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C-299—3 Volts .06 amp. Dry Battery Det. & Amp. $6.50
C-300—5 Volts Gas Content Detector $5.00
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C-12—Similar to C-11 with standard base $6.50

Type C-301A gives greater Power Amplification with only ¼ Amp. Filament Current.

Cunningham tubes are covered by patents dated 1-7-05, 1-13-07, 1-13-08, and others issued and pending. Licensed for amateur, experimental and entertainment use in radio communication. Any other use will be an infringement.

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Effecting direct communication with both Hartford and the "Bowdoin" and relaying a message and its answer between them is a feat of which anyone might well be proud.

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—Confucius

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The Official Organ of the ARRL

VOLUME VII

JANUARY, 1924

No. 6

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.
The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical improvement of short-wave two-way radio telegraphic communication.

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

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Achievement

S ee the gentlemen in the upper right who so convincingly grace our head-
ing illustration? That is supposed to be the editorial we, hard at work dictating
inspiration and enthusiasm for the hungry readers of QST. The gent looks a whole
lot more like the editor of a certain other magazine but let that pass—it’s a good
picture. There’re a few more inaccuracies: our stenographer won’t let us chew cigars
while talking; besides, we use a dictaphone; and, as our esteemed predecessor once said
about a similar heading, we never had a coat and vest like that. But the thing about
that picture which is most ruffling to our editorial complicity this morning is the
air of easy nonchalance it seems we are to affect as we go about our day’s work.

No darnation of it happens! This place is a madhouse about this time of the year.
“Hot news” is breaking every day, amateur records are being smashed to smithereens
every time we turn around, and it’s a wild job to keep up with progress and get
the stuff chronicled in the mag. Our amateur activity runs in cycles, you know.
During the summer we have little of achievement actually to chronicle in QST;
our pages are filled with informative material and the latest dope on improving ama-
teur operation; everybody is busy studying 

... (Continued on page 4)

What Bothers the B.C.L.

T hat great portion of the American public interested in the reception of
broadcast programs is now in the midst of its third season at the game.
Operating conditions have improved vastly. The staggering and zoning of the broadcasting waves eliminated overlapping and did more than anything else could to make the programs enjoyable. At the same time the enforced amateur quiet hours removed entirely the negligible amount of interference caused by amateur operation during the early evening hours. But still the life of a broadcast listener is full of trials, his concerts are broken up just as often and just as completely as before, and his radio existence is not more satisfactory than it was before these improvements came into effect.

The trouble lies with the commercial traffic. Even on good selective tuners the interference from shipping and some coastal stations is so bad on the average listener’s set, particularly within a few hundred miles of any of our coasts, that reception is anything but a pleasure. These code stations actually use transmitting waves within the broadcast band and so of course there is no simple way of tuning them out. They’re not supposed to do it—we thought that American shipping was to be required to forego the use of the 450-meter wave between 7 P.M. and 11 P.M.—but it is worse than ever. We even hear some of our coastal stations requesting ships to shift wave from 600 to 450, right into the concert band, to get thru the QRN on 600 meters. Lately we have been making some observations and we find numerous cases where it is impossible to receive broadcasts with any satisfaction whatever, even on fairly selective sets, because of ships pounding in all over the scale—loud powerful signals that break up almost every item on any program. And some of these ships are a thousand miles away.

We amateurs are getting the big end of the blame for this interference, and we don’t like it. Our listener friends don’t know the code, but if they hear a code signal they are sure it’s an amateur. We’ve even seen several cases where the interfering ship signals were so loud and persistent that the listeners knew just which “local amateur” it was who was breaking up their reception. Now we know that the interference we amateurs are causing during our limited hours is practically zero, for the law is being obeyed, and we’re getting sick of being blamed for things we don’t do. We know by many observations that the B.C.L. has a great big grievance. But that grievance is the commercial interference, not amateur transmission, and we amateurs must pull together to show him the facts. It is the duty of every one of us to point out to our B.C.L. friends that we are co-operating, that we observe the law, that we cause no interference, that this thing that bothers them is an entirely different class of station—we must do this to save ourselves from unjustified blame.

We hope the Bureau of Navigation can find some effective method of dealing with the situation. It is hindering public enjoyment of radio and is bringing upon us amateurs much undeserved criticism.

Playing Fair

ALL of a sudden there is an awful bunch of fellows recklessly disregarding the radio law in several particulars. How come, gang? You’re not “toting fair” with the rest of us—you’re liable to get all of us “in dutch.”

First there is this matter of wave length. Perhaps it is the rush to get back on the air, thousands of new sets being tested, and at first they are not easy to get down. Whatever it is, there are nights when we hear as many stations above 200 meters as we do below—and our tuner goes away down. We can’t expect to get away with anything like this.

Then the “quiet hours.” We’ve just written something about how nicely we observe the quiet hours. In percentages this is true, and we don’t think any appreciable interference is caused, but there are too many violations. Slopping over 8 o’clock and opening up a little before 10:30 may beexcused by poor time-pieces (for which there is no excuse, by the way) but we refer more particularly to outright transmission in the midst of the quiet hours. The operator who does this violates the regulations as definitely as if he sent a false SOS, and can expect about the same treatment when the Supervisor nabs him—which is only a question of time.

We are even more concerned about the business of false calls. There are not that many “bum fists” in our number, so some of these are deliberate. We have heard unknown stations falsely signing 6KA, 9ZN, 1AW, 1ARP, 9KW, 9RR, 9AOG, 6IA, 1AFV, 7ZU, and 1CBS. What do you think of that, men? Don’t you agree with us that it warrants the use of a little “white space” and vitriol in QST? Need we say that it is strictly illegal, as well as a rotten trick to play on any station? It may also get the real owner of a call in serious trouble for which he is not to blame. Right there is the point: any man signing another’s call must be regarded as trying to transfer the penalty for law violation to the innocent man. It isn’t funny, it’s serious—and these birds will get short shrift from us, you bet!

Now, what are we going to do about these things, fellows? It is a discouraging job having to write sermons every so often about obeying the law. Your A.R.R.L. Headquarters does it as a service to you, that you and all the rest of us may continue to enjoy amateur radio. Please take it as fair warning, for the time is approach-
ing rapidly when to protect the interests of the big law-abiding majority of amateurs we'll have to unship the Wouff-Hong and go gunning for you. It's plainly evident that a few chronic offenders should not be permitted to get the entire amateur fraternity into trouble. The Bureau of Navigation is not asleep—not by any means. After all the friendly warnings we publish about complying with radio regulations you can't expect A.R.R.L. Headquarters to go on forever pleading leniency for you. We amateurs are not the only radio folks these days, and we have to watch our step. We're entitled to do everything the law permits us, but our strength lies in never transgressing those bounds. The few who pay no attention to regulations are about to be assisted out of amateur radio—they are in immediate danger of losing their licenses. Please take the tip, fellows—play fair.

This Hoover Cup

On noon of February 1st the entries will close at A.R.R.L. Headquarters in the competition for the 1923 Department of Commerce Amateur Trophy, more commonly called the Hoover Cup. This is our last opportunity to remind you of it and to suggest that you get busy on your entry. This will be the third cup given by Secretary Hoover under the auspices of the League. Its purpose is to encourage individual effort in the design and construction of amateur apparatus—it is emblematic of the high interest the Secretary has in the progress we amateurs are making. It is the highest honor Amateur Radio has to offer in recognition of initiative in short-wave station building. A fine thing about it is that the terms of the award are calculated to reward the builder of "home-made" apparatus, and so the finances of the competitors have little if anything to do with it.

We will hail the winner of this cup as the owner of America's best all-around home-made amateur station for 1923. It's worth real effort to attain. The complete regulations of the contest were published on page 25 of our November issue. Read them carefully, O.M., and file your entry—everybody has a chance.

Transatlantic Amateur Communication Accomplished!

1MO and 1XAM Work French 8AB When Two-Way Amateur Contact is Established Across Ocean for First Time; 1MO Wins QST's Brown Derby for Feat; One Hundred Meters Does the Trick

The Atlantic Ocean was bridged in two-way amateur operation for the first time in history when Station 1MO in West Hartford, Conn., communicated for almost two hours on the night of November 17th with French Station 8AB, operated by Leon Deloy in Nice, France. Later that same night Station 1XAM, sometime 1QP, in South Manchester, Conn., also worked 8AB.

For years we have dreamed of this; for over a year we have seen it coming; for weeks we have been sure that winter weather would see the thing accomplished. It has been done, fellows; we are actually in back-and-forth contact with Europe over our amateur sets. For the first time in history we have worked a European amateur, and for the first time the amateurs of distant foreign countries have sat by their respective firesides and talked to each other with ease.

The story of how it was done goes back to this summer when Mr. Deloy, the leading French amateur, visited this country to study American amateur methods with the avowed intention of "working" us this winter. Hundreds of our fellows met him at the A.R.R.L. Convention in Chicago this fall. Returning home, Deloy applied the "dope" he had collected here and built a short-wave transmitter and when all was in readiness cabled Traffic Manager Schnell that he would transmit on 100 meters from 9 P.M. to 10 P.M. starting Nov. 25th. This news was spread immediately by broadcast and many stations commenced listening. Schnell built a special short-wave tuner for the job and when all was tuned to 100 meters and waiting. Promptly at 9 o'clock Deloy started up, and from the very first word he was copied by 1MO. Altho Deloy has been heard in America before, this was in itself an achievement. For an hour he called "ARRL" and sent the cypher group "GSJTP" for identification purposes. The next night, No. 26th, Deloy again transmitted and, having been advised by cable that he was QRK, sent two messages, which were copied not only by 1MO but by 1QP. One of these, the first amateur mes-
THE TRANSMITTER AT 1MO-18HW which, under the call 1MO and on a wavelength of 110 meters, was the first American amateur station to connect with a European amateur. This set was built in accordance with the scheme outlined by John L. Reinartz, of 1QP-1XAM, in another article in this issue, which every transmitting amateur should read.

The other message made a further schedule and proposed listening for a reply on about the same wave. Meanwhile 1MO got permission from the Supervisor of Radio to test on the short wave, and the following night, the 27th, was in readiness. Deloy came on at 9:30 and for an hour called America and sent two more messages. At 10:30 he signed off, asking for a QSL. 1MO gave him a long call on 110 meters, and European and American amateurs were working for the first time, for Deloy came right back! It brought the thrill that comes but once in a lifetime. Deloy’s first words were:

R R QRB UR SIGS QSA VY ONE FOOT FROM PHONES ON GREBE FB OM HEARTY CONGRATULATIONS THIS IS FINE DAY MIM PSE QSL NR 1 2.

Then Schnell asked him if he would take some messages, and greetings were sent to General Ferrie, director of French military radio, and to Dr. Pierre Corret, president of the French Joint Transatlantic Committee. Meanwhile 1XAM (1QP on special license) called 8AB on 115 meters simultaneously with 1MO and Deloy acknowledged receipt, asking him to QRX. The Editor took the key at 1MO for a few minutes and exchanged compliments with Deloy, and then Schnell asked 8AB for a message from French amateurs for WNP, the MacMillan Arctic Expedition’s “Bowdoin.” This message Deloy sent, expressing the hope that they might soon work Mix; but a couple of words were missed at 1MO and a repeat was asked for. Reinartz had copied it solid, however, and acknowledged it to 8AB, who then shifted to his wave and chewed the rag with him for several minutes. Then 1MO and 8AB connected again. Deloy repeated the WNP message to Schnell, but shortly after developed some sort of transmitter trouble and signed off rather hurriedly at 12:28 A.M.

For two hours these two American stations had worked the French station and in this space but one repeat in each country was necessary. At 1MO, 8AB was audible 25 ft. from a loud-speaker working on one audio step, and 1XAM used loud-speaker throughout too. Deloy reported 1MO “a foot from fones,” using a Grebe CR-13.

Not only was the ocean spanned but new records were made for 100-meter operation; in fact, we believe we can say it was the short wave that made the accomplishment possible. It is interesting to note that all three stations in this communication used the same circuit arrangement, a Hartley with modification originated by Reinartz and described in detail elsewhere in this issue.

(See page 11 for more information.)
January, 1924

issue. Deloy visited Reinartz while here this past fall and was so interested in the possibilities of the short-wave set that he resolved to build one, with the results already reported.

The next night after this work, Nov. 28th, was a bad one, with plenty of static and noise. 1MO had a schedule with 8AB at midnight; they exchanged calls but that was all. 8AB changed wave length and apparently had trouble. His note was poor and he faded badly. 1BGF in Hartford, listening on a Grebe CR-13, and 1XAM also heard him.

Thanksgiving night, the 29th, 1XAM again worked FSAB for a few minutes. 8AB was right on KDKA's short concert wave, about 103 meters, and could be heard only when KDKA was idling. 1XAM heard him at 8, 8:30 and 9 P.M., and connected with him at 10:40 P.M., asking him to shift wave length. This he apparently did but nothing more was heard of him. 1MO had had a schedule at 6 P.M. but 8AB was not heard.

On the night of Nov. 30th 1MO had 8AB on from 10:58 P.M. until 1:17 A.M., signals very QSA but decent copying utterly impossible because of terrific squeals from several local receivers, to say nothing of heavy static. Four long messages were sent to 8AB and acknowledged. He sent two to 1MO which were copied complete by 1XAM who, fortunately, was free from "listener QRM." 8AB was also heard by 2CQZ, 1BGF, 1ANA, and 1XAM.

At this writing, the first of the month, a very determined little group of amateurs is hard at the job, resolved that 8AB shall be kept in nightly contact with this country.

Schnell Wins the Brown Derby

It is going to be hard to explain to you fellows, we know, how an A.R.R.L. officer happened to win the Brown Derby offered by the Editor of QST as a trophy to the first ham to work to Europe. We hear agonized yells of "Collusion!" We're helpless, tho. Schnell vowed his determination to win the lid, he got busy and did it—and there's nothing else to do, he has won it.

(Jealous of our high British hat, we think, and wanted something to wear himself. H!) We're going to hand-paint this derby until Q.M. Stetson himself won't know what it is—watch FS's smoke!

The Stations

We have no particulars on M. Deloy's transmitter, but imagine his power was close to a kilowatt, for which he is licensed, as he certainly had a mean signal. The note, by the way, is 25-cycle unrectified, and the signal was strong enough to receive non-oscillating, merely regenerating on the 25-cycle modulation! His receiver is a new short-wave Grebe. 1XAM used the transmitter described elsewhere in this issue, with 3.1 amps. in the antenna on 115 meters; he of course used a Reinartz tuner for reception, with a 2-step. The sender at 1MO is of the same type but is a full-wave self-rectifying circuit using two UV-203-A's on each side of the cycle. The antenna current on 110 meters is about 1.5 amperes. The power at both 1MO and 1XAM is under a half kilowatt. 1MO's receiver was at best a pile of junk, just a couple of cardboard tubes with a few turns of wire in the ordinary tickler circuit, a 4-plate variable condenser, and a junk detector-onestep.

In the first transatlantic operation between 1IMO and FSAB, a message of greetings was sent to the renowned General Ferrie, director of French military radio, reading as follows:

GENERAL FERRIE,
PARIS, FRANCE.

AMERICA GREETs YOU FOR THE FIRST TIME BY AMATEUR RADIO ACROSS THE ATLANTIC OCEAN ON 100 METERS.

AMERICAN RADIO RELAY LEAGUE.

The answer was received on the morning of Dec. 2d when FSAB sent his Nr. 9 to 1IMO:

AMERICAN RADIO RELAY LEAGUE,
HARTFORD, CONN.

HEMERCIE ET MAGNIFIQUES FELICITATIONS RESULTATS OBTENUS AVEC ONDE 100 METRES QUI ONT PERMIS ETABLIR NOUVELLE LIAISON ENTRE FRANCE ET ETATS UNIS.

GENERAL FERRIE.

Translated, this reads:

AMERICAN RADIO RELAY LEAGUE,
HARTFORD, CONN.

MANY THANKS AND MOST HEARTY CONGRATULATIONS ON THE RESULTS OBTAINED WITH 100 METER WAVE, WHICH HAVE PERMITTED THE ESTABLISHMENT OF A NEW BOND BETWEEN FRANCE AND THE UNITED STATES.

GENERAL FERRIE.

Not a thing extraordinary, in other words, about any of the stations—the accomplishment is merely a demonstration, more effective than all our talk, of the efficacy of the shorter waves. Deloy recognized this too. In his conversation with the Editor via radio he said: "This is...a great moment in my life, for which I have been working several
years. Hearty congratulations to you both and to League for great development of short wave work."

The distance covered by these tests, some 3400 miles, is not remarkable, for western amateurs dump signals to New Zealand over much vaster distances as a matter of course, nor does it compare with the WNP-6CEU record for two-way communication. But it was over an area confessedly much more difficult to cover, it is the first two-way transocean contact with any foreign country, and it is the most important achievement of Amateur Radio in years in that it definitely links us with our European cousins.

Beating the Tests

It seems assured that this is but the forerunner of regular transatlantic operation. European amateurs of course continue to log large numbers of American hams regularly. On the night of Nov. 24th 1AWW in Springfield, Mass., and 8BOY and 3BVA at State College, Pa., copied 6NI in Liverpool, England, answering "Tests" on D.C.C.W., signals QSA, wave between 225 and 250 meters, 10:20 to 10:30 P.M. E.S.T. Although we imagine 6NI is a broadcasting station, this was in good Continental. British 2AW and Dutch PA9 solicit special 100-meter tests with American amateurs—the Traffic Manager is arranging schedules. PA9, by the way, is the first authorized amateur transmitter in the Netherlands, especially licensed to the Dutch amateur transatlantic committee at Delft for the 1923-24 tests. There is some activity in Italy and ACD is ready with 200 watts, waiting for his license. Belgium shows signs of life and before long there will be amateur transmitters there. In France and England of course they are ready for us this winter by the dozens, but they will have to step some to keep up with F8AB.

To Deloy and lMO and 1XAM, our hearty congratulations. You have started a great winter!—K.B.W.

Anti-Regenerative Amplification

By Lewis M. Hull, Ph. D.*

The average radio man is wandering about in a maze of tuned radio-frequency amplifier circuits, bewildered by conflicting claims. Nowhere is the confusion worse than in the field of anti-regeneration devices—those things that are used to keep tuned radio amplifiers from oscillating. The business of this article is to clear up the tangle. It shows that all anti-regeneration devices are built up from a few quite simple ideas, and it explains just how the final circuits work.—Tech. Ed.

During the past year several different receivers using anti-regenerative radio-frequency amplification have been exploited commercially under different trade names, and the idea has been fostered that these circuits each represent a fundamentally different development in radio technique. As a matter of fact, all vacuum tube repeater circuits, in which regenerative currents through the internal tube capacities are compensated or neutralized by the addition of an extra circuit element, can be separated into a few simple classes. As soon as the basic principles are understood these circuits can be constructed with numerous variations, almost to suit the taste of the experimenter. At intervals during the last two years my colleague, Mr. Stuart Ballantine, and I have investigated a number of anti-regenerative circuits and it is for the purpose of co-ordinating the more popular circuits of this nature with the general scheme of things that the present discussion is written.

Regeneration

Every operator of a radio receiver knows that tuned amplifier stages are subject to electrical instability caused by regeneration through the tubes themselves, which may produce locally sustained oscillations in one or more of the tuned circuits, with exasperating effect on the ear and disposition of the long-suffering listener. It may be well
to stop here a moment to recall a few general facts about regeneration. First, the definition: Regeneration is any form of reaction from the output (plate) circuit upon the input (grid) circuit of an amplifying tube whereby the alternating-current power supplied to the input circuit is increased. (Obviously regeneration must be preceded by amplification in the tube, or there would be no excess of power available in the output circuit to react.) Second, the cause: Among the many ways in which regeneration can be produced, there are two which are especially popular in radio reception; namely inductive coupling from output (plate) circuit back to input (grid) circuit (Armstrong) and capacitive coupling from output back to input. The second (capacitive) method is based on the well-known circuit law that if the output circuit, between plate and B+ terminals, is wholly or partly inductive, any capacity whatever existing between the plate and the grid will pass a reaction current back into the input (grid) circuit which aids the current already there. There are two popular methods of controlling this reaction current in regenerative receivers: either connecting an outside variable condenser between plate and grid and varying it to change the magnitude of the reaction ("feedback") path, or using the fixed plate-grid capacity as a reaction path and varying the constants of the output circuit by "tuning" it, or by inserting a series variometer in the plate circuit. It is this latter type of regeneration, produced through the fixed plate-grid capacity by the presence of a tuned output circuit, that we are concerned with in the present discussion of amplifiers.

