designed for standard relay rack mounting though a walnut cabinet for table mounting will be supplied on special order.

A booklet describing this receiver in detail will be mailed on request

NATIONAL COMPANY, INC., MALDEN, MASS.
RCA-841 • • • • RCA-842

NOW ONLY
$3 25 EACH

RCA-841 is a three-electrode tube of the high-mu type, and is particularly useful in radio amateur transmitters as a radio-frequency doubler, r-f power amplifier or oscillator (self-excited or crystal-controlled). It may also be used as a voltage amplifier in resistance-coupled a-f circuits. Filament voltage, 7.5 volts. Filament current, 1.25 amperes. As Class C r-f amplifier, maximum unmodulated d-c plate voltage is 450 volts, maximum d-c plate current, 60 ma.

RCA-842 is a three-electrode tube of the low-mu type well suited as a modulator and Class A power amplifier type in amateur transmitters. Filament voltage, 7.5 volts. Filament current, 1.25 amperes. Maximum d-c plate voltage, 425 volts.

RCA-841 resembles type 10 in operating characteristics and rating, while RCA-842 resembles type 50.

Now that these tubes are priced at only $3.25 each, net to the amateur, they deserve the particular attention of those who want the most for their money.

RCA-841 and RCA-842 carry a rating of 15 watts maximum plate dissipation and may be used to advantage in applications ordinarily suggesting the 10 or 50 respectively.

For complete technical information on RCA-841, RCA-842 or other RCA-deForest types, see your RCA-deForest distributor or write to

RCA de Forest AMATEUR RADIO DIVISION
RCA RADIOTRON CO., INC.
CAMDEN NEW JERSEY
The 1934 Meeting of the Board

One of the longest and most important meetings of the Board of Directors of the American Radio Relay League ever held took place in Hartford on May 11th and 12th. For two whole days the Board was in session, with every director present and with the officers and general counsel of the League in attendance. As every radio amateur knows, this annual meeting of the Board is the high point in amateur affairs of the year, for at this time the policies of the League are gone over in minute examination, responsive to the wishes of the majority of the members, and new plans made for a coming year.

With every director present, fully conversant with the wishes of the amateurs in his region, it was possible to make a thoroughly intelligent survey of all the affairs of amateur radio. All the officers had previously submitted extensive reports to the directors, and brought their records to the meeting. Each director in turn submitted a report for the information of all of the others on conditions in his home territory, and then the Board went to work. Meals were served in a room adjoining the meeting room, so that there would be as little lost time as possible for the necessities of life, and all in all the Board was in session nearly nineteen hours.

This report will conclude with the actual minutes of the meeting, but because such minutes are necessarily in a somewhat abbreviated form and are rather stuffy reading, perhaps a narrative account of some of the highlights will be of interest.

Perhaps the most important actions of the Board were the making of certain constitutional changes in the by-laws. A.R.R.L. Boards have sought for many years a workable method whereby the voting power in the League would be confined to licensed amateurs. Many ideas to this end have been examined but not until this year was one developed that was feasible of administration. Now we have a new by-law: that in elections for director the votes will be counted only when they come from members who are licensed amateurs or who have a proprietary vote by reason of having been a member of the League prior to this change. (By-laws cannot be amended to deprive any member without his consent of any right that he had at the time he joined the League.) Members in that category will be entitled to vote so long as they maintain their League membership without lapse, regardless of whether they have amateur licenses, but no new member of the League will have his vote counted unless he is in fact an amateur. In the past it has also been provided in our by-laws that members in arrears shall be counted as members for a period of ninety days thereafter and permitted to vote during that period. This figure the Board also amended to read thirty days afterward. One result of this is that old non-licensed members of the League having a proprietary vote will lose the same if they do not renew their membership within thirty days after expiration, since after that time they will be regarded as new applicants and will not possess the right to vote unless they are in fact at the time of voting licensed amateurs. The result of this provision will be the gradual elimination from the League rolls of the proprietary votes. From the practical standpoint the matter is not of immense importance since there has never been any appreciable non-amateur participation in A.R.R.L. elections; but there is indeed a pleasant feeling in knowing that our by-laws are now so worded as to obviate any possibility of the control of any A.R.R.L. affairs by other than licensed amateurs.