Regeneration in Tuned R.F. Amplifiers

Figure 1 is a diagram of the typical tuned amplifier stage which is subject to these regenerative effects. T1 is the tuned input circuit exciting the grid of the radio amplifier tube and T2 is the tuned output circuit included in the plate circuit. The stage here shown can be considered the first stage of a series (in which case T1 would be a tuner and T2 the primary of a coupling transformer) or it may be an intermediate stage, wherein T1 and T2 are respectively the secondary and the primary windings of resonant coupling transformers. Cm is the other important element, the ever-present mischievous go-between which causes regeneration and instability; in other words Cm is the internal capacity of the tube itself between the grid and the plate, augmented by the unavoidable capacity between the wiring and other metal parts connected to the plate and grid. These are jumped together and shown on the diagram, Fig. 1, as a single capacity Cm, which represents the total active feedback-producing capacity of the circuit. The primary (amplifying or forward) action of the amplifier consists of the flow in circuit T1 of a magnified copy of the currents flowing in T2; this action occurs in the well-known fashion through the agency of the electron streams within the tube. The secondary regenerative or backward action of the amplifier occurs through the agency of the capacitive coupling between circuits T1 and T2, which has just been mentioned. As soon as the magnified currents are established in T1 by the direct action they react upon T2 through Cm and it so happens that when T2 is tuned even to approximate resonance with T1, the secondary currents set up in T2 by this reaction aid the currents already there.

Regeneration Always Present

The question of how far this regeneration is harmful in an amplifier is irrelevant; we are here concerned with the fact that this regeneration is always present and even when Cm is brought down to an irreducible minimum by the use of short connecting leads to grid and plate it may cause spontaneous local oscillations ("howling") and render the amplifier so unstable that it cannot be operated near the resonance point.

Purpose of Anti-Regenerative Devices

The function of all anti-regenerative devices is not necessarily complete elimination
of the effects of capacity coupling through \( C_m \) but control of the resulting regeneration such that a cascade amplifier made up of stages like the circuit of Fig. 1 can be rendered stable and easy to tune without producing oscillations in the stages or in the tuner. Many popular circuits on the market today contain two radio-frequency amplifying stages with low-resistance tuned coupling transformers and the novel feature of certain circuits of this class (such as the "neutrodyne" circuit) consists merely of the provision of some agency which limits the regeneration through the fixed \( C_m \) elements of the separate stages, for all tuning adjustments in the plate circuit.

Regeneration Limiting Devices

The possible methods of limitation fall into two general classes. The first of these, dignified not by its merit so much as by its extensive practice, consists of the deliberate introduction of such losses into circuits \( R \), or both, that the energy fed back through the \( C_m \) capacities is thereby absorbed and obscured. Grid potentiometers, "stabilizers," shunt resistances on transformers, transformers wound with high-resistance wire and short-wave transformers with iron cores, are all practical modifications of this ingenious principle. If regeneration were the only activity limited by this method it would have much to recommend it. But it also limits selectivity, tends to produce distortion in the amplified currents and is generally analogous to the custom in the mechanical field of dissipating dearly-bought momentum in the brake linings of a motor car instead of using it to store up energy while the car is being stopped, as is done in certain highly efficient types of electrically driven vehicles. If for practical reasons a method of this class must be employed to control an amplifier the least harmful way of putting it in practice is to introduce a variable series resistance into one of the tuned circuits, as shown at \( R \), in Figure 2a, or to use a shunt resistance with a variable induct condenser, as shown at \( R \) and \( C \), in Figure 2b. \( R \) should have a maximum resistance of about 50 ohms. \( R \) should be considerably larger. If \( R \) is about 50,000 ohms a two-plate "vernier" condenser can be used at \( C \). In either case, since the losses are controllable, the absorption of regenerated currents is variable, and the control does not involve inter-stage rectification as is frequently the case when the grid is biased by a potentiometer connection between the legs of the filament. The latter device also is practically equivalent to replacing a variable shunt resistance across circuit \( T \), since the grid-filament path through the tube draws more and more current as the mean grid voltage is increased above that of the negative filament terminal by a potentiometer. The disadvantage of this method lies in the distortion produced by the changing grid-filament resistance of the tube.

Feedback Prevention and Compensation

The second general class of methods of control strikes at the source of the regenerative feedback and involves either the prevention of current flow through the capacity \( C_m \) or the compensation of the effects upon the input circuit of this current flow. This class of methods falls into two groups. In the first of these, exemplified by the Hazeltine "Neutrodyne" circuit, the degree of compensation is progressive, increasing as a suitable variation is made in the compensating element, so that overcompensation is possible, with a corresponding reduction in the effective amplification of the circuit below that furnished by the forward action of the tube alone. The second, of which the Rice circuit is an example (described in U. S. Patent No. 1,334,118) the compensation can be in-
increased only to a critical or maximum value which just obscures the reaction through \( C_m \) and then is reduced again, during a progressive change in the compensating element.

**Reversed Tickler**

The simplest method of the first group is shown in Fig. 3a. It consists merely of the addition to the \( C_m \) coupling between grid and plate circuits of an additional magnetic coupling through the coil \( L_n \). The connections to this coil are made opposite (reversed) with respect to those of the feedback coil in the Armstrong circuit, so that this magnetic coupling tends to suppress regeneration instead of aiding it, thus directly opposing the coupling through \( C_m \).

This circuit has been used by many experimenters and was probably first disclosed by Hartley (U.S. patent No. 1,183,875). It is now being utilized commercially in the Tuska “Superdyne” receiver. An inherent disadvantage of this form of control is that it involves balancing an inductance against capacity and hence the degree of compensation varies quite rapidly with the wavelength of the received signal. A fixed value for the inductive coupling may prevent actual self-oscillation over a band of wavelengths, but in general as \( T_n \) and \( T_r \) are tuned to different wavelengths the compensator coupling must be changed as well.

**Reversed Capacitive Feedback**

In the second circuit of this group (shown in Fig. 3b) the compensating element is a condenser \( C \) connected from the grid to the high-potential terminal of a coil \( L_n \), which is so coupled to the primary coil in the tuned plate circuit that the voltage across \( L_n \) is just opposite in phase to the voltage across circuit \( T_n \) regardless of the wavelength to which \( T_n \) is tuned. Hence by proper choice of \( C \) the current through \( C \) can be made to introduce into \( T_n \), a voltage which opposes and just balances that produced by the current through \( C_m \). This is Professor Hazeltine’s circuit. It should be noted that if the coefficient of magnetic coupling between coils \( L_n \) and \( L_r \) could be brought fully up to unity, and if the capacitive coupling between these two coils could be simultaneously kept low, the feedback currents from \( T_n \) into \( T_r \) would be prevented equally at all wavelengths; the neutralization would be truly independent of the frequency and of the tuning of \( T_n \), as specified in Professor Hazeltine’s original disclosures. It is an unfortunate physical fact, however, that two coils cannot be wound in opposite directions, with a reasonably low intercoil capacity, without allowing appreciable magnetic leakage between them. This causes the voltage across the secondary coil \( L_r \) to depart somewhat from a uniform and constant opposition to the voltage across the primary coil; the relative phases are made to depend somewhat upon the frequency. This is the reason why the degree of compensation varies to some extent with the tuning in the commercial neutrodyne sets. The only way in which two air-core coils can be given approximately unity coupling is to wind the two wires which compose the coils together, so that they go on the coil support in the form of geometrically parallel strands. This cannot be done with the neutrodyne coils because the sense of the windings must be opposing, and it is impossible to reverse one coil after winding them together on account of the high distributed capacity between them. This structural difficulty appears to be a permanent bar to the full enjoyment of the theoretical advantages of this excellent circuit.

A somewhat similar type of circuit is shown in Fig. 3c. Here the coupling unit which joins the tube shown to the next in line consists of a series resonance circuit, comprising coils \( L_n \) and \( L_r \) in series, tuned by condenser \( C_r \). The coils may or may not have mutual inductance; it is immaterial for purposes of compensation, but it may be convenient in tuning to have them coupled loosely together. The coil \( L_n \) is in the plate circuit of the amplifier tube shown, and the grid and filament of the next tube are connected across \( L_r \). The circuit is tuned to resonance with the incoming wavelength, \( \lambda \), by adjusting \( C_r \) that

\[
\lambda = 2\pi \sqrt{(L_n + L_r + L_M) C_r}
\]

When the circuit is resonant the voltage across \( L_n \) is just opposite in phase to the voltage across \( L_r \). Hence the feedback currents through \( C_m \) can be compensated by connecting \( C_r \) between the top of \( L_n \) and the grid, just as in the Hazeltine circuit. This circuit has the advantage, moreover, that the grid voltage passed on to the next tube bears the ratio \( L_r / L_n \) to the plate voltage of the tube shown, at resonance, whereas with transformer coupling, as in circuit (b) these voltages are in the ratio \( \sqrt{L_r / L_n} \). In other words, this circuit “steps up” the voltage at resonance as the square of the turn ratio, instead of as the first power of the turn ratio with ordinary transformer couplings. The circuit has the peculiarity that while compensation of regeneration is not perfect for wavelengths off the resonance point of the coupling circuit, the compensation at resonance is independent of the resonance wavelength. I have constructed two-stage radio-frequency amplifiers using this circuit which were very successful.

**A Good Circuit**

In circuit 3d the compensating element contains a coil \( L_n \) closely coupled to the tuned input circuit, \( T_n \), as in circuit 3a. Circuit 3d has two important advantages, however: First, the plate circuit proper does not contain the compensating element, and second, the
compensation can be fixed, independent of the wavelength, over a wide range. In a single stage as shown here the output transformer or coupling $T_1$ may have any form whatever since it has no connection with the compensator. The tuned input circuit must contain a coil $L_1$ and coupled to this coil with very close coupling (coefficient of coupling greater than 0.5 and preferably nearly unity) is the compensating coil $L_c$ which is wound in the sense opposing $L_1$. The high side of $L_c$ is connected to the plate through a condenser $C_c$, so chosen, as in all the other circuits, that the back voltage from the plate acting through $C_c$ upon circuit $T_1$ will just balance the back voltage from the plate acting through $C_m$ upon circuit $T_1$. The adjustment of $C_c$ is rather critical, but the circuit is useful because one or two stages can be controlled without oscillation, with the compensator in the tuner alone. For instance circuit $T_1$ can constitute a single-circuit tuner directly in the antenna, with compensating coil and condenser $L_c$ and $C_c$ (which perform independent of the load in the plate circuit). Then $T_1$ can be any form of radio-frequency transformer working into a detector or into another amplifier stage. In fact I have operated two R.F. stages into a tube detector from such a compensated tuner, with Ballantine Variotransformers, Model 5, as the coupling elements in both stages, with entire freedom from oscillation over the range from 150 to 600 meters. The compensation prevents oscillation in the tuner, which is where the most noisy and disagreeable oscillations occur, and with this model of Variotransformer no oscillations are produced in the transformers themselves. The condition for a compensation which is independent of the wavelength in this circuit is as follows:

$$\frac{C_c}{C_m} = \frac{L_1}{L_c} = \frac{N_1}{N_c}$$

where $M$ is the mutual inductance between $L_1$ and $L_c$ and $N_1$ and $N_c$ are the numbers of turns, respectively, in coils $L_1$ and $L_c$. Thus, when the turn ratio is determined, the value of $C_c$ for complete suppression of regenerative effects depends, as in the Hazelton circuit, only upon the grid plate capacity, $C_m$.

### Wheatstone Bridge Circuits

The second group of methods in which over-compensation is impossible is easy to describe but not simple to put in practice. The principle employed is the following property of the alternating-current Wheatstone bridge: If a bridge be arranged with four arms, which may be capacities, inductances or resistances, and the bridge is properly balanced, then an alternating voltage impressed between either pair of opposite points of the bridge can produce no voltage drop between the other pair of opposite points of the bridge. In other words, a balanced bridge is a network in which two spaced points are electrically isolated from two other points. Reference to Fig. 1 suggests the utility of this principle in opposing regeneration. In order to prevent regeneration the input circuit $T_1$ must be electrically isolated from the output circuit $T_2$ except for the "forward action" of the amplifier tube. This is done by forming four external arms of a balanced bridge and placing the input and output circuits across the two pairs of opposite terminals of this bridge.

Figure 4a illustrates an application of the principle in the Rice circuit. The filament terminal of the tube, instead of being connected to the lower end of the input circuit $T_1$, is connected to an intermediate point which divides the inductance of this circuit into two parts, $L_1$ and $L_2$. The lower terminal of the input circuit is connected through a small fixed condenser $C_c$ to the plate. Then terminals $G$ and $X$ of the input circuit and terminals $P$ and $F$ of the output circuit are two pairs of opposite points of a Wheatstone bridge having two inductive arms and two capacitive arms. The inductive arms are $L_1$ and $L_2$ which serve also as elements of the tuned input circuit $T_1$. The capacitive arms are $C_c$ and $C_m$. The bridge is balanced for a given magnitude of capacity $C_m$ by so placing the filament tap that inductance $L_1$ bears the ratio to $L_2$ that capacity $C_c$ bears to $C_m$. Thus if $C_c$ is made equal to $C_m$ the filament connection can be brought permanently to the center of the inductance coil in $T_1$. It is best in constructing this circuit to connect the filament lead permanently near the center of the coil and vary $C_c$ until a balance is reached. $C_c$ can then be locked. The
proper value of $C_e$ will seldom be greater than 15 micro-microfarads. When the bridge is balanced in this way $T_1$ is electrically isolated from $T_2$ since all retroactive currents through $C_m$ are exactly compensated in $T_1$ by opposing currents through $C_e$. This permanent compensation is independent of the wavelength and of the tuning of circuits $T_1$ and $T_2$, when the bridge is balanced. It is also independent of the internal resistance and amplification factor of the tube, provided that no grid current flows in the tube. The amplifying action of the tube is the same as before. When a received signal is brought into $T_2$ the resulting voltage across the $L_2$ portion of the coil is impressed on the grid and a magnified copy of the currents in $T_1$ is maintained by the tube in $T_2$. The tube is now a true one-way repeater, however, and no reaction by these currents upon $T_1$ is possible.

Amplifiers with four or five cascaded stages can be constructed in this way which will be perfectly stable and easy to manipulate. The input tuner and the secondaries of the radio-frequency transformers need only to be supplied with a center tap and each stage must be provided with a compensating condenser as shown in the figure. Any experimenter who has had experience with a radio-frequency bridge will realize, however, that the circuit must be arranged with regard for stray capacity couplings.

A second compensated circuit of this type is shown in Fig. 4b. Here the arms of the Wheatstone bridge are all capacitive. $C_e$ is an external fixed condenser, forming the arm adjacent to $C_m$. $L$ is a radio-frequency choke coil of such size that its distributed capacity $C_2$ serves as a fixed bypass for radio frequency currents. $C_i$ is the third arm of the bridge and $C_2$ the fourth arm. $C_3$ may be an external condenser but it is convenient to use for $C_i$ merely the internal capacity of the tube between grid and filament, hitherto unmentioned. Thus the only extra circuit elements that are necessary are the fixed coil $L$ and the condenser $C_3$ which can be adjusted and then set.

Similar other combinations of inductance with capacity and resistance with capacity in the four arms of the bridge are possible, all of which permit a balance which is independent of the frequency. Those previously shown are typical and perhaps the most practicable. For economy of apparatus two of the arms should be arranged as parts of the tuned input circuit whenever possible.

**Complete Amplifier Diagrams**

In Fig. 5 are shown circuit diagrams for two two-stage anti-regenerative amplifiers using two of the circuits previously described. These are shown merely to demonstrate how the typical single stage pictured in the diagrams can be cascaded. There are no points of novelty in the coupling transformers or the compensating condensers. Either of these circuits when carefully constructed with two or three stages will equal any other anti-regenerative circuit in stability, selectivity and quality of the detected signal.

**History**

In this somewhat hurried review of the situation existing today I have made no reference to some interesting historical aspects of anti-regenerative amplifiers. Regeneration in tuned amplifiers only has been considered because this type is of prime importance at the present time. The somewhat more complicated problems of regeneration in resistance-coupled amplifiers were attacked and partially solved by the French army engineers years ago, at a time when they used such amplifiers extensively. The first "reflex" circuit which appeared in this country was contained in a resistance-coupled amplifier brought over by General Ferrié in 1917, which contained means for controlling regeneration in the form of a variable capacitive coupling between the output of one stage and the input of a previous stage, so positioned in the series that the voltage in these two circuits conspired through this coupling to oppose regeneration. The importance of anti-regenerative devices was appreciated some time ago by Nichols, who described an external anti-resonant grid-plate coupling (U.S. patent No. 1,325,879) and by Heising, who published extensive information on the incomplete control gained in a single stage by varying the constants of the output circuit (U.S. Patent No. 1,426,733). These patent references, as well as the others cited in this paper constitute, as far
as I am aware, the only published accounts of the contributions of these experimenters. It should be mentioned here that important contributions to the design of anti-regenerative amplifiers were made by Balantine as far back as 1918 of which no published description was ever made. He first applied the principle of the alternating current Wheatstone Bridge in isolating the output circuit of an amplifier from the input circuit, and pointed out extensive applications of this principle in particular circuits, some of which are in use at the present time.

### New World’s Relay Records

*International Group Sets Speed and Distance Marks*

<table>
<thead>
<tr>
<th>Category</th>
<th>Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fastest relayed message</td>
<td>2412 miles</td>
</tr>
<tr>
<td>Longest 3-station round-trip relay</td>
<td>12,300 miles</td>
</tr>
<tr>
<td>Longest amateur relay</td>
<td>9,565 miles</td>
</tr>
<tr>
<td>First 4-country relay</td>
<td>France, U.S.A., Canada, Greenland</td>
</tr>
</tbody>
</table>

Sounds like the work of many stations and many weeks, doesn’t it? But it isn’t—6 stations did this in a few evenings.—Ed.

On November 20th messages started buzzing back and forth along a 3-station relay route reaching from Refuge Harbor, above Etah, Greenland, to Hartford, Connecticut—by way of Catalina Island, California. This route worked beautifully from the start—messages snapped from WNP at Etah to 6XAD-6ZW at Avalon, Catalina, and thence transcontinentally to 1HX at Hartford with hardly an interruption. After the route had run for about a week and had provided rapid contact between Radioman Donald Mix, 700 miles from the north pole, and his family at Bristol, Conn., it happened to occur to both 6XAD-6ZW and 1HX that they had all the machinery for making a round-trip relay speed record. They began trying on the 27th and made a round trip in 8 minutes and 30 seconds for 12,290 miles covered. This was good—but it needed improvement to suit these three. They took another try that evening, and while they did not better this speed they put a message (a thanksgiving greeting from Mrs. Mix) into Don's snowed-under radio cabin less than 6 minutes after his mother had finished telephoning it to 1HX.

#### The Speed Record

On the next night the new record was made—a message started at 1HX at 5:19:00 A.M. Eastern Standard Time, was acknowledged by 6XAD at 5:21:00 A.M. E.S.T., and after a “break” to WNP was acknowledged by that station. Immediately Mix started an answer back to 6XAD, who acknowledged with a single “R,” broke to 1HX and received an acknowledgment at 5:21:06 A.M. E.S.T., or FIVE MINUTES AND SIX SECONDS AFTER THE MESSAGE HAD STARTED. This represents a distance of 12,290 miles covered at the rate of 2412 miles per minute. That’s a double world’s record, the longest round-trip relay and the fastest relayed message!! It beats the famous 1AW-9AWM-6ZAC message in both respects, for that covered 9800 miles at a speed of 2279 miles per minute.

This was a good beginning but there was more to come—and on the same night at that.

#### The International Relay

In the early morning of the 27th 1MO and 1XAM-1QP were working French 8AB at Nice, France. Presently Leon Deloy of “FSAB” sent 1MO a message addressed to WNP and the message was copied partially by 1MO, but copied complete and acknowledged by 1XAM who phoned it to 1HX. From 1HX the message went to 6XAD as usual but stalled there since WNP was apparently not on the air. 6XAD gave it to Canadian 9BP at Prince Rupert, B. C., who passed it to WNP the next night. This message broke no speed records—it hardly traveled fast at all but it did break two
other records: it was the first 4-country relayed message, and it traveled farther than any relayed amateur message had ever gone before.

Here is the routing:

Miles
F8AB, Nice, France to 1XAM, S. Manchester, Conn.................... 3500
1XAM to 1HX by telephone
1HX, Hartford, Conn., to 6XAD-6ZW, Avalon, Cal.................... 2500
6XAD-6ZW, Avalon, Cal., to Can. 9BP, Prince Rupert, B. C................ 1305
Can. 9BP, Prince Rupert, B.C. to WNP, Etah, Greenland............. 2260
Total...............................9565

The Stations That Did It

WNP has been described many times in these pages. Mix, the 50-watt tubes and the Zenith sending set, performed brilliantly as always. Wave length 180 meters. Receiving set, Zenith IR.

9BP, Jack Barnsley’s station at Prince Rupert, B. C., has acquired fame along with WNP. The description on page 49 of the December issue is still good, except that this time the wave was 180 meters. Paragon receiving set.

6XAD-6ZW, Lawrence M. Mott’s station on Catalina Island, Calif., certainly needs no introduction—it has been heard everywhere. We do not know which of the many sending sets was in use but the signal on this coast sounded as if the antenna current was about 15 amperes. Wave 220 meters. Grebe CR-13 receiver.

1HX-1XAQ used a pair of “50-watt” General Electric UV-203-A tubes in the familiar Hartley circuit—with A.C. on the plates, one tube on each side of the cycle. Nothing remarkable about this set except an 85-foot mast that nearly caused this magazine to need a new technical editor—and the C. D. Tuska Co. a new Engineer.

“Every Station but 6XAD-6ZW was below 200”

It happens that the station belongs to “LQ” and to “BP.” Wave 180 meters. Tuska 22U receiver.

1XAM is described in this issue. Wave 100 meters. Reinartz receiver of course.