The Board also adopted a provision for alternate or vice-directors. The function of a director is personal and although there has been a provision to send an alternate to a meeting of the Board if the director be ill or otherwise unable to attend, the director has been unable to transfer his vote to the alternate and on those occasions the division has had no vote. This would be overcome if a vice-director were elected with the constitutional right to cast the division's vote if requested by the director to attend the meeting for that purpose. This has now been accomplished. At the elections this autumn, vice-directors will be elected at the same time as directors, in half of our divisions, and next year there will be similar elections in the other half. The Board also examined with much care the possibilities for making an improvement in the composition of the A.R.R.L. Executive Committee, which now consists of the five officers. The salaried officers of the League do not relish the present arrangement except that it provides an opportunity for quickly getting the judgment of five men on important questions and avoids the possibility of "one-man control" of anything. Different
schemes were examined but nothing was developed that did not actually handicap these aims rather than assist them, and the question went over for further study. An important change was made with respect to the affiliation of local societies, in keeping with the general trend to solidify A.R.R.L. administration in strict terms of licensed-amateur control: the Board declared it to be its policy neither to affiliate any society nor to continue an existing affiliation except where the club is so constituted that control of its affairs is vested in licensed amateurs, of whom at least sixty percent are also members of A.R.R.L.

A move to undertake a complete revision of the A.R.R.L. constitution was rejected as altogether unnecessary.

Many of the amateur operating regulations were examined and a number of requests made of the Federal Radio Commission: that the Commission open to mobile amateur operation all of the amateur frequencies above 56 megacycles; that the Commission assign to amateurs exclusive harmonic-family bands at 112 mc., 224 mc., 448 mc., 896 mc., and 1792 mc., that we may have our place in the ultra-high frequency spectrum; that the Commission arrange for Class A and B amateur examinations at cities normally visited by the inspectors and at amateur conventions; that the Commission take such steps as are possible to eliminate automobile ignition interference with high-frequency work; and that the regulations be amended to permit much simpler station logs, without all the "bookkeeping".

This meeting was no exception to the record of recent Board meetings in devoting a very great deal of consideration to 'phone questions. This year it was the 14-mc. band that received the attention. A great many of the directors felt that it was desirable to have the 'phone allocation in this band at one end or the other of the band, and many of them believed that it should be increased in size. Proposals were made and passed, reconsidered and rejected, new proposals made and the whole question studied for several hours. At length, chiefly because the Canadian 'phone allocation does not coincide with ours and any movement of our 'phone allocation to one end or the other would result in virtually the entire band being devoted to 'phone, the Board decided to leave the allocation just as it is for another year; and in the meantime it directed the communications manager to make a complete survey of 'phone-telegraph operation in all of the bands. It was proposed at the meeting that we ask the Commission to make the 'phone allocations exclusive to 'phone, as some members and clubs had requested, but there is an excellent legal argument against this as causing a fundamental weakness in the amateur position; and in lieu of such action the Board directed the Communications Department to appeal to the sportsmanship of e.w. telegraph operators to confine their operation to the portion of the bands not open to 'phone work. The editor of QST was requested to open a special department for 'phone, if feasible, and QST was specifically directed to endeavor to work up data on the use of low-pass filters for 'phone, to reduce mutual interference.

Other important actions: The Board approved the request of the Navy Department where-under, subject to suitable regulations, amateurs who are members of the N.C.R. may attain the right to use the "N" prefix in lieu of "W". For the specific recommendations made by the Board on this subject, the minutes should be consulted. The secretary of the League and the technical editor of QST were ordered to attend the third meeting of the C.C.I.R. in Lisbon this autumn to represent amateurs in the name of I.A.R.U. It was voted to collaborate with the National Broadcasting Company on a series of brief programs intended to give favorable publicity to amateur accomplishments. The general counsel and secretary were instructed to proceed with plans for obtaining more amateur frequencies at the Cairo conference. The Board went on record as opposed to the elimination of the code requirement for any amateur licensee. A petition from members in the Los Angeles, San Diego and Arizona sections of A.R.R.L. to create a new A.R.R.L. division was rejected by a vote of ten to six, one less than the two-thirds required to amend the by-laws to that effect. Thanks and appreciation were voted the Standard Frequency Stations and the District QSL Managers for their loyal services to amateur radio; and to the officers and employees for their efforts in producing the anniversary number of QST. Finally, Mr. Hiram Percy Maxim and Mr. Charles H. Stewart, veteran president and vice-president, respectively, were re-elected for two years, each being the only nominee for his office.

The Board gave careful consideration to the problem of better contact with the members and the supplying of fuller information on what the League is doing—inefficiencies which in the past year have resulted in misunderstandings and criticisms. The secretary was directed to maintain in QST a department to supply members with fuller information on what the League is doing—
information which in the past has been supplied in large quantities to the directors but which many of them have been unable to pass on adequately to all the members. Money was appropriated to allocate a fund to each territorial director to be disbursed at his discretion for legitimate expenses of A.R.R.L. administration. With each director provided with the necessary working funds, there should be tremendous improvement in knitting us all closer together and avoiding these misunderstandings. Perhaps this is a good place to say that a new "headquarters movie" is under preparation for the use of the affiliated clubs and, although it will be many months before time can be found to complete it, advantage was taken of the presence of the directors in Hartford to get pictures of the directors and of the Board in action. As every member knows, a few months ago there was much criticism of A.R.R.L. headquarters and the officers, the secretary getting the brunt of it, with resolutions and circular letters and letters to directors condemning policies, criticizing officers, demanding investigations, etc. The Board took cognizance of these matters by constituting itself a sort of court of inquiry. It examined carefully into the whole matter, interrogated officers, examined records, scrutinized salaries, studied the Madrid and "continental channels" matters. It found no justification for any of the charges that have been disturbing members, and voted hearty commendation of the secretary and other officers for their conduct of League affairs. With the thorough airing given every detail of League administration, with everything examined and found above reproach, with the fuller information that every director is able to take home to his members after this meeting, and with the improvements that this meeting effected in League organization, it is hoped that our period of unrest and baseless criticism is over and that we shall now be able to put all of our shoulders to the wheel and carry on together for amateur radio.

These, obviously, are only the highlights of a two-day session. Your director can give you more detailed information on any subject that particularly interests you. The complete minutes follow:

Minutes of Annual Meeting of Board of Directors, American Radio Relay League, May 11 & 12, 1934

In compliance with the constitution and responsive to due notice, the Board of Directors of the American Radio Relay League, Inc., convened in regular annual meeting at the Hartford Club, Hartford, Conn., on May 11, 1934. The meeting was called to order by President Maxim at 10:06 a.m., d.s.t. After a brief address by the president, the roll was called, with the following directors present:

Hiram Percy Maxim, President, Chairman
Charles H. Stewart, Vice-President
Alex. Reid, Canadian General Manager
Russell J. Andrews, Rocky Mountain Division
G. W. Bailey, New England Division
H. L. Caveness, Roanoke Division
Frank M. Corlett, West Gulf Division
S. Q. Culver, Pacific Division
Ralph J. Gibbons, Northwestern Division
J. C. Hagler, Jr., Southeastern Division
M. M. Hill, Delta Division
Carl L. Jabs, Dakota Division
H. W. Kerr, Midwest Division
Loren G. Windom, Central Division
Eugene C. Woodruff, Atlantic Division

Absent: Bernard J. Fuld, Hudson Division. There were also present Secretary K. B. Warner, Treasurer A. A. Hebert, Communications Manager F. E. Handy, and Assistant Secretary A. L. Budding.

Moved, by Mr. Culver, that a verbatim stenographic record be made of the proceedings of this meeting and supplied the members of the Board but available for inspection by any member of a division. Seconded by Mr. Jabs. After round-table discussion during which most directors opposed such record as unnecessary, too expensive and an impediment to free discussion, the motion was rejected, Messrs. Culver and Jabs voting in the affirmative.

During the above discussion Mr. Fuld and General Counsel Paul M. Segal entered the meeting, at 10:22 a.m.

On motion of Mr. Reid, VOTED that, without reading, the minutes of the last meeting of the Board are approved in the form in which they were issued by the secretary. Messrs. Culver and Jabs requested to be recorded as not voting because they had not been present at the previous meeting.

On motion of Mr. Windom, unanimously VOTED to accept the annual reports of the officers and other officials as submitted to the Board of Directors and place the same on file.

On the question of the election of a new president and new vice-president, on motion of Mr. Windom, unanimously VOTED that these elections go over as the last item of business of this meeting.

Moved, by Mr. Windom, that all acts performed and all things done by the Executive Committee since the last meeting of the Board, and by it reported to the Board, be ratified and confirmed by the Board as the actions of the Board. Moved, by Mr. Culver, to amend the motion to have read to the Board, before approving, the Executive Committee acts of the entire year except affiliations of clubs.1 After discussion, the motion to amend was lost, 5 votes in favor, 9 opposed. The original motion was then ADOPTED without dissenting voice, Mr. Culver asking to be recorded not voting.

Mr. Reid presented his report as Canadian General Manager. In turn, every division director rendered a report on conditions in his division.

The Board recessed for luncheon at 1:05 p.m., reconvening at 2:21 p.m. with all directors and officials in attendance.