That leaves French 8AB, of which station we know little except that it belongs to Leon Deloy of Nice, France, and that the plate supply sounds like about 20 cycles—rattles. But it has plenty of punch, even tho the wave is 100 meters. Grebe CR-13 receiver.

A Constant Frequency Set With a Record

By Captain Tom C. Rives, Signal Corps, U. S. A.*

The first requirement made of an amateur set is range. The set at 2CXL meets that requirement gloriously, for it has been copied daily, with a single tube, by Mr. John L. Liestra at Rotterdam, Holland. What else is demanded of the ideal amateur set? Probably that it is reliable, simple, efficient, able to send out a steady, sharp wave without keying clicks and—not too expensive. Then if the set can shift wave rapidly it is surely a very good set. The set at 2CXL meets all these hard requirements.—Tech. Ed.

The set described here was designed and constructed in the Radio Department of the Signal School at Camp Alfred Vail, New Jersey, by enlisted students in the school. Much valuable information as to design data was obtained from Mr. Pressley and Mr. Young of the Radio Laboratories at this place. The present set is only a table hook-up but we hope some day to mount it on a panel. The set was started at about the same time that QST started fighting for a band of wavelengths for the amateur instead of just the one fixed wave length. It took about three months of experimenting with different hookups before we got anything worth while.

The set uses a constant-frequency master oscillator of the Hartley type, the output of this master being amplified by three tubes (power amplifier) before being fed to the antenna. By means of a variable condenser it is possible to vary the wave length of the master oscillator circuit from 170 meters to 200 meters. The antenna circuit...
is brought into resonance by means of a variometer or a variable condenser, depending entirely upon whether the antenna wave length is above or below the wave it is desired to emit. A change from one wave to another takes about 30 seconds.

The Master Oscillator

The master oscillator inductances $L_3$ and $L_4$ are wound on a tube $3\frac{1}{2}''$ outside diameter. The full details of these inductances are shown in Figure 2. While “Litz” was used in our set we found that No. 10 D.C.C. magnet wire worked very well for these inductances, also for coils $L_1$ and $L_2$. Don't waste time or money on the Litz.

The variable condenser $C_1$ was a General Radio one with a maximum capacity of $.0005$ microfarads and a minimum capacity of about $.00001$ microfarads. To secure good operation of the master oscillator it was necessary to move this entire capacity-range upward by adding the fixed condenser $C$. This gave a combination with a maximum capacity of $.0145$ and a minimum of $.00094$ microfarads. This fixed condenser was made of small sheets of mica $.01''$ thick, placed between leaves of sheet brass having the dimensions shown in the drawing. Two of the brass leaves and the outside metal clamping plates were connected together as one terminal of the condenser, while three other brass leaves were connected together for the remaining terminal. The capacity of the condenser, when clamped together by means of 4-32 machine screws, as indicated in Figure 2, was $.00093$ microfarad. The dimensions of the parts are also given in Figure 2.

The resistance $R_1$ is a 12,000-ohm grid-leak. The coil $L_4$ is a radio-frequency choke made by winding approximately 3000 turns of No. 33 D.S.C. wire in the $\frac{1}{2}''\times\frac{1}{2}''$ space of the fibre (or wooden) spool shown in Figure 2. These two units make up the grid-leak of the master oscillator.

All of the condensers in the set except $C$ and $C_1$ are Dubilier type 557 and they easily stand 500 volts without breaking down.

The Amplifier

After the master oscillator is completed and in good operating order, connect it
to not over three\(^1\) amplifier tubes as shown in Figure 1 and 2. When using three VT-2 or "E" tubes the grid-leak \(R_1\) has a value of 5,000 ohms and is of the same type as \(R_2\), while the choke \(L_1\) is exactly like \(L_2\), described before.

The primary of the output transformer, \(L_1\), is made by winding about 40 turns of No. 20 D.C.C. wire on a 4-inch tube as shown in Figure 2. Connect this winding into the plate circuit of the amplifiers tubes (in series with the milli-ammeter) as shown in Figure 1, and start the set going. Leave the antenna circuit open. Set the variable condenser \(C\), at the middle of its range and read the milli-ammeter; it will probably read very high. Now take one turn at a time off the winding \(L_1\) until the milliammeter reading comes down to very nearly zero. We got this reading down to about 12 mils. with full voltage on the tubes. This is supposed to determine the most efficient number of turns for this winding.

Figure 4 shows the curves that were made while determining the correct number of turns for the primary (\(L_1\)) of the output transformer. Since we desired to work well below 200 meters the 29-turn coil was selected as it gave the lowest input at these wave lengths. The correct coil for each band of wave lengths is the one whose lowest point is at about the center of the band of wave lengths which will be used under ordinary conditions. (Under no circumstances attempt to make this adjustment with the antenna circuit closed and with the antenna ammeter as the indicator. The result of such an attempt will certainly be that the amplifier will oscillate and not be controlled by the master-oscillator. Follow the method given by the author, remembering that his results fit only his particular tubes and antenna. If you wish to work over a wider band of waves, tap \(L_1\) at several turns and use a clip. Thus it can be seen from Figure 4 that at 2CXL the following taps would be useful for ordinary amateur work: 23 turns—Below 170 meters; 23 turns—170-182 meters; 30 turns—182-189 meters; 31 turns—189-200 meters.—Tech. Ed.

\(^1\)This is a thing that causes many master-oscillator sets to fail. The rating of the amplifier tubes must not be over about 2 times that of the master tube if steady and reliable operation is wanted. Don't try to operate a pair of 50-watt tubes on a 1-watt master.—Tech. Ed.
The Antenna Circuit

The secondary, $L_2$, of the output transformer is wound with Litz as shown in Figure 2, but here again a solid D.C.C. wire will serve well. If the wave length of the antenna, with $L$, connected in the antenna lead, is higher than the working wave it will be necessary to use a series variable condenser. If the wave length of the antenna system is below the desired working wave an antenna variometer is used as shown at $L$, Figure 1. We had quite a bit of trouble in getting the proper number of turns on the variometer. This is purely a proposition of “cut and try,” we finally left ours with 8 turns on the rotor and 8 turns on the stator.

Operation

The completed set was connected to an antenna consisting of two 4-inch cages in parallel with one end about 30' high and the other about 50' high. The flat-top portion was 50' long with a 30' lead to the set. With all tubes running cool the antenna current was 2.6 amperes at 200 meters and about 2.3 amperes at 170 meters. It is a pleasure to work the set as it is a sure-fire proposition, and with D.C. on filaments and plates gives a beautiful C.W. note. The only kick we have heard against it is that it is too sharp. Once we raise a man he can stay with us but it doesn’t ordinarily disturb the ether enough to attract attention. The combination of constant frequency plus inductive coupling to the antenna certainly eliminates interference and gives a very sharp wave.

Although the constants of this set are for use with Army VT-2 tubes, it is believed that they will not be very far off for commercial 5-watt tubes. At any rate, the circuit has been found to be all that can be expected of it.

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Operation

A simpler construction would be to wind extra turns on $L_1$ which could be made to slide in $L_2$ rather than turning as at present. To change wave one would then move the antenna clip and turn the master-oscillator condenser until the antenna ammeter went up again. The losses in such an arrangement would perhaps be lower than in a series variometer. Where a series condenser is needed there is no object in tapping $L_1$.—Tech. Ed.

$4,000.00 in Transatlantic Prizes

By F. H. Schnell, Traffic Manager

FOUR thousand dollars is the value of the prizes donated to us amateurs by our many good manufacturers, jobbers, and dealers of the United States for our Fourth Transatlantic Tests. The A.R.R.L. wishes to acknowledge with heartiest thanks the splendid response and keen cooperation in the interest of our Tests. We hope every manufacturer, jobber, and dealer who donated prizes will get back many times as much as he is putting in from what advertising we can offer thru these columns. Our heartiest thanks to you all!

There is a peculiar aspect to this business of getting prizes for this series of tests—you know we haven’t done it before. Last year some of us couldn’t keep quiet during the tests and we had hoped that by offering prizes of the finest radio apparatus in America we could give you something to be quiet for. Ever hear about the little boy who wouldn’t keep quiet until he got a piece of candy? Well, we’re not all little boys but we have something to offer you if you will keep your transmitter silent and do some good receiving of European amateur signals during the tests. Another reason why we went after prizes is because we think this will be “the last of the Trans-Atlantics,” because two-way Transatlantic Amateur Communication has been established and there is no necessity of another series of tests.

Believe yours truly, it is no easy matter to sort our $4000.00 worth of prizes in a way that will be satisfactory to everybody and do all the other things which come up when Trans-Atlantic Tests come along. (Next year we hope to spend a little of the time during the holidays with the family—something we haven’t done for two years.) We are not going to spend a whole lot of time going over the conditions of “how to win a prize” —but we do want to say that the way NOT TO WIN A PRIZE is by using your transmitter during the tests.

Get our copy of December QST and read the announcement of the contest. If you haven’t got one, send 20¢ to 1045 Main St., Hartford, Conn., and get one. (You might send a $2.00 bill and be sure of your copies for twelve months in the future.) December QST will give you all you have to know about the prizes and how to win them.

The three judges, whose duty it will be to verify and approve all reception records, are K. E. Warner, Secretary A.R.R.L.; and F. H. Schnell traffic Manager, A.R.R.L.; and A. A. Hebert, treasurer, A.R.R.L.; and F. H. Schnell, traffic Manager, A.R.R.L.

In the event that no signals are heard,
all prizes will be returned to the donor, as will all prizes not qualified for. The prizes are not at A.R.R.L. Headquarters; they are being held pending shipping instructions from A.R.R.L. upon verification of reception reports and proof of NO TRANSMISSION. What shall we ship you, OM?

In submitting your reception report show all details, including your name and complete address. Your log must show date, time (be sure to specify whether you use eastern standard or Greenwich time), call and/or code word. You know what is wanted—let us have it!

**VALUE OF PRIZES OFFERED**

A. H. Grebe & Co., Richmond Hill, N. Y........................ $1100.00

Howard Radio Co., Chicago........................................ 200.00

Chicago Radio Laboratory, Chicago................................ 100.00

Zenith Radio Corporation, Chicago................................. 100.00

Allis-Chalmers Co., Upper Merion, N. J........................... 150.00

The Magagnotti Co., Oakland, Calif................................ 150.00

Colin B. Kennedy Corp'n, St. Louis................................ 125.00

Multiple Electric Products Co., Newark........................... 125.00

Radio Corporation of America, New York City....................... 125.00

Nathanial Baldwin, Inc., Salt Lake City, Utah...................... 100.00

Premier Electric Co., Chicago...................................... 90.00

Radio Corporation of America, New York City....................... 90.00

National Chinese Radio Corporation, Boston........................ 52.00

Cromley Manufacturing Co., Cincinnati............................. 50.00

Klaus Radiotechnik Co., Philadelphia............................... 50.00

Burgess Battery Co., Madison, Wis................................ 50.00

The Precision Equipment Co., Cincinnati........................... 50.00

R. Mitchell and Co., Boston......................................... 48.00

National Carbon Co., Long Island City, N. Y......................... 48.00

Electric Specialty Co., Stamford, Conn.............................. 48.00

The Precision Equipment Co., Chicago.............................. 42.00

R. Mitchell and Co., Boston......................................... 42.00

R. Mitchell and Co., Boston......................................... 30.00

E. T. Cunningham, Inc., San Francisco............................. 30.00

Tower Manufacturing Corp'n, Boston................................. 30.00

Allen-Bradley Co., Milwaukie, Wis................................ 25.00

Dubillac Condenser & Radio Corporation, New York City.......... 22.50

C. A. Brasham, Inc., Buffalo....................................... 22.50

Jewell Electrical Instrument Co., New York City.................. 20.50

Stromberg-Carlson Co., Rochester.................................. 20.00

Kliner Electric Co., Buffalo........................................ 16.50

Jewell-Sterl Co., Cleveland......................................... 16.50

The Automatic Electrical Devices Co., Cincinnati................ 16.50

Weston Electrical Instrument Co., Newark, N. J.................... 15.00

Panasit Products Co., Inc., North Chicago, Ill.................... 15.00

National Electric Mfg. Co., St. Louis............................... 15.00

Signal Electric Mfg. Co., Menominee, Wis.......................... 15.00

Rauland Manufacturing Co., Chicago................................ 15.00

The Stoll-Watson Battery Co., Chicago.............................. 15.00

Westinghous Ballast Co., Switson.................................. 15.00

Mansfield Products Co., Revere..................................... 15.00

American Transformer Co., Newark, N. J............................ 15.00

R. Mitchell and Co., Boston......................................... 15.00

American Transformer Co., Newark, N. J............................ 15.00

R. Mitchell and Co., Boston......................................... 15.00

The Rousch Mfg. Co., Urbana, Ohio................................ 15.00

Post Electric Co., New York City.................................. 15.00

U. S. Tid Co., Newark, N. J........................................ 15.00

The Hart & Hegeman Co., Hartford................................. 15.00

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**GRAND PRIZE**

Grebe 200-watt C.W., L.C.W., Phone Transmitter, Value $1100.00.

**GROUP A**

First: Zenith® Receiver and 2M two-step amplifier; 1 Atlas Loud Speaker; 1 Homecharger; 1 pair Baldwin type C phones; $5.00 selection from Howard Radio Co.; 1 Everyeord 2767 battery; 1 Zenith® transformer; 1 Zenith® variable condenser; $5.00 cash from the Bakelite Corp.; 1 Premier Microstat; 1 Burgess 2556 battery; 1 Unity vernier rheostat; 1 601-T Dubilier condenser.

Second: 1 Crosley Model X receiver; 1 Radiocorpu 10-960 C.W. power transformer; 1 Atlas Loud Speaker; 1 Homecharger; 1 pair type E phones; $8.00 selection from Howard Radio Co.; 1 Metacite soldering iron; 1 Burgus 2260 battery; $5.00 cash from the Bakelite Corp.; 1 type 22-45-2 B-battery; 1 Premier 23-plate condenser; 1 Everyeord 2766 battery; 1 Burgess 2556 battery; 1 Chicago A.F. transformer; 1 Burgess 2556 battery; 1 Unity vernier rheostat; 1 Unity cartridge rheostat; 1 Radial dial.

Third: 1 set Banston honeycomb D.L. coils; 1 Stromberg-Carlson 1-A loud speaker; $8.00 selection from Howard Radio Co.; $5.00 cash from the Bakelite Corp.; 1 Remler variometer; 1 C-2001-A amplifier tube; 1 3/16 x 8 x 25 Radion panel; 1 Premier variocoupler; 1 Everyeord 2766 battery; 1 Everyeord 2764 battery; 1 Burgess 2556 battery; 1 pair Ambassador phones; 1 Bradleystat; 1 Unity vernier rheostat; 1 602-T Dubilier condenser; 1 Unity cartridge rheostat; 1 type 601-T Dubilier condenser; 1 Dubilier variometer.

Fourth: $3.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corporation; 1 Radiocorp UV-216 20-watt Kenotron; 1 Philadelphia variocoupler; 1 Chicago variometer; 1 Horne verni-tuner; 1 5-tot. Headphone A.F. transformer; 1 Burgess 2556 battery; 1 Everyeord 2766 battery; 1 pair Scientific phones; 1 Bradleystat; 2 Unity cartridge rheostats; 1 Everyeord 2711 battery; 1 Burgess 2556 battery; 1 Dubilier condenser; 1 type 601 Dubilier condenser.

Fifth: $8.00 selection from Howard Radio Co.; 1 Hedgbecue 5-to-1 A.F. transformer; 1 pair Hedgbecue F.P. phones; 1 Bradleystat; 1 Unity vernier rheostat.

**GROUP B**

First: 1 Zenith® 3R receiver and three-step amplifier; 1 Atlas loud speaker; 1 Bakelite battery charger; 1 pair Baldwin type C phones; $8.00 selection from Howard Radio Co.; 1 type E phones; $5.00 cash from Bakelite Corporation; 1 Atlas Loud Speaker; 1 Homecharger; 1 pair Scientific phones; 1 type 101-G Dubilier capacitor; 1豬acheford transformer; 1 Burgess 2556 battery; 1 Unity vernier rheostat.

Second: 1 Tusa 2252 receiver and two-step amplifier; 1 Western Electric 160-d loud speaker; 1 pair Baldwin type C phones; $5.00 selection from Howard Radio Co.

Third: 1 set Coto-Coil (15) mounted coils; 1 Radiocorpu UL-1096 transformer; 1 General Radio 200-D amplifying unit; $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corporation; 1 Premier variocoupler; 1 type 101-G Dubilier capacitor; 1 pair Stromberg-Carlson 2A phones; 1 General Radio 231A transformer; 1 Burgess 2260 battery; 1 General Radio 217H condenser; 1 pair Scientific phones; 2 Bradleystats; 1 Bradleystat; 1 Dubilier variometer; 1 Dubilier type 601 condenser; 1 Unity cartridge condenser; 1 601-T Dubilier condenser.

Fourth: $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corporation; 1 Horne verni-tuner; 1 Radiocorpu UV-202 tube; 1 Chicago variocoupler; 1 5-to-1 Hedgbecue A.F. transformer; 1 Radio panel 3/16 x 7 x 21; 1 Burgess 2266 battery; 1 pair Scientific phones; 1 Bradleystat; 1 Everyeord 2771 battery; 2 Unity cartridge rheostats; 1 Ray (Si) crystal detector; 1 Hart & Hegeman rheostat; 1 Unity type 601 condenser.

Fifth: $8.00 selection from Howard Radio Co.; 1 pair Rode Head Model F phones; 1 5-to-1 Hedgbecue transformer; 1 Unity vernier rheostat; 1 Bradleystat; 1 Dubilier type 601 condenser.

**GROUP C**

First: 1 Tusa Superdyme receiver; 1 Atlas loud speaker; 1 Emer 200-A power transformer; 1 Roller-Smith 0-5 amp. R.F. meter; 1 pair Baldwin type C phones; 1 Rigers battery charger; 1 Rauland push-pull amplifier; $8.00 selection from Howard Radio Co.; 1 type 2256 battery; $5.00 cash from Bakelite Corp'n; 1 Premier 23-plate condenser; 1 Burgess 2556 battery; 1 Premier microstat; 1 Unity vernier rheostat; 2 Dubilier type 601 condensers.

Second: 1 type 142 Magnavox 3-stage power amplifier; $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corp'n; 1 Bradleystat; 1
Bradley leak; 1 Eveready $7111 battery; 2 Dubiller type 601 condenser; 1 Remler variometer; 1 Premier microstat; 1 Burgess #2165 battery; 1 Signal 23-plate condenser; 1 Hedgehog A.F. transformer; 1 Premier microstat; 1 Eveready $767 battery; 1 Unity vernier rheostat; 1 Atlas loud speaker; 1 pair Baldwin type F phones; 2 Dubilier type 680 condenser.

GROUP D

First: 1 Colin B. Kennedy Model V complete receiver; 1 Esco battery charger; 1 Atlas loud speaker; 1 pair Baldwin type C phones; panel to order from Diamond State Fibre Co.; $8.00 selection from Howard Radio Co.; 1 Eveready $768 battery; 1 Burgess $2168 battery; 1 pair Scientific phones; 1 Radion dial; 1 Hart & Hegeman rheostat; 1 Eveready $771 battery; 1 Dubiller type 677 condenser.

Second: 1 Precision type 3B receiver; 1 Jewell wave counter, 3-1/8"; 1 Allied 600 thermoammeter; 1 Sterling 500 battery charger; $5.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corp’n; 1 Chelsea variable condenser; 1 Premier microstat; 1 Remler variometer; 1 Unity vernier rheostat; 1 Dubiller Duratran.

Third: 1 Remington .22 cal. rifle equipped with Maxim Silencer; $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corp’n; 1 C-301-A amplifier tube; 1 Horne verni-tuner; 1 Premier 23-plate condenser; 1 Premier microstat; 1 Remler variometer; 1 Premier telegraph; 1 Eveready $7111 battery; 1 Dubiller Duratran.

Fourth: $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corp’n; 1 C-301-A amplifier tube; 1 Horne verni-tuner; 1 Hedgehog 5-to-1 A.F. transformer; 1 Radio corp UV-216 20-watt Kenetron; 1 U.S. Tool Co. condenser; 1 Burgess $2165 battery; 1 Eveready $768 battery; 1 Premier vernier rheostat; 1 Unity condenser; 1 Chelsea socket.

GROUP E

First: 1 Paragon complete receiver; 1 100-volt Kimley panel B battery; 1 Valley battery charger; 1 Atlas loud speaker; 1 pair Baldwin type F phones; $10.00 cash from Bakelite Corp’n; $8.00 selection from Howard Radio Co.; 1 Eveready $767 battery; 1 Premier microstat; 1 Burgess $2165 battery; 1 Eveready $7111 battery; 1 Unity vernier rheostat; 1 Roman dial; 1 Dubiller type 680 condenser.

Second: 1 A-G (R. Mitchell) knock-down receiver; 1 Thorardson 900-watt plate transformer (mounted); 1 pair Baldwin type C phones; $8.00 selection from Howard Radio Co.; 1 Kimley 26-MG-2 B-battery; 1 Signal type R21 Navy type receiving transformer; 1 Metallectric soldering iron; 1 Premier 23-pla­de condenser; 1 pair Ambasador phones; 1 Burgess $2165 battery; 1 Bradleyleak; 1 Unity vernier rheostat; 1 Unity cartridge rheostat; 1 Radion dial; 1 Dubiller type 680 condenser.

Third: 1 complete set of Curkold coils with triple-mounting; $8.00 selection from Howard Radio Co.; $5.00 cash from Bakelite Corp’n; 1 American A.F. transformer; 1 Remler variometer; 1 Premier variocoupler; 1 Premier 28-plate condenser; 5-to-1 Hedgehog A.F. transformer; 1 Premier $765 battery; 1 Radion panel 5/16 x 7 x 18; 1 pair Ambassador phones; 1 Eveready $721 battery; 1 Eveready $768 battery; 1 Eveready $7111 battery; 1 Bradleyleak; 1 Unity cartridge rheostat; 1 Chelsea rheostat.

Fourth: $8.00 selection from Howard Radio Co.; $6.00 cash from Bakelite Corp’n; 1 C-301-A amplifier tube; 1 Remler variometer; 1 Chelsea pentode; 1 Horne verni-tuner; 1 Hedgehog 5-to-1 A.F. transformer; 1 Burgess $2165 battery; 1 Signal 23-plate condenser; 1 pair Scientific phones; 1 Chelsea rheostat; 1 Dubiller type 580 condenser.

Fifth: $8.00 selection from Howard Radio Co.; 1 Hedgehog 5-to-1 A.F. transformer; 1 pair Red Head Model F phones; 1 Bradley leak; 1 Unity vernier rheostat.

 Articles Welcome!

For the first time in many months we are able to dust off the old sign "Articles Welcome"—and hang it up for all to see. That's one of the things that the increased size of QST has done for us, and it's certainly great to know that we are once more able to print an article within a reasonable time after it arrives. Let the articles come! Articles on the following subjects are scarce right now:

Synchronous Rectifiers that work and can be filtered.

Counterpoises and experiments on them.

Short-wave work, either at 176 meters or else on the special waves.

Comparative results with good and poor apparatus in the same circuits.

Daylight transmission.

The Effect that the Aurora Boralis has on Radio.

An Amateur Tuner that does not send out a "Carrier."

How to Boost the League.

Making a Radio Club show enthusiasm.

Key-click-less Sending Sets.

How to Call and Send—in other words, how to become an operator.

Stories—good ones—are scarce, very scarce.

It always makes the editors feel much more kindly toward an article if it comes to the office in good condition, so we'll give everyone a fair chance by stating (once more) how we like to have articles look.

1—Make the text as complete as possible, omitting nothing at all; we'd a lot rather give the number of words than to guess at some things that were left out. Just the same, "Write it short."

2—Use standard size typewriter paper if at all possible and in any case write with double spacing between lines. Use the typewriter if possible.

3—Illustrations should always be on separate sheets, not mixed in with the
written matter. Use large illustrations and plenty of them; again it is better for us
to drop a few than to guess at those that
were omitted. Diagrams may be in pencil
but should have all necessary detail and
be drawn with reasonable care.
4—Photographic illustrations absolutely
must be good, to be useful in making a
halftone for QST. The picture should
measure at least 3½"x4¼", should be on
glossy paper, and must be from a negative
much better than those made by the ordi-

ary amateur. Have the picture made by
someone that knows how to use an
anastigmatic lens on apparatus. A portrait
man is generally not as good as a com-
mercial photographer.
5—Finally, address the article correctly.
Many have been delayed or lost in the past
because they were sent in the same envelope
with a letter, or because they were not
properly addressed. The correct address
is "Editor, QST, 1045 Main Street, Hart-
ford, Connecticut."

Good Work of "Bustan" Continues

No Government radio activities ever
aroused such a chorus of approval
as have the Bureau of Standards
"Standard Frequency Transmissions" from
station WWV at Washington, D.C. From
every state east of the Rockies have come
many letters commending this service that
for the first time makes it possible for an
amateur to know his wave length with pre-
cision, and at small cost. The demand for
an extension of the service is very large.

The last previously announced schedule
was printed in QST for November. The
next schedules are given below; they can
be heard and used at most points east of
the Mississippi River and at many beyond.

The signals are of use in testing receiving
sets, checking wave meters and ad-
justing transmitters. The accuracy is
better than 3/10 of 1%. This is much
better than the accuracy of any wave meter
the average amateur will ever own.

Information on using the signals was
given in the February 1923 issue of the

Schedule of Frequencies in Kilocycles.
(Approximate wave lengths in meters in parentheses)

<table>
<thead>
<tr>
<th>Eastern Std. Time</th>
<th>Jan. 7</th>
<th>Jan. 21</th>
<th>Feb. 5</th>
<th>Feb. 20</th>
</tr>
</thead>
<tbody>
<tr>
<td>11:00 to 11:05 P.M.</td>
<td>150</td>
<td>500</td>
<td>1300</td>
<td>150</td>
</tr>
<tr>
<td>11:12 to 11:20 P.M.</td>
<td>205</td>
<td>600</td>
<td>1400</td>
<td>205</td>
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<tr>
<td>(1463)</td>
<td>(500)</td>
<td>(214)</td>
<td>(1463)</td>
<td></td>
</tr>
<tr>
<td>11:24 to 11:32 P.M.</td>
<td>260</td>
<td>700</td>
<td>1500</td>
<td>260</td>
</tr>
<tr>
<td>(1153)</td>
<td>(428)</td>
<td>(200)</td>
<td>(1153)</td>
<td></td>
</tr>
<tr>
<td>11:36 to 11:44 P.M.</td>
<td>315</td>
<td>833</td>
<td>1600</td>
<td>315</td>
</tr>
<tr>
<td>(952)</td>
<td>(360)</td>
<td>(187)</td>
<td>(952)</td>
<td></td>
</tr>
<tr>
<td>11:48 to 11:56 P.M.</td>
<td>370</td>
<td>900</td>
<td>1700</td>
<td>370</td>
</tr>
<tr>
<td>(810)</td>
<td>(333)</td>
<td>(176)</td>
<td>(810)</td>
<td></td>
</tr>
<tr>
<td>12:00 to 12:08 A.M.</td>
<td>435</td>
<td>1000</td>
<td>1800</td>
<td>435</td>
</tr>
<tr>
<td>(689)</td>
<td>(300)</td>
<td>(167)</td>
<td>(689)</td>
<td></td>
</tr>
<tr>
<td>12:12 to 12:20 A.M.</td>
<td>500</td>
<td>1200</td>
<td>1900</td>
<td>500</td>
</tr>
<tr>
<td>(600)</td>
<td>(250)</td>
<td>(158)</td>
<td>(600)</td>
<td></td>
</tr>
<tr>
<td>12:24 to 12:32 A.M.</td>
<td>570</td>
<td>1400</td>
<td>2000</td>
<td>570</td>
</tr>
<tr>
<td>(526)</td>
<td>(214)</td>
<td>(160)</td>
<td>(526)</td>
<td></td>
</tr>
</tbody>
</table>
A GOOD amateur sending set should allow you to work your tubes at good efficiency and should allow prompt change of wave length over the amateur band, 150 to 220 meters. At 1QP-1XAM there has been worked out experimentally a sending set and antenna system which do these things and also permit receiving on the same antenna system without a change-over (send-receive) switch.

In the Hartley circuit of Figure 1 adjust the grid and plate clips for best operation of the tube. We will find that it is now possible to change the setting of the condenser V.C. over quite a range without any need to change either the plate or grid clips. Such flexibility applied to a sending set would be very useful.

If we replace the variable condenser by the equipment shown in Figure 2 we will more nearly simulate the properties of an antenna and counterpoise such as we may connect to the helix when sending. First let us assume that the "dummy antenna" and the "dummy counterpoise" are exactly alike. Now if we set the antenna series condenser and the counterpoise series condenser at the same capacity we are sure that the current anti-node (and the voltage node) will be located at the filament clip. (See "The Nodal Point Explained" in September QST* for reasons why this is important.) It is possible to change the variable condensers to any equal-capacity settings without moving the nodal point off the filament tap if the dummy antenna and the dummy counterpoise are exactly alike. To show the serious effect of moving the nodal point off the filament tap, try setting one condenser at 90 percent scale reading, the other at 10 percent scale reading, note the wave length, the plate input, and the current in the oscillating circuit. Now re-set the condensers so that the wave length is the same and the capacities of the condensers are the same. You will find that the two ammeters now read alike (and higher), also that the plate input has been reduced. All of this is to show why it would be nice to have a sending system with antenna and counterpoise series condensers that can be set at the same reading without having unpleasant things happen in the circuit.

Making an actual antenna system act in this same fashion is not quite so easy; in fact it cannot be done except with some error and over a limited range of wave lengths. However, the amateur band is quite narrow and for amateur purposes the thing can be done. Evidently the antenna

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*Can be obtained from the QST Circulation Dept. at the regular price.

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John L. Reinartz and The Set at 1QP-1XAM.
and the counterpoise should have the same fundamental wave length to earth, and also they should have the same inductance and capacity.

At 1XAM the antenna system has the proportions shown in Figure 3. The purpose of the very narrow counterpoise and its high location is to reduce the capacity per foot to values not too much different from those of the antenna, so that the tuning effect of the two series condensers will be about the same. In fact at 1XAM the scheme operates perfectly between 125 and 180 meters. The error below 125 meters is small and no series condensers are used above 180 meters with this antenna. The method of adjusting the length of the counterpoise was as follows. The counterpoise and antenna dips were set the same number of turns from the filament dip, both series condensers set at half scale (same capacity), and the key pressed. See Fig. 1. Then the capacity of the counterpoise series condenser was slowly reduced and the plate input dropped, showing that the counterpoise cage was too long. This cage was shortened 6 inches at a time until any change from the equal setting for the two condensers caused the plate input to rise, indicating that the nodal point was then correctly located when the condensers were set alike. Of course this is strictly correct only in the center of the scale (where the adjustment was made) but, as was said above, the scheme works nicely over a 60-meter band at 1XAM.

Having made this adjustment, if one can measure the fundamental of the antenna to earth and the counterpoise to earth, they will be found equal.

The input to the set can be changed instantly by moving the plate clip or changing the plate voltage, the wave length can be changed just as quickly by turning the two series condensers simultaneously (in fact they can be belted together as shown in the photo of 1MO, elsewhere in this issue). The two adjustments (power and wave length) are independent.

For the sake of safety against electrical shocks the filament clip should be grounded. If this is done directly a slight misadjustment of the nodal point will cause considerable currents to flow thru the ground connection which is not desirable. Therefore this ground connection is made thru a radio frequency choke (a single-layer coil will answer). See Figure 4. The receiving set may be connected in as shown and—unless the sending set is misadjusted—you can receive thru the transmitting circuit, doing away with a change-over switch, always being able to hear the other station when the key is up.

Going a little farther, secure the use of a good wave meter, calibrate your two series antenna condensers so that you can instantly tell just what your sending wave is—and then calibrate the receiver too.

### NOTICE TO OUR NEWSSTAND READERS

As announced in our last issue, the Operating Department Report and the "Calls Heard" Department have been eliminated from the newsstand edition of QST because our non-member readers in general are not particularly interested in them. This results in a saving in expense which makes possible the publication of a larger and better QST.

These two departments are included in the edition supplied to members of the A.R.R.L. If you are interested in them, it is proof positive that you ought to be a member of the League. May we not direct you to the handy application blank appearing on page 88 of this issue?
Splendid Contact With the "Bowdoin"—WNP Helps To Make Some New Records Too

Each month we are publishing an account of the contact maintained with the MacMillan Arctic Expedition Schooner "Bowdoin," WNP, now at Refuge Harbor, North Greenland, via A.R.R.L. stations. This is a report of operations in the month of November.—Ed.

With the arrival of winter, contact with the "Bowdoin" became a much easier matter, with the result that in incomplete reports at hand we have definite record of twenty amateur stations working WNP during the month of November. Five of these were Canadians, five were 7's in our Northwestern Division, and five were 9's in the Dakota Division. This shows that the area of reliable communication is extending eastward. Good for the Dakota gang! Jack Barnsley, 9BP at Prince Rupert, B. C., remains the best gateway between the Expedition and civilization, having been in touch with WNP a matter of a dozen times in November, handling practically all of their message traffic and, as far as we are now aware, all of the press reports which have appeared in the daily papers.

All world's distance records for amateur two-way communication were smashed when Mix of WNP and Mr. R. Smith of 6CEU, Hilo, Hawaii, talked to each other for a quarter of an hour on the night of November 15th. The distance is about 4600 miles. Of course amateurs have been heard much farther, but this is the greatest DX worked. A remarkable point is that 6CEU used but three "5-watters" with 2.2 amperes in the antenna, chemically-rectified A.C. on the plates. Mix reports 6TQ of Honolulu, with the same power QSA also.

During the month WNP got in reliable contact with 6XAD-6ZW at Avalon, Calif., and much of his N.A.N.A. press was copied by Mott. 6ZW continues to pound in all along the east coast, and some very pretty relaying was done late in November when 1HX in Hartford passed numerous messages to WNP thru Mott's station and received the replies over the same route, a distance of over 6000 miles each way with but one intermediate relay. These accomplishments are described in greater detail in another article in this issue.

7AIB of Port Angeles, Wash., has the distinction of having worked WNP with but a single 5-watter. Mix said "QRK like bricks here." In fact, Mix reports all the stations he works as very loud. WNP's signals are fairly good in most reports, except for very bad fading, complained of by almost everyone. Press dispatches report high winds around the expedition's location, and the antenna probably is being rocked violently. Since freezing in Mix has erected a new radiating system, the aerial stretching forward from the ship's mast to some hills ahead, while a fan counterpoise of wires flat on the ice extends forward from the bow. He reports that he is still using the same tubes with which he set sail; no trouble has been experienced with 2000 volts on the plates.

Seven amateur stations picked by Mix (52AV, 7ABB, 6AWT, 6CGW, 6BZI, 9MC, and 8ZZ) are broadcasting American news to the MacMillan Expedition on schedule. POZ and GBL are copied for international news. On Nov. 26th Mix reported the reception of the broadcasting station at Glasgow, Scotland, sending music and calling America, signals loud. Traffic from the "Bowdoin" has been given preferred attention by the amateur stations thru which it passed, and in particular the Traffic Manager has laid out some "express routes" stretching across the country to 9BP by which it is expected traffic to and from WNP can be moved on schedule with the greatest speed.

Dispatches from MacMillan indicate that the radio installation on the "Bowdoin" is a great blessing. It has annihilated their isolation, it brings them entertainment and all the news of the world, and thru the
amateur stations of the A.R.R.L. their business traffic and their news reports to the outside world are handled with all the speed and reliability of a wire-line connection.

The following summary lists all WNP reports received up to press-time. If you hear or work WNP, let us know so the report may be as complete as possible.

LOG OF A.R.R.L. STATIONS WITH "WNP"

Night of Aug. 31—Sept. 1
Heard by 6CCM, San Francisco; incorrectly reported as 6OCC in our November issue.

Oct. 15-16
Worked by 7SC, Aberdeen, Wash.; 1 msg. sent.

Oct. 24-25
Heard by 1FD, Norwich, Conn.; QRZ QSS but whole msg. copied.

Oct. 27-28
Heard by E. J. Anderson, Chicago, QSA.

Oct. 30-31
Worked by Can. 9BP, Prince Rupert, B. C.; 1 msg. sent.

Oct. 31—Nov. 1
Worked by Can. 9BP, sent 2, received some Calls Heard. Heard by 9ACK, Jamestown, N. D.; 8CWX, Dayton, 0.

Nov. 2—3
Worked by Can. 9BP, 5 msgs. sent. Heard by 9BEB, Cape Girardeau, Mo.; 7OY, Seattle.

Nov. 3—4
Worked by Can. 9BP, 8 msgs. rec'd including balance Calls Heard. Heard by 2BQC and 2CPB, Elizabeth, N. J.; 7FD, Seattle; 5OT, Duncan, B. C.

Nov. 5—6
Heard by 5GK, Toronto; 4NI, Ft. William, Ont.; 5BE, Pt. Worth, Minn.

Nov. 7—8
Heard by 5APV, Chevy Chase, Md.; calling 9MC QSA.

Nov. 8—9
Worked by Can. 9BP, 5 msgs. rec'd including complete N.A.N.A. press; sent 7 and news. Heard by 6GO, Vancouver, B. C.; 5CT, Duncan, B. C.; 7ABB, Everett, Wash.; 7AIB, Pt. Angeles, Wash.

Nov. 9—10
Heard by 8CWX, Detroit.

Nov. 10—11
Reported by 8ARK, Detroit.

Nov. 11—12
Worked by 7AIB, Ft. Angeles, Wash., one 5-watt, took 1 msg.; exchanged calls with 2AGB, Summit, N. J. Worked by Can. 9BP, 5 msgs. sent, 3 rec'd. Heard by 6IN, Bellevue, Pa.; 6AHS, San Diego; 7AIY, Wenatchee, Wash.; Can. 5OT; Can. 5GO.

Nov. 14—15
Worked by Can. 9BP, 7 msgs. sent, 8 rec'd; 7AIB, Everett, Wash.; 7AIY, Wenatchee, Wash.; Heard by Can. 5CT.

Nov. 15—16
Worked 15 mins. by 6CEU, Hilo, Hawaii, longest 2-way amateur DX ever recorded. 1 msg. rec'd; worked by Can. 9BP, 2 msgs. sent, 8 rec'd. Heard by 6AOL, Riverbank, Cal.; Can. 5GO.

Nov. 16—17
Heard by H. C. Barney, Providence, R. I.; 9DBK, Minot, N. D.

Nov. 17—18
Worked by 4CL, Edmonton, Alta., QSA QRM. Heard by 7AIY; 8CY, Akron, Ohio; 5BE, Ft. Worth, Tex.

Nov. 18—19
Worked by Can. 4CL again; took half his press msg. OK, QSA QRM. About this date WNP was worked by 7AIB in Alaska. Worked by Can. 9BP, 5 msgs. sent, 7 rec'd including 455 wds. N.A.N.A. press. Heard by 9DLF, Aneta, N. D.; L. Strobel, Akron, O.; 3BPM, Philadelphia; 6AWT, San Francisco; 7GU, Polytechnic, Mont.; 4EA, Winnipeg.

Nov. 19—20
Worked by Can. 9BP, 4 msgs. rec'd including 1000 words N.A.N.A. press, sent 1 msg. About this date also worked by Can. 4DQ. Worked by 5OT, Duncan, B. C.; QSA QSS, 1 msg. rec'd. Worked by Can. 3NI at 6:30 A.M. for 15 mins. QSA QSS QRU. Most of N.A.N.A. press was copied by 6XAD, Avalon, Cal. Also heard by 7FD, Seattle, 6AWT; 7AIB; 6AAH while at Boulder, Colo; Can. 5GO.

Nov. 20—21
Worked by Can. 9BP, 1 msg. sent, 5 rec'd; and by 9DBE, Minot, N. D., QRU. Heard by 9BH; Can. 5GO.

Nov. 21—22
Worked by Can. 9BP, 3 msgs. sent. Heard by 5ABE, New Orleans, and 9DBL, Chicago.

Nov. 22—23
Exchanged calls with 9BKH, Minot, N. D., lost in spark QRM. Worked by Can. 5GO, Vancouver, B.C.; with two 5-watters; QSSd out. Heard by 8BFH, Norwalk, O., calling 6XAD.

DON MIX of WNP

AS 1TS AS WNP

Nov. 23—24
Worked by Can. 9BP; 3 msgs. sent, one with ck 712; rec'd 5. Worked 20 mins. QSA by 9ACK, Jamestown, N. D.; 10 mins. by 9DBE; about this date apparently worked 7SU, Aberdeen, Wash.; worked 9BTT, Excelsior, Minn., 20 mins. QSA QSS QRU; about this date worked 9ZT, Minneapolis, and 9APF, Denver, no particulars. Heard by 9CVS, Forest Park, Ill.; 1AUG, Winsted, Conn.

Nov. 24—25
Worked half hour by 7TU, Polytechnic, Mont.; QRZ QSS QRU. Heard by 8BXX, Norwalk, O.; 9DLF, Aneta, N. D.; 7MT, Arlington, Wash.; 28XW, Altamont, N. Y.; F. H. Canfield, Newark, N. J.; Can. 5GO.

Nov. 25—26
Worked by 6XAD who was QSO 1HX and handled message Hartford to WNP and return in 8 mins. 30 secs. new record; also message to Opr. Mix from his mother in 7½ mins. from his home. Worked by 9AVZ, Pierre, S. D., QRK QRU; 7AIB, Everett, Wash., 1 msg. sent. Heard by 7ABB; H. C. Barney, Providence, R. I.; 5G0, Abington, Pa.; 7MT, 28XW.

Nov. 26—27
Worked by 6XAD who was QSO 1HX in Hartford; handled series of messages in fast time, establishing new records for speed and longest relays, 5 mins. 6 sec. round trip from 1HX. Worked by Can. 9BP; sent 2 msgs. Heard by 7ABB, and 7KS.

Nov. 27—28
Heard by 8CYT, Akron.

Nov. 28—29
Heard by 1AUG, Winsted, Conn., QRZ QSS.