1 For the information of members it should be stated that full minutes of all Executive Committee meetings throughout the year are sent to all directors immediately after each meeting.—Editor.
On motion of Mr. Andrews, it was unanimously VOTED that the sum of twenty-eight hundred dollars ($2800) is hereby appropriated from the surplus of the League, as of this date, for the purpose of defraying the expenses of holding this meeting of the Board of Directors, any unexpended remainder of this sum to be restored to surplus.

On the question of the Navy Department’s desire to arrange for the use of the prefix “N” for N.C.R. amateurs, after extended discussion during which several suggestions were made and withdrawn, it was, on motion of Mr. Bailey, VOTED that the League approves the request of the Navy Department to the Federal Radio Commission for the adoption of the following amateur regulation:

In the case of an amateur licensee whose station is owned by a regularly commissioned or enlisted member of the United States Naval Reserve, the commandant of the naval district in which such reservist resides may authorize in his discretion the use of the call letter prefix “N”, in lieu of the prefix “W” assigned in the license issued by the Commission, provided that such “N” prefix shall be used only when operating in the frequency bands 1715-2000 kilocycles and 3500-4000 kilocycles, and provided further it shall be used only for communication between stations licensed to regularly commissioned or enlisted members of the Naval Reserve, or for Naval Reserve communication with naval radio or Naval Reserve radio stations in accordance with instructions issued by the Navy Department.

After further discussion, on motion of Mr. Corlett, VOTED that the League advises the Navy Department and the Federal Radio Commission of its willingness to expand the above arrangement to permit the use of the “N” prefix by such authorized stations not only when communicating with each other but also when communicating with “W” and “K” stations that are not members of the Naval Communications Reserve, in these two frequency bands.

The Chairman then requested the Board to give consideration to matters of unrest within the League organization. Mr. Windom introduced and moved the adoption of a resolution intended to terminate the affiliation with the League of the Santa Clara County Amateur Radio Association and to recall its charter because of false statements circulated by it. The motion was adopted without dissenting voice. Mr. Jabs stated that because he had not yet had opportunity to examine the books and records of the League, he wished to reserve his vote and to be so recorded. Mr. Culver requested a ballot shall be counted unless it shall affirmatively appear either from such ballot or the envelope in which it is contained that the member submitting it either is at the time the holder of an amateur radio station or operator’s license or has been continuously since May 15, 1934, a member of the League.

The yeas and nays being ordered, the said question was voted in the affirmative. So the by-law was amended.

Moved, by Mr. Andrews, that By-Law 16 be amended by striking out the words “in secret, but’’, The yeas and nays being ordered, the said question was decided in the affirmative: yeas, 16; nays, 0. Every director voted in the affirmative. So the by-law was amended.

Moved, by Mr. Andrews, that By-Law 16 be amended by striking out the words “ninety” and substituting therefor the word “thereafter”. The yeas and nays being ordered, the said question was decided in the affirmative: yeas, 16; nays, 0. Every director voted in the affirmative. So the by-law was amended.

Moved, by Mr. Culver, that By-Law 16 be amended by inserting after the 32nd line in the printed edition thereof, and substituting therefor the word “thereafter”. The yeas and nays being ordered, the said question was decided in the affirmative: yeas, 16; nays, 0. Every director voted in the affirmative. So the by-law was amended.

Moved, by Mr. Andrews, that By-Law 16 be amended by striking out the words “after the twentieth day of December” appearing in the 34th and 35th line of the printed edition thereof, and substituting therefor the word “thereafter”. The yeas and nays being ordered, the said question was decided in the affirmative: yeas, 16; nays, 0. Every director voted in the affirmative. So the by-law was amended.

The Board engaged in extended round-table discussion on the purpose of informing the membership what is going on in League affairs.

The Board recessed for dinner at 7:04 p.m., reconvening at 8:40 p.m. with all directors and officials in attendance.

The Board addressed itself to an examination of the criticism of the headquarters establishment. The Board engaged in extended round-table discussion on the purpose of informing the membership what is going on in League affairs.

The Board recessed for dinner at 7:04 p.m., reconvening at 8:40 p.m. with all directors and officials in attendance.

The Board addressed itself to an examination of the criticism of the headquarters establishment.
An extended general discussion ensued during which all available criticisms were examined and the fullest possible attempt made to discover acts or omissions deserving the attention of the Board, but without result. 4

On motion of Mr. Caveness, the Board adjourned at 11:34 a.m., subject to an order to reconvene at 9 a.m. on the morrow. The Board reassembled at the same place on May 12, 1934, and was called to order at 9:17 a.m. with all directors present and all officials in attendance except Messrs. Hebert and Segal.