Nov. 29—30
Worked by Can. 9BP: 5 msgs sent, 2 rec'd.

Dec. 1
Heard by P. H. Prouse, Jericho Springs, Mo.
The material contained in this discussion of receiving tubes, their characteristics and use, is based on a number of questions which were sent to the Technical Editor of QST in response to his request as stated in the August number of QST.

As was to be expected, the questions covered a very wide range, but with a few exceptions they fall into distinct classes and for convenience the answers to these questions have been grouped accordingly.

The writer is attempting to answer as fully as possible all questions sent in, only omitting two or three which did not refer to receiving tubes or which referred to types of tubes about which the writer has no information.

There seems to be much interest in the relative merits and characteristics of the three filament materials now in common use—pure tungsten, thoriated tungsten (XL), and oxide coated platinum.

**Tungsten**

The material used in the pure tungsten filament is practically the same as is employed in the ordinary incandescent lamp. It is capable of withstanding very high temperatures and in a vacuum tube burns at a white heat (about 2150°C. or more). Pure tungsten filaments can be made very uniform both as to voltage and current as well as electron emission. However, the electron emission efficiency, that is, the electron emission per watt of filament power, is low compared with that given by the XL and oxide coated types.

**XL**

The XL or thoriated filament differs from the pure tungsten filament in that a small amount of a thorium compound is mixed with the tungsten before the wire is drawn. Thorium has the property of giving off electrons at a much lower temperature than tungsten (about 1700°C.) so that this filament not only has a longer life, but at the normal operating temperature gives a much higher emission efficiency.

The burnout temperature of the XL tungsten is approximately the same as for ordinary tungsten, but the XL filament must be operated at a lower temperature than tungsten, otherwise the thorium would be evaporated from the surface of the filament so rapidly that the supply would soon be exhausted. Thus the life of an XL filament is almost never ended by actual burnout unless excessive voltage is applied.

The electron emission of the XL filament is given by a layer of thorium which is only one molecule deep on the surface of the wire, and the operating temperature is so chosen that there is a slow diffusion of thorium from inside the wire to the surface which supplies any losses of thorium molecules caused by evaporation or positive ion bombardment. As long as the supply of thorium is sufficient to maintain this surface layer the emission remains practically unchanged and, instead of gradually decreasing during the life of the tube, the emission is constant until shortly before the end of life when it falls off rapidly.

If too high filament voltage is used the rate of evaporation of thorium from the surface is increased more rapidly than the rate of diffusion of thorium to the surface and the emission will fall. If the high voltage is not applied for too long a time the original emission may be restored by operating at normal filament voltage without plate voltage for ten minutes or more, the time required for activation depending upon the duration of the over-voltage period. Too long application of excess voltage, of course, will completely exhaust the thorium supply and render the tube useless.

The high emission efficiency of the XL filament, as compared with that of pure tungsten, is clearly illustrated in Figure 1, which gives the total emission and emission-efficiency for two typical filaments. Under normal operating conditions the UV-201 filament requires 5 watts to give a total emission of 8 milliamperes or 1.6 milliamperes per watt. The UV-201-A requires only 1.25 watts and gives 45 milliamperes emission making an efficiency of 36 milliamperes per watt.

In comparing the emission efficiencies of
two filaments the life of the two should also be considered since large filaments can often be operated at higher temperatures than small filaments, assuming the same life. For this reason, any comparison should be made between tubes designed for the same sort of service as is the case with the UV-201 and UV-201-A, although the UV-201-A has a considerably longer life than the UV-201.

Coated Filaments

The coated filament differs materially from the tungsten filaments in that it consists of a metallic base, usually platinum, on which is placed a coating of oxides which give high electron activity. Its operating temperature (about 1000°C) is even lower than that of the XL filament and it should never be burned above a dull red heat.

Coated filaments give very high electron emission initially and the initial emission efficiency is often higher than that of the XL filament. However, there is considerable variation in different tubes of the same type and there is a tendency for the emission to decrease as the tube is used so that for present day tubes the average figures for this quantity are about the same as with the XL filament when the whole life of the filament is considered.

The end of life of the coated filament is usually caused either by loss of emission or by the formation of a hot spot and subsequent burnout at some point where the coating has been evaporated from the metal.

Excessive filament voltage affects the emission of the pure tungsten filament, but it also increases the rate of evaporation of the tungsten and so shortens the life.

In the case of the XL filament the emission is increased temporarily, but as has already been explained, the increase in the rate of evaporation of the thorium causes a deficiency in the surface layer which soon reduces the emission and if the excessive temperature is continued the life is greatly shortened.

The coated filament also shows an increase in emission when the temperature is increased above normal, but at the same time the coating evaporates at a high rate which, of course, decreases the life. However, after a period of overload the emission at normal temperature may show a temporary increase over its original value.

The choice as to whether the XL or coated filament is to be used in a tube depends principally on the service for which the tube is intended. The coated filament is better suited to use in tubes designed for very low filament voltage because for a given voltage and current it has a greater length. On the other hand, the XL filament can be made in smaller sizes and is more suitable for a low current tube. The XL filament is well able to withstand high voltage bombardment and is therefore easily adapted to use in power tubes, also the coated filament has been used successfully in such tubes.

The life of a vacuum tube depends on so many different factors that it is very difficult to give a definite figure which has any useful meaning. In fact, the case is somewhat similar to the life of an automobile—it all depends on how it is used. Under certain standardized conditions, such as are recommended in the instruction sheets which accompany most tubes, the life can be predicted with fair accuracy; but since tubes are used under widely different conditions, often with no attention paid to the recommended voltages, the life may be either greater or less than the predicted life expectation.

With regard to plate overload it should be remembered that a reasonable plate voltage without grid bias may do as much
harm as excessive plate voltage itself. The life of a tube such as the UV-199 and UV-201-A is approximately the same at 100 volts plate as to 40 volts, but only if proper grid bias is employed. Also the life of different tubes of the same type is fairly uniform if instructions are followed; but under abnormal conditions some tubes may last their usual life expectation while others may show a much earlier failure. In other words, departure from safe operating conditions tends to cause non-uniform as well as shorter life.

On account of the exhaust method in making XL filament tubes there is a marked tendency for the vacuum to improve as the tube is used. This, together with the uniform emission, prevents any noticeable change in the constants of the tube until the end of life and the voltages required do not change during the life of the tube. The silvery or colored coating on the bulb appears during the exhaust process and is caused by the deposit of substances in the clean-up of the gas.

In the oxide coated filament type, also, there is a clean-up agent which helps in producing and maintaining a good vacuum during the life of the tube. This chemical agent does not appear on the bulb, however, but remains on the glass stem.

Each tube, whether XL or coated filament type, is required to pass a gas test before leaving the factory, the test being made in a circuit similar to that shown in Figure 2. Here the grid is made the anode and the plate is made slightly negative in order to attract any positive ions formed in the region between grid and plate. The positive ion current passing through a sensitive microammeter gives a reading which is an indication of the gas pressure in the tube. The limits are set so that all tubes which leave the factory must have less than about .2 micron pressure. A micron is equal to 1/1000 of a millimeter and since atmospheric pressure is approximately 760 mm, the maximum in an XL tube is less than one half of a millionth of atmospheric pressure. A majority of tubes do not even approach this limit during the factory test, and after a short period of use many tubes "clean up" until in the test circuit there is no readable deflection of the micro-ammeter, showing that the pressure has decreased to perhaps .001 micron or less.

**Grid and Plate Design**

One question was asked as to the influence of the mechanical dimensions and spacings on the characteristics of a tube. The exact relation between the tube constants and the mechanical dimensions can only be expressed by a somewhat complicated mathematical formula, but speaking in approximate terms the effectiveness of a high vacuum tube as an amplifier is increased as the length of the filament and the effective area of the other elements are increased. It is also increased as the spacings between are decreased. This, of course, assumes that sufficient electron emission is available and that suitable grid and plate voltages are employed.

The amplification constant is easily varied through almost any range by changing the number of turns per inch of the grid winding. Changing the amplification constant by varying the grid turns also changes the plate impedance in the same direction, although not always to the same extent. The larger the size of grid wire and, within certain limits, the greater the distance between grid and plate, the higher will be the amplification constant. The usual practice is to make the spacings as close as is commercially practicable and then to adjust the plate impedance and amplification constant by changing the grid turns.

The detector action of a high vacuum tube, when grid leak and condenser are used, is partly dependent on the amplification characteristics, so that the effect of the dimensions as given above also applies to the case of the detector. In addition, the characteristics of the grid circuit have a considerable influence on the detector action. In a gas tube the action depends partly on the mechanical dimensions and partly on the gas pressure and voltage adjustments.

Theoretically there should be a slight improvement in the characteristics of a high vacuum detector if the entire filament were on the same potential with respect to the grid. Such a filament, of course, is impossible in the ordinary types of tubes and it is doubtful if the improvement would be enough to be noticeable.

**Distortion**

The question was asked as to the cause of distortion in radio circuits and why a crystal appears to give less distortion than
a tube detector. Distortion may be caused by any or all of a number of different things, so that it is often difficult to isolate the exact causes in any given case. It is commonly supposed that a crystal detector gives better reproduction of speech and music than does a tube detector, because a tube does not have a linear relation between input radio frequency voltage and output audio frequency current. That is, for moderate signal voltages the output current or voltage is roughly proportional to the square of the input voltage. However, almost all crystals, although giving less response, have much the same shaped characteristics so that there is little to the claim that the tube, unless regenerating, causes more distortion in this way. The true explanation is probably that the tube is more often associated with audio frequency amplifiers which directly or indirectly cause distortion. Also the greater sensitivity of the tube detector may cause the phones to be forced to the point where distortion occurs in the phones themselves, while if the crystal were used, the weaker response would appear undistorted.

A regenerative detector may cause very bad distortion, but for a different reason. A modulated wave is a combination of the carrier wave and a number of higher and lower frequencies comprising the "side-band." For perfect reproduction these side frequencies must all be amplified and rectified equally. If the regeneration in the detector circuit is increased until the grid voltage wave is lop-sided and cannot as \( \frac{1}{2} \) megohm or more, and the voltage drop in this winding is, of course, lost to the grid of the tube. Since this occurs on only one-half of the cycle, the resulting grid voltage wave is lop-sided and cannot
**Filament Circuit Data**

<table>
<thead>
<tr>
<th></th>
<th>WD-11 C-11</th>
<th>WD-12 C-12</th>
<th>UV-199 C-299</th>
<th>UV-200 C-300</th>
<th>UV-201-A C-301-A</th>
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<td>0.25</td>
<td>0.06</td>
<td>1.0</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Plate Voltage**

- **Detector**
  - WD-11: 20-45
  - WD-12: 20-45
  - UV-199: 20-45
  - UV-200: 15-23.3
  - UV-201-A: 20-45

- **Amplifier**
  - WD-11: 40-100
  - WD-12: 40-100
  - UV-199: 40-100
  - UV-200: ****
  - UV-201-A: 40-100

**Dimensions Overall**

- **Height Maximum**
  - WD-11: 4¼”
  - WD-12: 3½”
  - UV-199: 3½”
  - UV-200: 4¼”
  - UV-201-A: 4¼”

- **Diameter Maximum**
  - WD-11: 1½”
  - WD-12: 1¾”
  - UV-199: 1¾”
  - UV-200: 1¾”
  - UV-201-A: 1¾”

**For Detection**

- **Grid Leak Megohms**
  - WD-11: 2-3
  - WD-12: 2-3
  - UV-199: 2-5
  - UV-200: 2-5
  - UV-201-A: 2-5

- **Grid Condenser µfd.**
  - WD-11: 0.00025
  - WD-12: 0.00025
  - UV-199: 0.00025
  - UV-200: 0.00025
  - UV-201-A: 0.00025

**Plate Impedance (Approx.)**

- **in Ohms**
  - WD-11: 19,000
  - WD-12: 19,000
  - UV-199: 18,500
  - UV-200: 9,000
  - UV-201-A: 16,500

**Amplification Constant (Approx.)**

- 6.5

**Mutual Conductance in Micromhos**

- 340*

**Plate Current in Milliamperes (With Zero Grid)**

- **Plate Voltages**
  - 20: 0.3
  - 40: 1.2
  - 60: 3.9
  - 80: 3.9
  - 100: 3.9

- **Internal Capacities (µµfd)**
  - 4.5-6.0

**NOTE 1**

**NOTE 2**

**NOTE 3**

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**NOTE 4:** All of the above values are based on approximate averages taken over long periods of time. Individual tubes may vary somewhat from figures shown.

*At 40 Volts on Plate and Zero Grid.

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**How to Use the Grid Bias**

Figures 3, 4, and 5 illustrate the above action. Figure 3 gives a typical grid-voltage-grid-current curve for a high vacuum tube and it will be noticed that the grid current starts at a small negative value then rises slowly until positive voltages are reached, after which it rises more sharply. Figure 4 shows the effect on the static grid-voltage-plate-current characteristic of placing a high resistance in series with the grid. The plate current instead of rising rapidly as the grid voltage becomes positive, flattens out and shows very little increase. This is because most of the applied voltage is lost in the high resistance.
and so is not effective in increasing the plate current. In a qualitative sort of way, this illustrates what happens in an amplifying transformer when the grid voltage is allowed to swing positive. Figure 5 shows what may happen to the wave form in a typical case. The true sine wave, Curve A, represents the voltage induced in the secondary of the transformer, which is approximately the same as the terminal grid voltage when bias is used. Curve B shows the distorted wave which results from use of no bias. If correct grid bias is used the grid does not become positive at any time and the voltage drop in the transformer is negligible, so that practically the entire voltage induced in the secondary windings is applied to the terminals of the tube.

There are other reasons for using grid bias on amplifier tubes besides the very important one given above, which dealt only with comparatively strong signals. Reference again to Figure 3 shows that the grid current is not zero even when the grid voltage is zero; that is, when it is connected to the negative end of the filament. From this it follows that even on the weakest signals there is a small grid current if the grid return is connected directly to the negative filament terminal. It is assumed that in this case the plate voltage is not over 40 and that head telephones are being used. Since over a small region the curvature of the grid characteristic is not very great, this is not a serious cause of distortion, but the current flowing through the transformer does cause a voltage drop which weakens the signal somewhat. The amount of grid current at zero grid voltage varies considerably in different tubes and it sometimes is so small as to be negligible, but in general a grid bias of .25 to 1.0 volt gives better and more uniform amplification. This is easily provided by placing the filament rheostat in the negative filament lead and connecting the grid return not to the negative side of the filament, but to the negative side of the filament battery. In this way the voltage drop across the rheostat serves as grid bias.

A third reason for using grid bias at the higher plate voltages is to reduce the plate current and so lessen the chance of over-loading the tube. In this way the life of the plate battery is lengthened also.

The various questions as to tube constants and the proper voltages to be used are best answered by reference to the table which is given in Figure 6.

(To be concluded in the February issue.)

The Growth of the Experimenters' Section

By S. Kruse, Technical Editor

At the beginning we were sure that the radio experimenters in A.R.R.L. wanted some way of exchanging ideas, just as the brass-pounding traffic handlers of the Operating Department do. But we did not realize how many of the experimenters there were—we that they were in the minority, possibly only a very few altogether. The famous full-page questionnaire of the July issue of QST showed a surprising interest in the experimental side of radio—the laboratory portion of amateuring—and we began to suspect that the interest might be large.

So we printed in a recent issue a modest little note to the effect that we would like to hear from experimenters who were willing to tackle some of the jobs that confront the amateur. We expected replies—we expected quite a number of replies—but we never expected to be hopelessly snowed under by hundreds of letters.

That is exactly what happened; we have not yet got thoroly on our feet again and at the present time the experimenters' correspondence is badly in arrears but is being caught up.

What Has Happened

The names of the men who wrote in have been filed and each of them sent two mimeographed lists of the branches of work that can be undertaken for the amateur. The experimenter keeps one of these lists, marks his class of work on the other and returns it to this department. Knowing what men are available, knowing something of their apparatus, it is now possible to write for

The Laboratory of W. W. Harper at Ottumwa, Iowa.
them outlines along which they may work. That is the stage of the work at the present time—some jobs are already well under way while others have not yet been outlined. The other outlines are now in preparation and will be in the mail before this magazine.

What Is Still to Happen

With several hundred men working on our problems we found out some things worth knowing about amateur radio. But it has been uphill work because the experimenter often did not know of the "brass pounder's" problem and the key man did not know where to turn for his help. At the same time also a number of experimenters have often worked on the same task—some of them knowing of the work done by the others.

This is the sort of thing that the "Experimenter's Section" can help in: to provide contact between the men and the job and to provide contact between the men who are working the same job.

All this sounds a good bit like an advertisement for an employment agency, but it is different because we know the cooperative spirit of amateur radio and are sure that it will work out here as well as it has in the field of message traffic.

It will not be necessary or desirable to build such an elaborate organization as that of our Operating Department, but it will certainly be necessary to appoint district representatives—call them District Experiment Chiefs—and provide them with the facilities to exchange information between the men in the division, much as the Division Traffic Managers handle matters. Some of these men are in sight—others are still to be found.

Where We Are Today

We are far from having arrived at a smoothly-running machine, but we can say, "The experimenter's section is at work with several hundred men enrolled."

At the present time one of the most active pieces of work is the development of the short-wave transmitter described in our October issue by Mr. Howard Tyzzer of the American Radio & Research Corp. (See "A New Radio System," page 15, October QST.*)

Mr. Tyzzer has taken charge of this work and at present has quite a large number of men at work—over 70 letters having been received from men who wish to participate. A letter has been prepared in which are given the results of some tests and this letter has gone to all those that are working on the problem and is also available to others who will write Mr. Tyzzer in care of Amrad at Medford Hillside, Mass. However, please be reasonable and do not ask for the report unless you wish to aid in the tests and development.

The list of the men working with Mr. Tyzzer is unfortunately too long to be reproduced here, but they are in many cases equipped to do excellent work as is shown by the illustration of the laboratory of one of these men.

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The Power Lines In A Double Role

By Six Zee Jay

I HAVE a little stunt for eliminating both the "A" battery and the antenna of a portable set. This has given such good results that I am passing it on to the gang.

From the figure it will be noted that a small step-down transformer is used to light the filament of the VT. Usually the hum of the electric light lines is quite bothersome but if a potentiometer is shunted across the 6-volt supply this hum can be practically eliminated by finding the "balance point." The circuit is the standard DeForest Ultra-Audio, used by most of us at one time or another. This circuit will oscillate continuously if some means isn't used to control it. To do this is very simple—use a 25-plate variable grid condenser—0.005 microfarads.

Believing that this circuit was super-sensitive I tried it with a 6-volt storage battery to light the filament. But there was ND, Nil. Then it was shifted back to the circuit given and—presto!! there they were!! The power line acts as the filament supply and the antenna.

Not very much 200-meter DX work has been done with this circuit. However, 600 meter sparks are very consistent and I can see no reason why just as good can't be done on the broadcast and amateur waves. (That is a good guess; we tried the stunt at 10A and amateur C.W. simply rolled in. Not much luck with amateur sparks as the 60-cycle hum is much worse.)

(Concluded on page 62)
Help Wanted
The Advertising Department Solicits Your Cooperation
By Edwin C. Adams, QST Advertising Manager

The A.R.R.L. and QST, its magazine, are co-operative institutions. Neither can live without the hearty participation of our members and readers. Many of you fellows are active in the Operating Department, others of you are helping "Jake" Bolles blazon the achievements of amateur radio all over the front page, and still more of you help make QST the valuable magazine it is by your articles and communications.

Now that's very FB for the League and QST, and also for the departments of Messrs. Bolles, Kruse, Schnell, and Mason. How about giving the advertising manager a boost too, for the betterment of QST?

As you've so often been told, QST's primary and principal source of revenue is from its advertising. This not only has to make QST self-supporting, but must pay almost the entire League expenses. The more advertising we can get, the more money will be available for League activities, and—get this—the larger can we make QST, which means more reading pages.

If QST were a strictly commercial magazine, with no other financial obligations, it could afford to go out and hire advertising representatives in the big centers, and spend a lot of money in intensive advertising solicitation. But inasmuch as it can't, what other means can we use to increase our advertising, and thus expand all that is dependent on it? We can use YOUR co-operation, as a loyal league member, as an enthusiastic reader of QST. Here's how.

First, an advertiser must be sold on QST as an advertising medium, and, second, he must secure enough tangible results to justify him in continuing to spend his money for space in our columns.

Take a look at the letter reproduced here. That's one way to help the advertising department to sell QST. If you see or learn of any apparatus that you yourself are interested in and which your fellow amateurs would like to know about—write us about it, and drop a line to the manufacturer. Tell him that only through QST can he tell his story to the real radio men; the backbone of the game, the men who not only represent a very large purchasing power in themselves but who also wield a tremendous influence on the purchase of apparatus by others.

We're not mind-readers, and in the ever-changing game of amateur radio it's often hard to know just what the majority of our readers would like to see advertised in QST. If you'll only tell us, and give us a lift by boosting QST to the man who makes or handles the apparatus in question, we'll have more advertising of the kind that's
wanted, and we'll be able to give you a bigger QST into the bargain.

The job's only half done, however, when the ad appears in QST. Our readers have got to buy the goods, or recommend them to others, and let the advertiser know that QST is responsible for the sale, for only in this way can he judge whether he can afford to use our magazine.