Moved by Mr. Jabs, that the secretary be instructed to maintain in QST a department intended more for beginning amateurs. After discussion, Mr. Gibbons proposed an amendment in toto which, with the assembly's permission, was accepted by Mr. Jabs in lieu of his wording, as follows:

That, for the purpose of stimulating the contributing of QST articles of the practical-application type by members of the League and published in QST only, the Board of Directors at each annual meeting commencing in 1935 award the sum of twenty-five dollars ($25) to the best article published in QST during the previous twelve months under each of the following eight headings by members of A.R.R.L.:

1) Antennas 2) Ultra-high-frequency communication 3) Phone transmission 4) C.W. transmission 5) Simple receivers 6) Superheterodyne receivers 7) Power supplies 8) General-interest (non-technical) articles

and that the technical editor of QST be requested to supply each meeting of the Board henceforth with his recommendations for these awards, for the information of the Board in their study.

After further discussion, the said motion was rejected.

Moved, by Mr. Gibbons, that for the purpose of recognizing amateur achievement, there hereby be established an award of two hundred fifty dollars ($250), to be known as the Hiram Percy Maxim Award, to be awarded annually by each meeting of the Board of Directors commencing in 1935, to that person who during the previous twelve months in the opinion of the Board has made the most meritorious contribution to the advancement of amateur radio. After discussion, the said motion was rejected.

Moved, by Mr. Gibbons, that the Board be requested to supply each meeting of the Board with the necessary funds for directors for necessary expenses in their division; after discussion, on motion of Mr. Hebert, VOTED that there is hereby allocated to each division director of the League and to the Canadian General Manager the sum of one hundred fifty dollars ($150) for legitimate A.R.R.L. expenses in his area; and that there is hereby appropriated from the surplus of the League, as of this date, the sum of twenty-one hundred dollars ($2100) for the purpose of defraying this expense, any unexpended remainder of this sum to be restored to surplus; this action in toto, subject to an order to reconvene at 11:25 a.m., to the next Board meeting to be restored to surplus; this action to be regarded as an experimental program for one year, its results to be subject to review at the next meeting of the Board.

During the above discussion Mr. Hebert entered the meeting at 10:02 a.m.

On the question of continuing the bi-monthly issue of QST, on motion of Mr. Hill, unanimously VOTED (a) that the secretary of the League and the technical editor of QST are authorized and instructed to attend the third meeting of the C.C.I.R. in Lisbon and participate in the name of the International Amateur Radio Union; and (b) that the sum of thirty-five hundred dollars ($3500) is hereby appropriated from the surplus of the League, as of this date, for the purpose of defraying the traveling expenses of these representatives and the participation costs of the meeting, any unexpended remainder of this sum to be restored to surplus.

Moved, by Mr. Jabs, that the communications department in QST be reduced to contain only articles and traffic totals, eliminating reports of individual activities, and that the space thus saved be used for the publication of letters of constructive suggestion received at headquarters from the members. After discussion, with the unanimous consent of the assembly, Mr. Jabs accepted an amendment by Mr. Culver to leave the communications department reports intact but, in the QST space normally devoted to a correspondence department, to show a "Vox Pop" attitude and publish both sides of arguments. After further discussion, the said motion was rejected, 5 votes in favor, 7 votes opposed. Mr. Windom requested to be recorded as having voted in favor of the motion.

On motion of Mr. Fuld, unanimously VOTED that the space in QST, at the discretion of the editor, be devoted to 'phone matters and to clubs.

On the question of collaborating with the National Broadcasting Company on a series of programs devoted to amateur radio, after discussion, on motion of Mr. Reid, VOTED that the League collaborates with the said company on the plan as previously outlined to directors. Mr. Jabs requested to be recorded as having voted in favor of the motion.

On motion of Mr. Corlett, unanimously VOTED that the editor of QST is instructed to undertake a policy of urging, through its columns, the use of low-pass filters to limit 'phone modulation frequencies to about 3000 cycles in order to reduce interference without preventing understandable communication.

On motion of Mr. Corlett, unanimously VOTED to add to the agenda of this meeting the question of the 20-meter 'phone allocation.

On the question of automobile ignition interference with ultra-high frequency reception, on motion of Mr. Hill, voted that the A.R.R.L. requests the Federal Radio Commission to enact such legislation as is possible to eliminate automobile ignition interference; and that manufacturers be encouraged to attain this in the design and manufacture of new automobiles; and that articles appear in QST which will cure most causes of interference in automobile electric systems. Messrs. Woodruff and Fuld requested to be recorded as voting opposed. After further discussion, on motion of Mr. Corlett, unanimously voted to reconsider the said motion. Upon reconsideration, the said motion was rejected. After further discussion, on motion of Mr. Culver, unanimously VOTED that the A.R.R.L. goes on record as calling upon the Federal Radio Commission to take such steps as are possible to eliminate automobile ignition interference.

On the question of show-station traffic, moved, by Mr. Windom, that the communications department be authorized to conduct an educational program by preparing such bulletins or circulars as may be necessary, to clarify or modify the show-station traffic situation.

At this point the Chairman requested the assembly to

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hear the report of Mr. Segal, who was under the obligation of leaving the meeting soon. Mr. Segal, responding to the request made the previous day, presented a suggestion for accomplishing the appointment of vice-directors who would be authorized to vote for the division. He also outlined the status of what have been referred to as abandoned continental channels, explaining why they are not available for American amateur use as is commonly and erroneously believed. In response to inquiry, he also discussed the situation for the Cairo conference.

On motion of Mr. Windom, unanimously VOTED that the Board instructs the general counsel and secretary to proceed with preparatory plans for the Cairo conference intended to increase the frequency allocations of amateurs, and directs them to advise the Board of any action necessary or desirable to this end on the part of members in the field or members of the Board.

Mr. Segal here retired from the meeting, at 12:10 p.m. Resuming consideration of Mr. Windom's motion regarding show-station traffic, the same was then unanimously ADOPTED.

Pursuant to the recommendations of Mr. Segal, moved, by Mr. Jabs, that the by-laws be amended as follows:

After By-Law 10, introduce the following new text:

10a. From each division of the League in the United States and Possessions, an alternate director shall be elected at the same time as the director is elected. Such election shall be subject to all the terms and requirements of these by-laws with regard to directors, both as to qualifications of candidates and the methods of voting. No person may simultaneously be a candidate for the office of both director and alternate director.

Amend By-Law 12 to read as follows:

12. The directors shall have the authority to appoint committees and assistants to aid them in the discharge of their duties. In case of inability of any director to attend a meeting of the Board of Directors, he shall so notify the secretary and, with the giving of such notice, the alternate director shall assume all the powers and duties of director and shall attend such meeting with full powers of a director.

The yeas and nays being ordered, the said question was decided in the affirmative: yeas, 15; nays, 1. All the directors voted in the affirmative except Mr. Windom, who voted opposed. So the amendments were adopted.

On the question of the creation of a Southwestern Division to consist of the A.R.R.L. sections of Arizona, Los Angeles and San Diego, Mr. Culver spoke in favor of the petitions that had been received. Moved, by Mr. Culver, that By-Laws 4 and 17 be appropriately modified to establish a Southwestern Division effective January 1, 1935, the election of new director therefor to be held in the coming autumn so that the new director may take office January 1, 1935.

After discussion, the yeas and nays being ordered, the said question was decided in the affirmative: whole number of votes cast, 16; necessary for adoption, 11; yeas, 10; nays, 6.

Those who voted in the affirmative are Messrs. Maxim, Bailey, Corlett, Culver, Hill, Jabs, Kerr, Reid, Stewart and Windom. Those who voted in the negative are Messrs. Andrews, Caveness, Fuld, Gibbons, Hagler and Woodruff. So the proposal was rejected.

By request, the chairman read a letter from John L. Rolinars expressing confidence in the secretary; which letter, upon motion, was ordered filed. Mr. Bailey read a telegram of similar import from John M. Clayton, which was ordered filed.

On the secretary's suggestion of a request for ultra-high-frequency assignments, after discussion, on motion of Mr. Culver, unanimously VOTED that this League requests the Federal Radio Commission to assign bands of frequencies exclusively to amateur stations in the ultra-high-frequency region, in harmonic relation to existing amateur bands, as follows: 112 to 120 mc., 224 to 240 mc., 448 to 480 mc., 886 to 960 mc., 1728 to 1820 mc.

On further motion of Mr. Culver, unanimously VOTED that, in the event the request made in the previous motion is denied, the secretary is authorized to notify the Federal Radio Commission that the League will accept the proposed shared basis from 112 megacycles up, until such time as exclusive assignments are available.

On motion of Mr. Kerr, unanimously VOTED that the warm thanks of the League and the Board of Directors are extended to the Standard Frequency Stations and to the District QSL Managers in appreciation of their splendid services on behalf of amateur radio.