How many of you fellows act on the request at the bottom of every advertising page and "always mention QST when writing to advertisers"? If you'll do that EVERY TIME, the advertiser can't help but know how much interest this advertising is causing. Let QST be your buying guide. With your cooperation in securing for our columns the ads of apparatus that the fellows want, you should be able to fill every want from QST. When possible, order direct from the ad, and tell 'em that QST gets the credit. If you have to buy QST-advertised apparatus from a dealer, tell him what started you, and "drop a card" to the advertiser telling him that through QST you have bought from such-and-such a dealer.

We print some 40,000 copies of QST every month, which are probably read by almost 100,000 people, of which YOU are one. There are surely half-a-dozen products advertised in this issue which you either need or are interested in. Write to the advertiser today, tell him you saw it in QST—and do it again next month and the time after that. Thus you can do your bit to help our A.R.R.L. and make QST bigger and better, and we'll be able to tell Warner, Schnell and Co. that they haven't anything on us. We've got our gang too, working for amateur radio.

New Zealand Bedlam of Yankee Signals

Hams Clash on 200 Meters During Transpacific Tests

By F. D. Bell, New Zealand's 4AA

THE Trans-Pacific Tests are on and the American amateur signals are duly rocking in. Conditions for reception in New Zealand have been good so far except for two nights of very bad static. About 90 amateur calls have been logged at this station during the period of the test, although most of these were just handling ordinary traffic. Judging by reports received here by radio from other experimenters throughout the Dominion, New Zealand should hand in a total of some hundreds by the end of the tests. The writer has also been QSO Melbourne (Australia) on several nights and they too reported excellent results. Apparently most, if not all, of 6KA's messages have been received there.

6KA is easily the star of these tests and seems even louder at times than he was during the last ones. I think we all agree that his are certainly the loudest Yankee signals ever received here, even including the redoubtable 6JD of glorious memory. We are all curious to learn his input and antenna current. Perhaps the next loudest is 6CGW, but his note is not a very good one for cutting thru the QRN, especially static of the continuous growly kind. Under such conditions we always search round until we get on to a chap with a good clear musical note like 6PL, even if he is not quite so loud. The I.C.W. chaps are all right under ideal conditions, but on a noisy night one is very apt to miss the dots altogether. Sometimes one gets properly bamboozled. For instance the other night (Tuesday Oct. 23rd N.Z.T.) I heard a station calling Australia which I logged as 6CMT. He sent the code phrase "Invoice is not made out." A few minutes later I heard 6CGA on the same wavelength sending the code phrase "Wait for the weather to clear." I am still wondering if it was one and the same station both times—I rather think it was. The note was the same in both cases, being rather a harsh I.C.W. Then of course there are the sets which quack like an asthmatic duck every time the key is pressed—you all know them well. Unfortunately we don't understand their language out here so they usually quack in vain.

Looking thru my log I find the following
stations marked "very loud" in the period since my last list was sent in, namely Sept. 23rd to Oct. 27th: 6KA, 6CGW, 6BVG, 6BVS, 6GX, 6CKP, 6AWT, 7HG, 7SF, 8VQ, 9BZl, 9APS, 9MC, 9CGU, 9ZV.

About 110 stations have been logged during this period and the list will appear in the "Calls Heard" section. I am sending a copy of my log to the Editor, so anyone who would like to check my reception of his signals can do so easily. The writer would appreciate cards from those amateurs who find the entries check OK. Some of you hams should take a trip out here one of these days, if only to hear the din on 200 meters. You won't need to bring Mr. Godley's super with you, either.

There is no doubt in my mind that your transmitters are not only more numerous but far more efficient than they were a few months ago. I am in a fairly good position to judge since I have not altered a single thing on my receiver since hearing my first Yanks last February. Then it was quite a struggle to log half a dozen even on a

(Concluded on page 54)

Low-Power Loop Transmission
By Oliver Wright, 6GD-6BKA

The amateur loop transmitter continues to make headway in low-power amateur transmission. The loop transmitter deserves much more attention than it has received, especially in crowded regions where interference is severe.—Editor.

Last winter about this time I was fooling with a simple heterodyne using the Hartley circuit (Fig. 1) which I believe I got from QST. It consisted of a coil of about 20 turns, tapped in the middle, a .0005 variable condenser, an amplifying tube and the "A" and "B" supplies.

I found that I could take the heterodyne down cellar and hear its carrier wave practically as loud there as when it was about 8 feet from the set in the operating room on the second floor of the house.

That set me thinking and I constructed a small 5-turn flat spiral loop approximately 3 feet on a side and tapped in the middle and substituted it for the coil of Fig. 1 and found that this circuit still oscillated very nicely. You will notice that there is no grid condenser or grid leak. As long as the voltage is kept low they are not needed but as soon as the voltage is raised to over 150 volts it becomes necessary to add them for the proper and safe operation of the tubes.

With the set thus arranged, with 45 volts on the plate and drawing 2.5 mils, I was able to transmit about a mile but did not notice any great directional effects.

With 400 volts and drawing 20 mils we were able to work around Pasadena (where all these experiments were carried on) with great ease and worked stations in neighboring cities easily. At that power we were able to hold a wave meter near the loop and get the light to light at distances of up to 30 inches. The curves (see Fig. 2) represent the approximate extreme distances from the loop at which the wave meter would light up. This indicated that the magnetic field was stronger about half way from the center to the edge of the loop than at its center.

We soon found that the loop must be kept absolutely still during transmission, for if the wires vibrated the wave was changed enough to spoil reception. This difficulty was overcome by laying the wires along pieces of wood and fastening them

(Continued on page 43)
The remarkable consistency with which the signals of 4FT reach to all parts of the country has caused many an amateur to rebuild his transmitting set, blow his money for more tubes, or put up a higher antenna in the hope that his results will be comparable. These amateurs would like to know what it is that has caused the signals of 4FT to out-distance all others time after time. We cannot say, except that we do not believe any one feature of the station is responsible. After reading the description perhaps you can draw your own conclusions.

The station is located on a level tract of ground ten miles from Wilmington, North Carolina. A special shack has been built to house the radio set, and all current is supplied by a 32-volt farm lighting generator and a set of storage batteries.

The antenna and counterpoise attract considerable attention. There are two pipe masts, made of 2½", 2" and 1½" pipe. The mast seen near the shack in the photo is 60 feet high while the other, located 80 feet to the rear, is 70 feet high. A tapering six-wire cage is suspended between the two with a tapering cage lead-in dropping straight down to the station building. Directly under the antenna is the 35-wire counterpoise, 14 feet high. Eight posts are set equidistant on the circumference of a circle 80 feet in diameter and a No. 10 bare copper wire is run between the tops of the posts, suitably insulated at each. The 35 counterpoise wires then lead from the top of the station building, which is at one side of the circle, to points along the No. 10 wire. A beautiful looking counterpoise is the result, though many will throw up their hands in horror at the idea of the counterpoise wires being of different lengths.

Entering the house, the transmitting and receiving apparatus is on a long table to the left of the room. The receiver is the familiar Paragon RA-10 with its companion two-stage amplifier. Above it is a Reinartz set and two-stage amplifier.
To the right of the receiver is the transmitting apparatus. Although there are sockets for four 50-watt tubes, plate power is not available to work this to capacity, hence but two tubes are generally used. Plate supply is obtained from a set of 32-volt batteries through an Esco motor-generator, a double-current machine giving 1000 volts for the plates and 12 volts for the filaments of the tubes. The reversed feedback circuit with series feed is used. Grid leak modulation is employed for phone. An antenna current of five amperes is obtained when working on C.W. and four amperes on phone.

There are very few stations in the country whose list of "DX" compares with that of 4FT. Amateurs in all states except Idaho and Utah have, at one time or another written Mr. Parsley, commenting on the fine signals from his station. Yet that is not all for 4FT's signals have also been heard by amateurs in Canada, England, Holland, France, Porto Rico, New Zealand, Alaska, Hawaii, Japan, Straits of Gibraltar, Mexico and Greenland and by ship operators at distances up to 9500 miles from Wilmington, N. C. The speech from 4FT has been heard by many stations within a radius of 2500 miles. This station was about the first to communicate with Porto Rico and has handled a great deal of traffic for that place. The greatest accomplishment in two-way communication was made at the time of the last daylight transcontinental tests when, in lining up the route for the test just before daybreak, he worked 6AWT in San Francisco.

Donald McR. Parsley, the owner and operator of 4FT, would appreciate reports on his signals from amateurs in the two states mentioned above that have not yet been heard from. His address is Box 113, Wilmington, N. C.

7BJ, Vancouver, Washington

"The Old Man's" station itself has nothing on 7BJ. Vancouver, Washington, always did have a reputation for making lots of noise, ever since the days when 7ZJ's spark was heard as far as the Mississippi river; and George Sturley, ol'-time op and proprietor of 7BJ, is no slouch when it comes to upholding the reputation of his town.

The transmitter at this station is a panel made for experimental work and uses either two 50-watt tubes or three 5-watt bottles. The plate supply is furnished with variations from 400 to 4000 volts by a plate transformer that is guar-
of audio is seen to the left of the picture, one stage being used for DX; the rest for music. A home-made wavemeter beside the receiver is useful for checking the transmitted wave and also makes a wave trap that works wonderfully when the air is congested locally.

This station has been operated from an experimental point of view as well as for amateur traffic work. The usual monthly traffic is about 150 messages. The location of the station is not very favorable and includes among other things, a nice juicy power line which passes directly in front of the house. 7BJ has been heard in all states west of the Mississippi and has over a dozen reports on his signals from the extreme eastern states. The best DX record was made when 7BJ was heard in New Zealand in the first Transpacific Tests. Three 5-watt tubes were used at the time.

The Masts at 7BJ

For the average amateur who lives in the city it is almost impossible to put up a real good transmitting antenna within the confines of a city lot. Geo. Sturley was confronted with this same difficulty, but overcame it in such a good way that the information is worth passing along.

He has two masts seventy-five feet high and the ground space required by each of them is only sixteen feet square. The details of construction can be observed from the accompanying sketch. Truss cables (¼ inch steel cable) run in two systems; one from the top of the mast over a set of five-foot iron truss-bars halfway up the topmast, over eight-foot 2x6-inch wooden truss-bars at the top of the mainmast, and then are made fast with turnbuckles midway up the mainmast. In addition, a second set of truss cables runs from midway up the topmast, over the large truss bars, and is made fast with turnbuckles to the base of the mast. The actual guysing is done by four guy cables which run down from the top of the mainmast and are anchored securely to big, husky dead-men. These mast are very rigid and, being painted white, present a neat appearance. Two halyards are provided at the top of each, one for the antenna and the other for rigging up a bos'n's chair and tackle, enabling one to go aloft.

The antenna is of the inverted-I type. The flat-top section is only forty feet long, as the masts are rather close together, and consists of two six-wire cages each two feet in diameter swung at the ends of twelve-foot spreaders. The counterpoise is supported by long tapered spars fastened to the masts ten feet above the ground with lag screws.

Address all cards and letters to George Sturley, 206 E. 17th St., Vancouver, Washington.

2CEI, Bronx, New York

Here is one of the Second District stations which reaches out very consistently. Altho only one fifty-watt tube is used, 2CEI has been heard in 35 states, Panama and Canada. The antenna is only 45 feet high, so perhaps the well-filtered plate supply has a great deal to do with the way this station reaches out. The "DX Wallpaper" is good testimony that 2CEI "rattles the cans" over a good part of the United States. Much of the apparatus, including the receiver and the detector-amplifier units, is home-made. Stations in all districts are frequently copied. Robert Kraus, 2313 Fish Avenue, Pelham Parkway, Bronx, N. Y., is the owner and chief operator.
5GP, Anniston, Ala.

This station is an example in neatness of arrangement that many amateurs can well afford to profit by. The cabinet on the left encloses the transmitting apparatus which uses one fifty-watt tube in the reversed feedback circuit with series supply. Meters showing the plate current, antenna current and filament voltage are mounted on the front of the panel with switches to change from C.W. to phone just below them. The phone is used only for short-distance work and is modulated by a magnetic modulator. A chemical rectifier of 56 jars with a chemically pure borax solution rectifies the plate supply voltage of 1500 which is furnished through a homemade transformer.

To the right of the transmitter cabinet is a variometer-type receiver with the detector and amplifier cabinets to the right of the receiver. A four-wire tapering cage 65 feet long and 30 and 50 feet high at the two ends constitutes the antenna.

LOW-POWER LOOP TRANSMISSION

(Continued from page 39)

rigidly there. By this means transmission from an auto in motion is possible. The wire on this, and all our other loops, was No. 18 D.C.C.

The next thing on our program was phone. One of the gang suggested absorption modulation so a coil was rigged up inside the loop consisting of one turn of insulated wire with a high resistance microphone connected to the two ends. (See Fig. 3.)

This worked surprisingly well around the city, and even up to distances of approximately 15 miles we had no difficulty working on voice. This also was very sharp. Due to this sharpness it was easy to work duplex provided a loose coupled receiver was used and separate “A” batteries were used for the receiver and transmitter. We never got around to using Heising modulation but there is no reason why it should not work perfectly.

We did not have sufficient time to work on this so we could not make the exhaustive tests we wanted to, but I will give you some idea of what we have been able to do since with the loop transmitters.

Early last spring I left Pasadena and came to Arizona to work for the U. S. Indian Service. We were in a camp out in the desert and just 50 miles from Pasadena. I managed to get up two 25-foot sticks about 120 feet apart and strung a one-wire aerial. For a ground I buried some tin cans and a kettle, for which the Chink cook almost knifed me, and then the fun began.

My receiver consisted of a single circuit tuner (I only use a single circuit in the desert, not in a city), a detector and two steps of audio frequency amplification. I copied 6BRJ in Pasadena, using a loop (Concluded on page 54)
French Regulations Recalled

In the October QST it was stated that the French Postal and Telegraph Administration had promulgated a new set of regulations regarding radio. These new regulations were announced and their complete text was published throughout France but they aroused such a storm of protest, particularly on the subject of wave lengths, power, and the amount to be paid the government by broadcasting stations, that they were not officially put into force. A new set of regulations that will be much more favorable for broadcasting, it is believed, is being framed, but it is probable that the rules concerning the amateur will remain about the same.

The granting of call letters to French amateurs has reached the letter “E.” There are now, therefore, more than 100 amateurs in France who are authorized to use transmitting apparatus.

Argentinians to Take Part in Transatlantic Tests

The Transatlantic Tests planned for this winter between Europe and the United States are attracting attention in all corners of the world. A group of South American amateurs have just signed their desire to take part in the tests and try their luck at reaching this country with their transmitters. About twenty stations will transmit, the average power being that obtained from four 50-watt tubes. Their wave lengths will be in the neighborhood of 200 meters and transmission will be mostly by radio telephone, although some will send with a key. The Revista Telegrafaica, published in Buenos Aires, has charge of the arrangements at that end.

As this will be their first attempt at real “DX” work, exceptional results are not looked for, especially in the matter of receiving, because it is now the summer season in the southern hemisphere. Next April or May, however, when receiving conditions are better in Argentina, American amateurs will try transmitting to them.

Just a word about the difference in time between this country and Argentina. The time there is four hours behind G.M.T. This means that eight P.M. Eastern Standard Time is nine P.M. in Argentina, and so on.

Now is the time to brush up on your Spanish and prepare to hear the signals of our South American cousins. Watch the weekly A.R.R.L. broadcasts for further information on these tests!

Will You Take Part?

Even at this date it is not too early to begin planning for next summer’s Pan-American tests. If interested, drop a post card to F. H. Schnell, A.R.R.L. Traffic Manager, 1045 Main St., Hartford, and signify your willingness to participate. State what power you intend to use and be sure and say to what extent you are familiar with the Spanish language. Let’s go!

Amateur Radio Getting Started in Brazil

“The main event in amateur radio in Brazil during the past year has been the formation of the ‘Radio Society of Brazil’ which has for its main object, although not the sole one, the furtherance of amateur radio. In a country where any form of radio is new, it is exceedingly difficult to cultivate amateur radio in these times without going through the broadcast stages first. It is now a simple matter to obtain a receiving license wherein a few months ago it was a very complicated matter, showing that the efforts of our organization are bearing fruit. Some new radio regulations are being framed and the Radio Society has made recommendations to the governmental committee regarding them. We have been assured that these recommendations will be carefully considered.

“Our eagerness to get on the air has brought about the condition that if you twist your dials carefully you will hear quite a few chirps around town. The results remind me of the early pre-war days; I found one on 950 meters!

“The amateurs here are only now starting to build short wave receivers so we cannot report any of your calls yet. Our test for DX is Buenos Aires, about 1500
miles to the south, where there are three or four broadcasting stations. One of these a 500-watt set, is consistently heard in Rio de Janeiro on a regenerative detector alone. Perhaps this does not sound exceptional, but it must be remembered that static down here will deafen you with one step of audio. There are two or three super-heterodyne sets and several employing radio amplification in use here, and they seem to be the best solution."

Mr. C. G. Lacombe, Cosme Velho 105, Rio de Janeiro, Brazil, a member of the A.R.R.L., has given us the above interesting insight into the radio outlook in Brazil. A series of special tests with British 2SH which took place the first part of December. His station JFWA, transmitted from 8:00 to 8:30 P.M. Tokyo time, using one kilowatt of C.W., power with a wavelength of 300 meters. Pacific coast amateurs stood a good chance of hearing him, but nothing in the way of results has been reported yet.

The status of the radio amateur in Japan is very unsatisfactory. No licenses are issued for the operation of amateur stations and JFWA is the only licensed private experimental station, except for those belonging to the various radio companies.

Like many an ambitious amateur comes to Mr. Ando's laboratories, carrying his transmitting equipment with him in order that he may test and experiment under the licensed call of JFWA. Despite the restrictions, there are around 500 amateurs in Japan. They work on wavelengths from 200 to 400 meters generally and use either a spark coil transmitter or a hard receiving tube as a C.W. transmitter. No call letters are used and only short distances are covered. The record transmission of 30 miles is held by 19-year-old Viscount Doi, using a C.W. transmitter of less than 5 watts.

Mr. Ando, who is hearing the signals of American amateurs, is a pioneer radio worker in Japan. He has over fifty patents relating to radio and communication and has written several books on radio, thus ranking both as an inventor and a scholar. His well-equipped "Institute of Radio Research" is the only one of its type in the

(JConcluded on page 54)
WARNING

The device pictured herein is the registered trade-mark of the American Radio Relay League. The design of the same is also the subject of a design patent covering its use as an association emblem. Permission is given A.R.R.L. members in good standing, and clubs affiliated with the A.R.R.L., to print, wear and display this device in connection with non-commercial amateur activities. Its use by other persons, or for other purposes, is prohibited under penalty of law, except by special arrangement with the proprietors.

K. B. Warner, Secretary.

Where have all the fellows gone who used to be interested in the reception of long-wave foreign stations? Let's hear from you. How is radio frequency amplification, etc., working out on these waves?

J. D. Blitch, 41S, Statesboro, Ga., was the "4" who appeared in the photo "All Districts and France and Canada at the Convention," printed on page 12 of the November QST. He'll be on with 100 watts right after the first of the year.

Every other day or so the postman brings in a package containing a dial, a variable condenser or other piece of apparatus addressed to Willie Jones, care of the A.R.R.L., Hartford, Conn. This is the result of Willie's writing to manufacturers on A.R.R.L. stationery and not giving his return address. Be careful about this, fellows; it will help you get replies to your letters.

A Real Amateur Amplifier

Karl Hassel's excellent article in the December issue suggests (page 40) that we need an audio transformer with a very high ratio of turns and with a very bad (seen from the music standpoint) distortion curve. We hope that someone will soon start to make a 15/1 transformer but in the meantime we can roll our own according to the formula devised by Larry Dunnam of old 3ZY. Here 'tis:

Take an ordinary Phoard coil and pull out the primary, then rewind with 4 layers of No. 30 double silk or at least single cotton wire (n.d. on the enamel—it puncitures). Then put the secondaries on and connect them up again. You now have an audio transformer that will make broadcast music sound like the wrath of heaven or a $5 phonograph but—the way it boosts C.W. signals leaves nothing to be desired. Repeatedly Larry was able to feed a nicely readable signal into one stage of this sort of affair and get out of it a noise that ran the gang out of the place. Incidentally this transformer has such a peaked curve that high 60-cycle plate grumbles do not get thru it to speak of and only the best note is amplified strongly. We understand that there were later patterns of the Ford-Dunnam transformer which had a closed core but we never saw these.

Let us know how this works with you.

When your license says "local standard time" it means the U. S. standard time of your region. Remember this and don't go off the reservation about the kind of "local" time that your village council or state legislature manufactures for home consumption. The license had better say "Standard Time" and cut out the word local—then all hands would understand what was meant.

Special Notice to Hardshells

All you birds who think (as in 1905) that the best amateur wave is 200-meters-plus-whatever-you-can-get-with are invited to do a bit of listening to the weekly 125 meter broadcast from 5XV at 10:30 Saturday nights. Of course you will have to can that commercial tuner and get an amateur one, also you will have to learn to tune, for 5XV is a real C.W. station.

Storage battery plate supply.

After your ears have recovered, tune on down to the waves used by 8XX and 9XW (about 90 meters) and hear the strongest signal you ever read about.