The secretary presented a communication from the Staten Island Amateur Radio Association, proposing reduction of maximum power to 100 watts, which letter was ordered filed. The secretary read a communication from the Butte (Montana) Radio Club concerning portable operation, which, on motion, was ordered filed. The secretary read a second communication from the Butte Radio Club concerning examination points. After discussion, on motion of Mr. Gibbons, unanimously VOTED that the Federal Radio Commission is requested to expand the number of points at which examinations are held for Classes A and B amateur examinations by causing the holding of examinations at the various other large cities necessarily visited by the inspectors in the course of their duties. On motion of Mr. Kerr, unanimously VOTED that the Commission is requested to consider the holding of examinations at divisional and state amateur conventions wherever practicable. Mr. Gibbons read a letter addressed to the Board of Directors by the Amateur Radio Club of Seattle and transmitted via him. In the belief that the matters mentioned in this letter would have the Board's consideration before adjournment, no action was taken.

On motion of Mr. Fuld, VOTED that the Board give a brief audience to former Hudson Division Director Lawrence J. Dunn after luncheon.

Without objection, the Board recessed for luncheon at 1:26 p.m., reconvening at 2:42 p.m. with all directors present except Mr. Woodruff and with all officials in attendance except Mr. Segal.

Pursuant to special order, Dr. Lawrence J. Dunn, former director of the Hudson Division, briefly addressed the meeting on the subject of loyalty to A.R.R.L.

On the question of radiotelephone assignments in the 14-megacycle band, moved, by Mr. Hill, that the Federal Radio Commission be requested to permit 14-megacycle 'phone operation from 14,000 to 14,200 kc. After discussion, moved, by Mr. Corlett, to amend the figures to read 14,000 to 14,250 kc.; but there was no second, so the motion for amendment fell. Moved, by Mr. Fuld, to amend the figures to read 14,200 to 14,400 kc.; but there was no second, so the motion for amendment fell. The question of requesting a 'phone allocation from 14,000 to 14,200 kc. then being called for, the same resulted in a tie vote, 6 in favor and 6 opposed, whereupon the Chairman declared the motion lost. Moved, by Mr. Jabs, that the Federal Radio Commission be requested to move the 'phone allocation to read 14,000 to 14,100 kc. Moved, by Mr. Fuld, to amend the figures to read 14,000 to 14,150 kc.; which proposal for amendment, being put to vote, was rejected. The main question then being voted upon, the same was adopted, 6 votes in favor and 6
votes opposed; namely, to request the removal of the 'phone band to 14,000-14,100 kc. Moved, by Mr. Fuld, that the Board recommend to the Federal Radio Commission that the 14-megacycle 'phone allocation be enlarged so as to include the frequencies between 14,000 and 14,160 kc. A record vote being demanded, the yes and nays were ordered, resulting in the rejection of the motion: whole number of votes cast, 13; necessary for adoption, 7; yeas, 5; nays, 8. Those who voted in the affirmative are Messrs. Caveness, Corlett, Fuld, Gibbons and Hill; those who voted opposed are Messrs. Andrews, Bailey, Culver, Hagler, Jabs, Kerr, Stewart and Windom; absent, Mr. Woodruff; not voting, Messrs. Reid and Maxim. After further debate, moved, by Mr. Windom, to reconsider the vote to request the moving of the 14-megacycle 'phone allocation. A record vote being demanded, the yes and nays were ordered, resulting in the adoption of the said motion to reconsider: whole number of votes cast, 14; necessary for adoption, 8; yeas, 13; nays, 1. Those who voted in the affirmative are Messrs. Andrews, Bailey, Caveness, Corlett, Fuld, Gibbons, Hagler, Jabs, Kerr, Stewart, Windom and Maxim; absent, Mr. Woodruff; not voting, Mr. Reid. So the motion was rejected, and the Board made no recommendation to the Federal Radio Commission to move the 14-megacycle 'phone allocation to read 14,000 to 14,100 kc., after further discussion, a record vote being demanded, the yes and nays were ordered, and the said question was decided in the negative: whole number of votes cast, 13; necessary for adoption, 8; yeas, 4; nays, 10. Those who voted in the affirmative are Messrs. Corlett, Fuld, Gibbons and Hill; those who voted opposed are Messrs. Andrews, Bailey, Caveness, Culver, Hagler, Jabs, Kerr, Stewart, Windom and Maxim; absent, Mr. Woodruff; not voting, Mr. Reid. So the motion was rejected, and the Board puts itself on record as being opposed to the elimination of code tests from amateur examinations.

On the question of the desirability of encouraging mobile work on the ultra-high frequencies, on motion of Mr. Fuld, unanimously VOTED that the Board recommend to the Federal Radio Commission that the 14-megacycle 'phone allocation be so reduced as to include the frequencies between 14,000 and 14,160 kc. Moved, by Mr. Fuld, that the Board put itself on record as being opposed to the elimination of code tests from amateur examinations.

On motion of Mr. Fuld, the Board unanimously extended a vote of appreciation to the officers and employees for their untiring labor which brought forth the May anniversary number of QST.

Moved, by Mr. Kerr, that the present voluntarily-reduced salaries of the officers and reduced salaries of the headquarters employees be fixed by the Board as their respective authorized salaries. After extended examination of the subject, Mr. Kerr, with the permission of his second and the unanimous consent of the assembly, withdrew his motion.

After discussion of affiliated clubs, on the joint motion of Messrs. Corlett and Culver, the following resolution was unanimously ADOPTED:

Resolved: (a) that it is the policy of the League to grant affiliation to any amateur society unless the articles of the applicant society lodge the control of its affairs in licensed amateurs; nor unless 60 percent of the licensed amateurs belonging to the applicant society are also members of the League; (b) that the communications manager is hereby directed to make a suitable survey of the affiliated clubs at the end of each year; and (c) that it is hereby declared to be the policy of the League to terminate the affiliation of any society found by such survey not to comply with these conditions.

Mr. Corlett read to the meeting a letter of suggestions from the Abilene (Texas) Amateur Radio Club.

Moved, by Mr. Culver, that the League request the government agencies to remove as many as possible of their affiliated amateur stations outside the amateur bands. But there was no second, so the motion was lost.

On motion of Mr. Windom, VOTED that the communications department is directed to make a 'phone-e.w. survey on all amateur bands over the coming year and report the results to the Board at its next meeting.

Moved, by Mr. Corlett, that the Federal Radio Commission be requested to make the 14-megacycle 'phone sub-allocation (14,150 to 14,250 kc.) exclusively 'phone. But there was no second, so the motion was lost. On motion of Mr. Caveness, unanimously VOTED that the Communications Manager is instructed to undertake a vigorous campaign to confine o.w. telegraph operation to the non-'phone portions of the amateur bands.

On the question of the desirability of encouraging mobile work on the ultra-high frequencies, on motion of Mr. Fuld, unanimously VOTED that the Communications Manager is instructed to undertake a vigorous campaign to confine o.w. telegraph operation to the non-'phone portions of the amateur bands.

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ael is requested to examine the legality of an arrangement whereunder, when two members of the same family are members of the League, the dues in the one case will be the usual figure of $2.50 per year including QST subscription and in the other case $0.50 per year with no subscription to QST; and, if he finds such arrangement legal, he is requested to draft suitable amendments to by-laws to accomplish it, for the further consideration of the Board.

Moved, by Mr. Jabs, that important questions of League policy arising between meetings of the Board of Directors be voted upon by the general League membership. But there was no second, so the motion was lost.

Mr. Hill suggested the desirability of spreading upon the minutes of the meeting a motion to show that the charges contained in the so-called Minneapolis circular had been investigated by the Board and found baseless. Mr. Culver pointed out that such further action was unnecessary in view of the vote of confidence in the officers that had been passed.

Mr. Caveness understood that the Minneapolis Radio Club has applied for affiliation, and proposed that the Board pass upon that application. In view of a disposition to deny affiliation, Mr. Jabs spoke in favor of their affiliation as helpful in solving present misunderstandings. The Chairman recommended a tolerant viewpoint. Mr. Reid suggested that the report that Mr. Jabs takes home from the Board meeting will show the members of that club that their circular was incorrect and ill-advised, and that conditions in the League are not as they imagined. The question of their affiliation was left to the Executive Committee, as is the usual custom.

On the election of a new president and vice-president, Messrs. Maxim and Stewart retired from the meeting, Mr. Corlett, senior director, assuming the chair. Mr. Kerr nominated Hiram Percy Maxim for president for the 1934–1935 term. On motion by Mr. Bailey, adopted without dissent, the secretary cast one ballot to elect Mr. Maxim as president; which done, the chairman declared him duly elected. Mr. Maxim returned to the meeting, amidst applause, spoke briefly in appreciation, and resumed the chair.

Mr. Fuld suggested future thought to a change in the constitution to provide for an additional vice-president. Mr. Bailey nominated Charles H. Stewart for vice-president of the League for the 1934–1935 term. On motion of Mr. Bailey, adopted without dissent, the secretary cast one ballot to elect Mr. Stewart vice-president of the League; which done, the Chairman declared him duly elected. Mr. Stewart was thereupon recalled to the meeting and spoke briefly in appreciation.

On motion of Mr. Bailey, the Board adjourned, sine die, at 8:45 p.m. Total time of sessions, 18 hours, 43 minutes.

Secretary.