P.S.—Good series condensers for sending sets can now be bought.

Foreign amateurs and ship operators...
We continue not to have a description of 3JJ—but hope still breathes feebly.

Improvements in the "Superdyne"

A tremendous number of inquiries for details on the construction of the "Superdyne" have been received by QST and by the C. D. Tuska Co. since the publication of the article on this subject in the November issue. The Tuska Co. is not interested in the sale of parts and our own interest was solely in putting basic information before the readers from which to work—we did not, and still do not, see the call for detailed dimensional drawings and the like.

We are therefore pleased to inform the reader that the Tuska Co. has issued a booklet about the Superdyne, giving dimensions, some changes in the circuit, and detailed operating instructions and advice as to choice of parts and their arrangement. This booklet may be obtained by addressing the C. D. Tuska Co. at 83 Homestead Avenue, Hartford, Conn. The price of the booklet is 50 cents.

Mr. Harry C. Gawler, formerly Radio Inspector for the first district and recently with the Radio Corporation, has now joined the General Radio Company organization in the capacity of Sales Promotion Manager. He has been in radio since 1904 and is a true friend of the amateur. We wish him every success in his new work.

The final decision in the suit of the C. F. Burgess Laboratories and the Burgess Battery Company against the French Battery and Carbon Company of Madison, Wisconsin, has been made in favor of the Burgess Companies. The court held that trade secrets and inventions of the Laboratories were wrongfully procured and appropriated to the use and benefit of the French Company. This suit was started in June of 1921 and probably has established a record for the Wisconsin Courts in the volume of testimony introduced.

The Acme Apparatus Company of Cambridge, Mass., will upon request, supply the owners of their transformers with a sheet showing the complete terminal data for all of their models of mounted and unmounted transformers. This will help the many amateurs who have written us for the information.

Regarding the stray in the December QST about tapping a Zenith tuner for 100 meter stuff, the total length of wire in use when tapped at the tenth turn will be about 15 feet, not 70 feet as there mentioned.

Dead Spots

We would like to have all possible information about any dead spots of which any reader can tell us. Sit down and think over the places you cannot hear—or the places you cannot work into. When writing please give all the possible information, whether it's spark or tube signals that do not get into (or out of) the place in question, how different waves act, whether the time of day and the season of the year has anything to do with it—every possible thing. Let's have a REAL response on this—several thousand letters.

—Tech. Ed.

In the story of the Second National convention in our November issue, in mentioning the receiving sets drawn for as special prizes, we inadvertently omitted the fact that the Western Coil & Electrical Co., of Racine, Wis., very kindly gave one of their WC-5-SW sets, a special 4-tube radio-frequency set designed for short waves with a range from 80 to 300 meters. Ralph E. Brooks of Hammond, Ind., was the lucky winner of this set.

Doctor Is Summoned by Amateur Radio

Probably through the summoning of medical aid by amateur radio, a woman and a little baby in the isolated village of Selkirk, 150 miles northwest of Winnipeg, are alive today. It was in early November that station 4AG at Selkirk was called upon to try and get a message through to Winnipeg, calling for a doctor. The operator at 4AG tried for two nights to put the message through but was unsuccessful. On the third evening he got into communication with 9EBT, owned by Harry Drew of Fargo, North Dakota, and gave him the radiogram asking for aid. Mr. Drew immediately wired it to the owners of the Selkirk mine at Winnipeg and a doctor was dispatched to the village. Several days later a letter of sincere gratitude was received by 9EBT for the great help his station had been.

Thus the value of amateur radio in emergencies has again been proven!

7IT is not an Alaskan station, but is located at Stevensville, Montana, and has been operated for the past year by Ashley C. Dixon. This is the station that Mix on WNP has been hearing. Roy Anderson's station at Ketchikan, Alaska, which formerly had 7IT for its call, has not been in operation for a long time.
The Crew at 1045 Main Street
A Few Close-Ups of the A.R.R.L. Headquarters Staff, and How They Spend Their Time.

So many requests have come in asking us to write a sketch on our Headquarters Gang and introduce ourselves better to our A.R.R.L. membership, and so many visitors have expressed surprise at the ramifications of our activities and the number of us here, that we have been more than half convinced that it may be helpful. This story is accordingly inflicted upon a patient membership.

The post-war headquarters of the League were opened by the Secretary-Editor in May of 1919 in a couple of dingy and ill-lighted little rooms in an old office building in Hartford. He was the only employee. By the end of the first week he decided that he simply had to have some help, and a young man stenographer, now no longer with us, was engaged—even if nobody knew where the money was coming from to pay him. In December of that year Mr. Adams, now our advertising manager, joined our staff as the Secretary’s assistant; the next spring Peggie King came in as a stenographer, fresh from a high-school commercial course, and the following fall the Traffic Manager was made a member of the Headquarters office and Mr. Schnell
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came to Hartford. By the spring of 1921 we had outgrown our quarters and with the need for more deskroom, we moved to the present site at 1045 Main St., Hartford. At first we had only a couple of rooms, but our needs increased and we grew bit by bit until now we occupy the entire third floor of our building. It isn’t much of a building, but we have plenty of floor space at a rent we can afford, and the general arrangement is well calculated for the turning out of huge quantities of hard work. From the very start the history of our League’s office has been one of expansion and development, with new and varied work constantly being undertaken and existing work developing to huge proportions, so that we have had a constantly growing and shifting personnel as new departments were created, promotions made, and additions made to the staff. There are now a total of nineteen of us. The wiring diagram herewith is a hook-up showing how we fit into the A.R.R.L. scheme of things and how our duties and responsibilities are divided.

Ours is no mahogany suite with green rugs and gold-plated cuspidors (that always has been our idea of luxury). But we have a happy, congenial crowd of people who are intensely interested in their work, and in our daily business lives we are more like one big family than a business office. We believe that we can be happy in our work and still get things done.

Now, rapidly, one by one, we want to present ourselves to you and tell you what we do up here.

Strictly speaking, Daddy Maxim, our A.R.R.L. President, is not a member of the Headquarters Staff—he has his own business, which is Maxim Silencers. But he is a very frequent visitor at 1045 Main Street, where we save up our hard problems for him. He solves those problems, gives us always a fresh viewpoint, and fills us anew with courage and ideas. It is his duty as president to keep a watchful eye on all our activities, and in the process he is our constant inspiration. On the air he is IAW, which has been heard everywhere from Japan to Holland.

The Secretary-Editor's Office

K. B. Warner, 1BHW, is the League's Secretary, the editor and general manager of QST, and the official custodian of the Wouff-Hong. Most of his time is given over to a general supervision of League work and the personal handling of many of the more important League affairs. He runs around the country collecting gray hairs and a furrowed brow in the study of League policies, and at home he directs the work of his staff in turning out QST, getting League publicity, keeping records, and handling the general correspondence of the League in the service of its membership. He is an ex-Illinoian, by the way, a pre-war 9.

Chas. A. Service, Jr., “CS” at 1CKP and ex-3ZA, is the Assistant Secretary and right-hand-man to K.B.W. He has had good training for this position as former vice-president of the League and Manager of the Atlantic Division. At headquarters he handles the bulk of the secretarial correspondence, particularly our foreign mail, which is now very sizable and immensely interesting. He's the office manager, hires and fires the girls, and pays us our weekly stint. Whenever the office isn't warm enough, or somebody's stenographer doesn't show up, or a letter can't be found, Charles is it. He is a Penn U. man, ’16, and a Zeta Psi.

The Operating Department

Is there anybody who hasn't met Fred Schnell in the three years he has been A.R.R.L. Traffic Manager? Here is the Chief of the Brass-Pounders, the leader of the Boiled Owls. Schnell was a Chicagoan before coming to Hartford; it was his notable success as Chicago City Manager of the O.D. in the application of the Chicago Plan that first brought him to the notice of the A.R.R.L. Board. He is one of the best amateur operators in the country, knows his stuff, and is a peach.
of a fellow. Can we say more? Oh, yes—1MO.

How many of you fellows knew that there was an assistant Traffic Manager? Yes sir—yes ma'am, we mean. Margaret ("Peg") L. Mays knows more about O.D. details than Schnell does, and for a very good reason—she handles them daily. She is the "MLM" you fellows see on O.D. bulletins; she keeps the files and records in the traffic office, and in general is F.S.'s right bower. She lives in Waterbury—we don't know why—and commutes.

P.S.: We've just found out why she lives in Waterbury. She has just become Mrs. A. L. Sage. So scratch her off your list of possibilities.

"The Hebert Department"

A. A. Hebert has so many jobs around here that he rates a department all his own. Besides being the Hon. Treasurer of our A.R.R.L. the watch-dog of our finances, he is the traveling representative of the headquarters office for helping clubs, making visits, attending conventions, etc., and he also supervises credits and collections in our financial department. Mr. Hebert has been a member of the A.R.R.L. Board since its national organization, and was our original General Manager and vice-president. Before coming to Hartford he was president of the Second District Executive Council and operated 2MP. He is now "AH" at 1CKP.

The Editorial Department

S. Kruse, our technical editor, is the chief technician at Headquarters. Kruse is a Kansan, hailing from Lawrence, where he graduated from the University of Kansas. He was one of the ring-leaders in pre-war amateur activity in the Mississippi Valley; during the war he instructed in the Signal Corps radio school at City College in New York; later he was an assistant engineer at the Radio Laboratory of the Bureau of Standards, where among other things, he handled lots of the work in connection with the Fading Tests; then he had a year as radio engineer with the Hammond Radio Research Laboratories; then back to his first love, the amateur game, with QST, where he writes articles in an unusually graphic style, edits other folks' articles, runs tests, and carries on a teletype correspondence. Kruse has been connected with more radio calls than most of us: prewar 9LQ, 9BM and 9XP; five different stations under the call WWV, NSJ-2, KDSU and KDYH (Hammond research), 3XX, 3ABI, 9KW, and at the present time 10A, 1HX and 1XAQ. Is it any wonder he knows something about amateur radio?

Howard F. Mason came all the way from Seattle to give us the help of a western amateur in the preparation of QST. He is the editor of the regular departments in QST, the official "question-answerer," and, with Kruse, joint proprietor of our new "experimenter" work. Mason and Kruse between them conduct our "Information Service" to A.R.R.L. members, and you'd be surprised at the volume of correspondence they handle. When these two fellows get to dictating, each talking at high speed to a dictaphone, the ether around 1045 Main gets blue and wailing and gnashing of teeth is heard from the direction of Howard F. Mason and his stenographers. Mason used to be '7BK; we robbed the Operating Dept. when we brought him to Hq., for he was then Manager of the Northwestern Division, as well as secretary of the Seattle Section of the I. R. E.

Here's the chap who actually "makes" QST: F. C. Beekley, our assistant editor in charge of production. Each month Beekley has hundreds of pages of "copy" shot at him, and from these he must have type set up and cuts prepared, then he wades thru yards and yards of proof-reading. When everything is in readiness he makes a big scrapbook from this material, under the direction of the editor, showing the location of every article and every ad. Then he breaks camp and moves down to the printer's with a nice sharp stick—for the issue must be got out on time and that is "Beek's" job.
A Few Glimpses
Around A.R.R.L. Headquarters

The Circulation Department
The Editor-Publicity Department
The Traffic Manager's Office
The Secretary-Editor's Office
A Corner of the General Office
The Advertising Department
It is at the same time the most fascinating job and one of the most difficult ones around the place. In-between-times he is 1WC and LAEL—yes, it takes a ham to read proof on QST.

The Advertising Department

Edwin C. Adams, our advertising manager, is in point of service our oldest A.R.R.L. man except the Secretary. Heaven only knows what jobs Ed hasn't done around here in the dim years now past, but for the last couple of years he has been in charge of our advertising exclusively. He is a perfect example of the possibility of making a real A.R.R.L. man out of a fellow who starts with no more than an Army knowledge of the Continental code. It is the advertising department which brings in the business which pays our bills and enables the League to carry on, so Adams is one of the mainsprings around here. He is a New York University man, a Psi U., and an accomplished linguist. He and Charles Service get all the medals in our office in Arts & Letters. Ed is married and has a fairly new loud-speaker in excellent operating condition.

Assisting Mr. Adams in the advertising department is Mrs. Marie C. Seltzer. She is a New York girl; in fact, she was just Marie Corr when she started at A.R.R.L. but there was a "reason" for her moving to Hartford and his name was Seltzer. She is jolly and capable, and you'd like her. She writes Ed's letters that bring home the bacon, and she's the Big Chief of the Ham-Ads. Mrs. Marie C. Seltzer knows somebody that knows Ethel Barrymore, and her hobby is the theatre.

The Publicity Department

The Lord High Potentate of the Royal Order of Inkslingers rejoices in the resounding name of Joshua Kenneth Bolles, but around this dump we call him "Jake" and let it go at that. Jake is manager of the Publicity Department, which not only supplies amateur news direct to hundreds of newspapers but, in the short year that that department has existed in our office, has built up a highly efficient field organization of the fellows interested in the A.R.R.L. publicity movement. This field organization parallels our Operating Department, with division, state and city officials, looking after and reporting A.R.R.L. news and maintaining scores of radio columns in newspapers across the country. It is Jake who is responsible for the fact that in the past year the A.R.R.L. name and the amateur's accomplishments have been seen everywhere; he is doing a work of which we are proud. He is a Connecticut lad, with considerable newspaper experience. His only vice is the dizzy habit of thinking to himself and then believing he has asked a question out loud. But he's a mean Inkslinger.

The rest of the Publicity Department is Miss Dorothy Nourse, a little girl with sparkling black eyes and a bit of the Gypsy in her temperament. She performs equally well on the typewriter, mimeograph, ukulele, or judge pan (ask 9RR, he knows). She's the "DAN" the Inkslingers see on their letters, and she keeps their publicity clippings in big scrapbooks. When she hasn't anything else to do she's pawing over the incoming mail looking for a letter from New London—wonder why?

The Circulation Department

Dave Houghton is the man who sees that you get your QST after Beekley crawls into the office after a ten-day battle and announces that we are ready to mail—he's the manager of the Circulation Department, with its involved records of members and subscribers, expirations, changes of addresses, and all the business of keeping QST on the newsstands, printing enough copies and yet not too many; and it is his department too which handles all the "A.R.R.L. supplies." It takes a mind with lots of gear-wheels in it to keep track of all these things; when Dave furrows that marble brow you can hear the buzzing. He is a Washingtonian but came to QST from the G.E. works at Lynn. He
January, 1924

QST

is an ardent sport fan, plays golf at sunrise with Fred Schnell, and is our leading armchair automobile expert.

Dan Ahern plays solitaire all day long with great gobs of QST stencils, but the chief idea is to keep them from getting shuffled. At mailing time he bosses the crew that sends you your copy, so his life isn’t all daisies either. Dan is our sartorial sport and the newest in haberdashery can always be found by a glimpse in the Circulation Department—the photograph with the new lid shows what we mean.

Miss Dorothy M. Sellew keeps the membership records and sends you your Certificate of Membership besides doing lots of other things. She lives in Cromwell, Conn., and commutes to Hartford. Her chief joys in life are her Willys-Knight car and a certain Cromwell young man, and if all is not well with both of them her day is ruined and the membership certificates are cock-eyed. Fortunately for us everything is going well in Cromwell.

The Financial Department

O.M. Hebert has had his inning, but we’ve more yet in this department—quite a bit more, in fact. The keeper of the strong-box is Miss Margaret King, our accountant and cashier. Peg has been an “A.R.R.L. man” for three years and a half. She is full of laughter and gaiety, and was a regular knock-out at our A.R.R.L. Booth at the First Show of the Second District Council. Her chief hobby is dancing, but she goes to church every Sunday, so she is a good book-keeper and manages to keep her figure(s) straight. It is the Financial Department which gathers in the shekels with which to pay our bills, and there’d be no payday around here if it weren’t for Miss Margaret King.

About Writing to Us

This is a good place for us to say a word to you about writing letters to us. You can see how our office is divided into departments, each handling a section of the League’s work. Please don’t write about General

Mrs. M. A. Meggat is the “MAM” seen at the bottom of so many of the letters from the “Headquarters” office. This capable lady is a Dictaphone operator, and she thrives on “cylinders.” She handles the entire dictation of the Editorial and Information Departments and that of the Secretary and Assistant Secretary, and then goes around the office looking for more to do. We’ve seen her desk on a Monday morning looking like a battle field, piled high with records dictated by LQ and MN on Saturday afternoon, but she always comes up smiling.

Miss Winifred Richardson is the stenographer for the Operating Department and the Circulation Department. She is so quiet that we don’t know much about her, but she was born in England, is an accomplished musician, has pretty bobbed hair, and her hobbies are tennis and amateur theatricals.

And now, ladies and gentlemen, permit us: the Sheik of High Street, Lawrence, our office boy. For pure catch-as-catch-can and fancy lady-killing, Larry can’t be beat. And he’s a real scrapper, too—came in with a black eye the other day. (No particulars available on the other fellow.) He handles our mail both inbound and outbound, including great stacks of circular stuff from the O.D. and the Publicity Dept., runs the general files, lends a hand everywhere, and does the million and one things that nobody else does. The amount of work Larry does per day hereabouts is a standard for the rest of us to shoot at.

About Writing to Us

This is a good place for us to say a word to you about writing letters to us. You can see how our office is divided into departments, each handling a section of the League’s work. Please don’t write about...
a variety of things in the same letter; don’t ask technical questions in letters renewing your membership; don’t incorporate Calls Heard in a letter to the Traffic Manager; don’t ask for an O.R.S. appointment in a letter which orders some back copies—please write separate letters about separate topics, so you can be served at one time by all the League’s departments. It is not necessary to address individuals or to try to figure out what department it goes to—that’s our worry: just address your letters to the A.R.R.L. at 1045 Main Street.

The Glad Hand

What do you think of your A.R.R.L. Headquarters? We’ll bet you had no idea it was as big an institution as it is. Now when you come by Hartford, O.M., drop up and see us—it’s a much more satisfactory way of getting acquainted than via a magazine article. You’ll find us hard at work but we’ve always got time to chew the rag with A.R.R.L. members. We’ll be glad to show you around the place and to learn the amateur gossip from your home town. The latch-string is always out at 1045 Main Street.

—K.B.W.

INTERNATIONAL AMATEUR RADIO

[Concluded from page 43]

country and has been granted an almost unlimited transmitting license. His signals, when using 500 watts of C.W., have been heard by Japanese ships 3000 miles at sea.

He invites letters from members of the A.R.R.L. Mail should be addressed to Mr. Hiroshi Ando, 13 Kitaiga-cho, Yotsuya, Tokyo, Japan. In the past many letters to him must have gone astray in the huge quakes and subsequent fires that swept Japan but, with that danger past, letters should reach him more promptly.

It is hoped that in the very near future JFWA can maintain two-way communication with American radio amateurs. Considering what has already been done, in reaching Australia and New Zealand, communication with Japan should not present any new difficulties. The air line distance from Seattle to Japan is no more than from Baltimore to Hawaii, and the distance from Hartford to Japan, across the center of Alaska, is hardly as far as from Los Angeles to New Zealand. JFWA is hearing our signals and he is the first station on the other side of the Pacific to come forward with a good-sized tube transmitter for the purpose of establishing twoway communication across the Pacific. Before many moons someone on this side is going to hear him.

NEW ZEALAND BEDLAM OF YANKEE SIGNALS

[Concluded from page 39]

good night, but now there are often several copyable stations going at once.

To return to the Trans-Pacific tests—I am afraid the N.Z. stations won’t burn out any phone leads in U.S.A. when they start replying. We did not know until the tests had almost commenced that we were expected to participate, and none of us have stations above the 50-watt input limit. The majority use one or two five-watters and no one possesses tubes of higher power. However no doubt a few of our fellows will obtain permission to use about 100 watts input and with three or more amperes in the aerial, should stand a good chance of reaching Hawaii. Over in Australia I believe they are fitting up several high-power sets which we all hope will succeed in reaching the Pacific Coast.

(Two unconfirmed reports have reached us of the reception of Australian amateur signals in California. Wonderful news if true. Details later.—Ed.)

LOW-POWER LOOP TRANSMISSION

[Concluded from page 43]

aerial with my circuit, on one for several nights and copied his C.W. signals a half an hour after the sun rose one morning.

He was using a 6-foot hard loop with 4 turns of wire on it and with one turn of wire inside the loop for absorption modulation. The tube was a five-wattier with 450 volts on the plate. He had no outside aerial up at the time. The loop was at ground level. It might be well to mention here that the loop should be as close to the transmitter as possible. Long leads are not conducive to high efficiency.

Later in the spring I kept two Indian Service camps in communication for a short while using a 4-foot loop and a five-watt transmitter with 350 volts of “B” batteries on the plate. The entire layout was in a 10 x 10 tent. The set at the other end was a regular five-watt transmitter with an outdoor aerial and a receiver similar to the one previously described. These stations, by the way, were 35 miles apart.

Most of our first experiments were conducted in the laboratory of Mr. Samuel McMeen and have been mentioned in an article by him which appeared in Radio for May, 1923. (See page 18 of that issue.)

Has anybody some bright ideas for QST covers? Not finished drawings, you understand, but ideas around which SZZ can draw a cover.
GETTING ON THE AIR

The Eighth of a Series of Articles of Helpfulness and Practical Value to Those Just Entering the Amateur Radio Game

By H. F. Mason, Department Editor.

BEFORE the embryo amateur has gone far he will have begun to make plans for his future station. Much helpful information can be obtained at this point by talking with other amateurs and visiting their stations. Even so, there is a chance of some wrong impressions being created and a little well placed information at the start will help the coming amateur much more than a jumble of miscellaneous ideas picked up here and there.

No set of rules can be given for building and arranging an amateur station. The tendencies of the owner, whether he be interested in relaying or from the experimental standpoint, will show greatly in the arrangement of his station. A relay man prefers a rather small room with no apparatus in sight except that actually in use. The experimenter type of amateur likes plenty of room with large tables and all kinds of radio apparatus at hand that can be pressed into service at a moment's notice to assist in carrying out some experiment. The experimenter, as well as the relay man, however, must know the code well and be able to carry on two-way communication with other stations in order to check up on the results of his experiments.

Amateur stations are of two types; neatly arranged stations and "haywire" stations. The class under which your own station comes can be determined only by you. The money you have spent on your station or the amount of apparatus you own has nothing to do with it. It is only by carefully planning and paying attention to the details that you can put your station in the neat appearing class from the very first and keep it there. This may be difficult to do but you will be repaid eventually, for neatness goes hand in hand with efficiency.

General Arrangement of Station

As stated above, the building of your station cannot be governed by any definite set of rules. Many amateurs have learned through years of experience, however, that there are several points that must be attended to if complete satisfaction is to be had.

If the station be a relay station, or if a considerable amount of relay work is done, it is very desirable that all apparatus, and especially the switches and tuning controls most frequently used, be within comfortable reach of the operator. Fig. 1, which is intended to represent a typical amateur station, will make this more clear. The receiver is located on the left and about sixteen inches back so the operator can rest his arms on the table while making the tuning adjustments. When doing the final tuning with his left hand he can copy the station with the pencil in his right without discomfort. When he desires to transmit he throws the send-receive switch which is mounted on the wall or table as near the transmitting key as possible. Very little time is then lost in making the change between the sending and receiving posi-
tions. The hand key should be mounted with the center of the key knob between sixteen and eighteen inches from the edge of the table, on a line with the operator's right shoulder, for the most comfortable operation.

The radio table itself is an important item. Without question the best kind would be a nicely finished and sturdy hardwood table. Unfortunately, however, such tables are not usually given to radio amateurs to bore holes in and fasten apparatus to, so we have to recommend anything that is handy and can be used for the purpose. The table should be solid and strong. A few coats of varnish will improve its looks wonderfully. Above all, be sure that the top is thirty inches from the floor. This is a standard height and even small variations from it will be noticeable. These same remarks apply in the case of a built-in radio table.

Installing the Receiver

Be sure to make a nice job of running the wires to the binding posts on your receiver. Loose wires running everywhere and in every direction do not make a good-looking station. Perhaps the best wire to use is heavy silk-covered lamp cord of some dark color, with each wire cut to the exact length required and a lug neatly soldered on each end. If the binding posts are on the front of the set, and it is not desirable to bore holes for battery and ground wires in the table, it is well to run a strip of wood about ¼ inch square around the bottom of the receiver with holes bored edgewise in it below each binding post to take the leads. The wires can then be led out at the rear of the set as shown in Fig. 2. A small moulded bushing placed in the wooden strip where each wire goes through it will add to the appearance of the installation. These bushings may be had from any electrical dealer and are the kind used where a piece of lamp cord enters the metal socket of a drop light. The receiver is then fastened to the oblong framework beneath it and to the table by brass angle-pieces.

The B batteries should be located near the receiver. Fastening them to the under side of the table or to the wall beneath the table with straps made of brass strip about ¼ inch wide and ¼ inch thick is perhaps the best method. The storage battery sits on the floor beneath the radio table. A lead-lined tray should be provided to prevent any acid from creeping out of the battery and getting on the carpet. Some form of battery charger will be around the station, and if the amateur desires the very latest he can build a small panel with a battery charge-discharge switch, an ammeter and a switch for turning on and off the rectifier. This panel can then be installed near the battery in the radio room.

There are sure to be visitors at your station at one time or another and on these occasions it is very handy to have several pairs of phones on hand as well as a permanent means of connecting them in the circuit. A small box with several double telephone jacks connected in series in it and the whole secured to the under side of the table is about the best solution. A separate plug is used for shifting the phones from one stage of amplification to another if the receiver is designed so this can be done.

Another innovation that will help improve the neatness of the station is to have a hook for the phones and to keep them hanging on it when not in use. After all, neatness consists of little more than having a place for everything and keeping everything in its place.

Power Wiring to the Transmitter

The first thing to do regarding the supplying of power to your transmitter is to go to the office of the local electric light company and talk the matter over with them. Be prepared to tell them how much current your transmitter will draw from the line and to give other details. They will be able to advise you as to just what is necessary in your particular case. In general, the wiring must be put in in accordance with the "National Electrical Code" which is the Regulations of the National Board of Fire Underwriters for Electric Wiring and Apparatus. Electric light companies have rules that must also be followed in addition to this code, however, so no accurate data can be given that will always apply.

As a general idea of what is required, one company requires a separate line from the regular house meter to the radio set, run in either "BX" (armored cable) or conduit, with an independent fuse block at the meter distribution box and an enclosed switch at the outlet in the radio room for cases where the power drawn does not exceed 250 watts. For larger powered sets, a separate pole transformer with a separate service for the radio set is required. A nominal rental charge must be paid for the use of this extra pole transformer in addition to the cost of the power used.

The information in the above paragraph will serve as a rough guide only; get the exact information from your light company as it will vary in different cities. If you are familiar with wiring methods and if running a separate lead to the meter is all that is required, perhaps you can do the job yourself in an approved fashion. Otherwise, get a certified electrician (Continued on page 57)
to install the wiring for you. In every case, however, the wiring will need to be inspected and approved. A copy of the 1923 "National Electrical Code" may be obtained by writing the National Board of Fire Underwriters at either 207 East Ohio Street, Chicago, Ill., or 26 City Hall Place, New York City, N. Y.

The Transmitter

An amateur builds a transmitting set by buying some parts, making others, and assembling them himself. They can be assembled behind a panel, with the meters and switches mounted on the front of the panel; or the apparatus can be spread out on a table or breadboard somewhat as in a diagram. It is hardly possible to assemble a C.W. transmitter and have it perform at its maximum efficiency at once. Some experimenting with different circuits, different values and kinds of condensers and inductances, will be necessary. For this reason it is strongly advised that your first transmitting set be not built up behind a panel, but that it be of the breadboard style which permits changes to be made more easily. Then when you have the set working satisfactorily it can be built up in panel-style if desired.

Good illustrations of transmitters of the breadboard style are shown on page 7 of the October, 1923, QST and in the Transatlantic Communication in this issue. Ideas can also be had from the "Amateur Stations" department of past issues of QST.

It is not possible to go into detail here regarding the construction of transmitting sets but a few points to watch can be mentioned. Keep the high voltage supply leads as far away from everything as possible. Be sure that all wiring is firmly supported so it cannot fall against other wires and cause trouble. Make the wires large enough to carry the current; the filament circuits should be wired with copper strip f or the larger tubes or with copper wire not smaller than No. 14 for the 5-watt tubes. Arrange the set so the meters and tubes are within plain sight of the operator at all times. Keep all power, radio frequency, and high voltage wiring away from the receiving set, as far as possible. Arrange the wiring in a neat manner and make a good job of the connections.

Figure 1 illustrates some of these points. The main power for the transmitter comes up from the basement to the enclosed switch under the right hand side of the table. The leads from the transmitter to the motor-generator or rectifier, which is also located below, run down through the floor next the enclosed switch. Thus all power wiring is kept away from the receiver.

The purpose of the switch mounted on the wall above the key is to switch the antenna from the transmitter to the receiver. The ground post on the receiver is permanently connected to the ground and the counterpoise post of the transmitter is connected directly to the counterpoise. It is very convenient to have contacts on the send-receive switch to heat the filaments of the transmitting tube when this switch is thrown to the transmitting position and to close the B battery circuit when it is in the receiving position. All changes are then made in one motion. Otherwise separate switches must be provided.

Many amateurs use a separate one-wire antenna for receiving. In this case the transmitter should preferably be disconnected from its antenna when receiving on the single wire as otherwise receiving will not be so good on the wave the transmitter is tuned to. The receiving antenna should be grounded when transmitting.

The best material for the leads carrying the current from the transmitter to the en-
eighth by one half inch in cross section. All current-carrying parts of this switch must be five inches from the building wall or other conductors and the switch should preferably be located in the most direct line between the lead-in wires and the point where the ground connection is made. The conductor from the switches to the ground connection should be at least as large as the lead-in in current-carrying capacity. The ground wire need not be insulated nor mounted on insulating supports. Fig. 3 shows a typical installation.

The entering insulators, as well as the base of the grounding switches, must be made of some non-absorptive insulating material. The entering insulators must have a creepage distance of at least five inches on each end from the current carrying parts to the wall or other objects. The lead-in wires may be brought through window panes, provided that the five inch creepage distance mentioned above is maintained. For further details on the method of installing the grounding switches, etc. see the “National Electrical Code.”

**Applying for Your License**

Coincident with the building of your station you should apply for a license in order to be “all set” to operate the station when your license arrives. Really two licenses are necessary before you can operate your station: an operator’s license, which certifies that you know the code and have a knowledge of radio regulations and radio apparatus; and a station license, which certifies that your station is adjusted in accordance with the radio communication laws with regard to power, wave length, type of apparatus used, etc. There is no charge made for either of these licenses. The first is called the operator’s license and the latter the station license. It is unlawful for a station to be operated without a station license having been obtained beforehand and the station must at all times be in charge of a licensed operator.

A government license and call is required for every transmitting station. Because you only use a spark coil or an amplifier tube with B batteries on the plate and talk with the fellow in the next block, no reason license is not required. As long as you deliberately transmit signals into the ether a license is necessary.

To apply for your two licenses, write the Supervisor of Radio for the district in which you live, first requesting application forms and examination papers for the operator’s license.

A list of the supervisors and their addresses follows:

<table>
<thead>
<tr>
<th>District</th>
<th>Name</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Charles C. Kolster</td>
<td>Customhouse, Boston</td>
</tr>
<tr>
<td>2</td>
<td>Arthur Batcheller</td>
<td>Customhouse, Baltimore</td>
</tr>
<tr>
<td>3</td>
<td>R. Y. Cadmus</td>
<td>Customhouse, New York</td>
</tr>
<tr>
<td>4</td>
<td>Walter Van Nostrand, Jr.</td>
<td>Federal Bldg., Atlanta</td>
</tr>
<tr>
<td>5</td>
<td>Theodore G. Deiter</td>
<td>Customhouse, New Orleans</td>
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<tr>
<td>6</td>
<td>John F. Dillon</td>
<td>Customhouse, San Francisco</td>
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<tr>
<td>8</td>
<td>S. W. Edwards</td>
<td>Federal Bldg., Detroit</td>
</tr>
<tr>
<td>9</td>
<td>E. A. Beane</td>
<td>Federal Bldg., Chicago</td>
</tr>
</tbody>
</table>

If you live within reasonable distance of the office of a Supervisor of Radio, however, it will be necessary for you to go directly to his office to take the examination. The examination questions include drawing a complete diagram of an amateur sending and receiving set, explaining the function of each part. Other questions on radio theory that every amateur should know, besides questions on the main points in the radio regulations, are also included. The code test in which the amateur must show his ability to send and receive messages at the rate of ten words per minute, is part of this examination. If you do not live near a Supervisor’s office and take the examination at home, it will be necessary to submit a statement signed by two licensed operators saying that you can send and receive at the rate of ten words per minute and that the answers to your questions are in your own handwriting.

Before applying for an operator’s license you should get a copy of “Radio Communication Laws of the United States,” obtainable for 15¢ (not in stamps) from the Superintendent of Documents, Government Printing Office, Washington, D. C. and study especially the parts relating to the method of calling, false distress signals, secrecy of messages, and amateur stations and operators.

After you have forwarded your examination papers to the Supervisor of Radio, the operator’s license will be forwarded, provided that you have made a satisfactory (Concluded on page 62)
Radio Communications by the Amateurs

A Canadian Speaks

Sandy Falls,
c/o Northern Canada Power, Ltd., Timmins, Northern Ontario.

Dear Eddie:

Re your remarks about the "C.R.R.L." I would like to have the floor for about fifteen minutes. Well, some time ago I sent in for a subscription to a Canadian radio magazine. I've naturally got to help radio over on this side of the line, you know. The second issue on the said subscription arrived today; and the C.R.R.L. stuff makes me sick.

Right here and now, I wish to stand up on both feet as a Canuck and say that it isn't above 15 or 30 minutes ago since Canada sounded like a graveyard on a cold wet night, as far as amateur signals were concerned. I also wish to assert that the present flourishing condition of Canadian amateur radio is mainly if not entirely due to the influence of the A.R.R.L.—Canadian amateur radio was cradled there.

There is no other magazine in the world just like QST, and no other magazine was ever printed that is looked forward to, or read with such avidity by grown men. The kidde with the picture-paper craze is a bored nonchalant guy in comparison with the "ham" who rocks one of the kids to sleep as he guzzles up the dope from the latest QST. It is, and always has been a never failing spring of information whereat legions of perplexed amateurs with furrowed brows have qualified, and gained enlightenment when the rest of the world was barren. While pettifogging history is teaching our youngsters that one of his nation can, and always could, lick three of any other nation, the members of the A.R.R.L. are talking with these "foreigners" and they are calling each other "old man," "ole timer" and ejaculating "hi-hi" with gusto. Why, man alive!—the very men whom the nations of the world will ask to be soldiers in the next war are joyously clicking out these terms of endearment nightly across the seven seas,—and shuffling to bed in early morn, whimpored for the want of sleep, only to slide into the land of dreams with a prayer on their lips to hasten the coming night; that they may do it all over again.

The A.R.R.L. made all this possible. The pages of QST since 1916 tell a wondrous story of those patient souls who gloriously failed so many times that the news of having won would oft bring tears.

Hence the world today twists a dial and drops its jaw, bewitched.

As a Canadian I wish to pay my humble respects to the A.R.R.L. and all it stands for. Posterity will mark that organization as the starting point of world camaraderie, and where this "Love-thy-neighbor" stuff got a real foothold in this world of men. I have no patience with such piffle as the C.R.R.L. unless the members fully appreciate the staggering debt they owe to the A.R.R.L. and will accept nothing less than an ironclad affiliation thereto. The hope of a handful of Canadian amateurs (and that's all we will ever be, comparatively speaking) being able to influence legislation is apparently futile, when we view the scars the powerful A.R.R.L. now wears after such combat.

Radio legislation is international in scope—it has to be—and the advent of any magazine or organization which tends to sectionalize the amateurs of any particular nation can do nothing but injury by scattering the economic force of the amateurs. Anyone who has the interests of amateur radio at heart would never attempt such a move, and the instigator of such policy does, in my opinion, stand self-condemned of some ulterior motive.

Possibly the time has come when it would be better to change the name of the A.R.R.L. to the I.R.R.L. (International). Should this come about and any body of Canadian amateurs get together to form a Canadian branch of the I.R.R.L., yours truly will be there with both hands. Otherwise, nix on building a fence around anything, especially when the A.R.R.L. never believed in them.

M. J. Caveney, Canadian 3GG.

Correcting an Error

Elgin, Ill.

Editor, QST:

On page 64 of your November issue there appears an account of a radio time service at the "temporary observatory on Catalina Island" during the recent eclipse, that perhaps to avoid misunderstanding needs further explanation.

The large observing parties at Catalina
from the Yerkes Observatory, Northwestern University, University of Wisconsin, Drake University and Carleton College were located in one camp known as Camp Wrigley, on the mountain "Summit," some three miles from Avalon.

At the request of Professor E. B. Frost, Director of the Yerkes Observatory Eclipse Expedition, the writer installed a complete radio receiving station at Camp Wrigley for the purpose of receiving radio time signals. The aerial consisted of a single wire 180 feet long and 15 feet above the ground. A 3-circuit regenerative tuner, using honeycomb coils, and two stages of audio frequency amplification were used for the reception of long waves.

Radio time signals were received twice daily direct from Annapolis, NSS. These signals were used by the writer to rate the timepieces of the various expeditions, which consisted of three mean-time ships' watches furnished by the Elgin National Watch Company, and the chronometers of the Yerkes and Drake observatories. For comparative purposes radio time signals were also received from Pearl Harbor, NPM, Darien, NBA, NPL and NPG. During the eclipse a special series of time signals was received from NPG.

No signals by a telephone line from 6XAD were received at Camp Wrigley.

Frank D. Urie, Assistant Director, Elgin Observatory.

Wanted—A Ham in the Azores

Galveston, Tex.

Editor, QST:

Wonde if anyone ever went to the trouble to examine a chart of the N. Atlantic Ocean to find a suitable spot for a 'Relay Central' for European traffic? There is a mighty promising looking place there if you look close enough, and its the Azores; where the NC planes stopped off for chow on their jaunt across the pond.

Here are some figures to show just how likely a location it is. First take the island of Flores, the Westernmost one of the group. Flores is 2,000 miles from New York, 1,400 miles from Halifax, 1,100 miles from St. Johns, N.F., 1,100 miles from Valencia, Ireland, 1,225 miles from Brest, France and 1,275 miles from Lands End, England.

To prove that this so out of this way, heres a list of the most consistent stations copied on April 29th while 200 miles N.W. of Flores: 1AR, 1ARY, 1ASI, 1CNI, 1CRE, 1GV, ISN, 2BMR, 2CEI, 2CQZ, 2RM, 3BG, 3BSS, 3HS, 3JJ, 3TR, 3Z0, 5XA, 8ABX, 8ALF, 8AVD, 8BDA, 8CCO, 8LJ, 8ZW, 9CRV, 9EQ, and Canadian 2BN and 9AL. All copied on detector alone. British and French stations have been copied over 1,000 miles repeatedly, so a good receiver at Flores or Terceira should melt the cans with cigs from both sides of the pond.

Now comes the flea in the ointment:—who has any data on the generosity of the Portuguese government regarding citizen radio? If it is permissible, and if a real ham can be found there, or one caught caged and carried there, it would change the possibility of Trans Atlantic traffic into a certainty. Come on gang, all ye Knights of Kage and Kounterpoise write to that long forgotten friend or fiancee in the Azores, and get some red hot dope on the restrictions there. Who will be the honored man to unearth another 'Cliff Dow' for the Azores?

Now as to whether the present conditions, or the proposed Azorean Relay be preferable would seem to admit of some difference of opinions the answer being according to which is better; the lure of greater accomplishment when two-way communication with Europe is eventually established, or a real Transatlantic traffic route via the Azores. Let us hear your opinions and criticisms as well as any information on existing radio restrictions in the Azores.

F. M. Keefe. "FK."

Poor Judgment

Roodhouse, Ill.

Editor, QST:

I would like to know how these birds get thataway. Here I sit with a message direct from Los Angeles for a town 60 miles away and a bunch of guys down there are calling CQ but won't answer me because I'm not high enough for their five-watt bottles. And the fellow in Los Angeles is standing by for me to get him an answer.

Here is a chance for the A.R.R.L. to show some speed and the service fell flat just because that bunch down there were too dignified to answer a 500-watt C.W. set 60 miles away because it was too much like local and I have to go back to the fellow in Los Angeles who has been waiting all this time and explain and give the thing up in disgust.

I have a 500-watt set that will work either coast with ease and I am not a bit too good to answer anyone who calls me any time even though he is in the next town for it is a safe bet that he is not going to waste good DX hours on me unless he has something for me and it is a sure thing that I am not going to call him just for the novelty of it.

Now this thing mentioned above not only happened to me but it happens to others in other towns, and I believe there are lots of messages that have traveled thousands of miles only to die within a few miles of their
destination because someone is too high-browed to work local. What good would our telegraph lines be if they were to place a minimum of 500 miles on each message and not move it at all if it could not be moved at least 500 miles? Think it over. There is hardly a message that does not have to make a short hop somewhere on its way.

A. H. Cain, 9MG (Hen).

W. E. Tubes
San Francisco, Calif.

Dear Editor:
In the October issue of QST I note that you want information on the operation of Western Electric transmitting tubes. The following should help.
The 50-watt tube is known as the "G" or "211-A" tube and fits the regular 50-watt socket; the 250-watt tube is called the "I" or 212-A and fits a special 4-prong socket, all connections coming out the base as in smaller tubes.
The oxide-coated filaments burn at a dull red and have a long life if the rated plate voltage is not exceeded. They are burned at a uniform current which is 3.4 amperes for all 50-watt tubes and 6.25 amperes for all 250-watt tubes. (This is in contrast to General Electric tubes which burn at a uniform voltage but take different currents.) Since the filament resistance of the tubes varies it is necessary to use various voltages and the proper value for each tube is indicated by a letter etched on the glass just after the serial number.

Voltage to be used with "G" tube to give 3.4 amperes.

<table>
<thead>
<tr>
<th>Code letter on tube</th>
<th>Voltage to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8.7-9.0</td>
</tr>
<tr>
<td>B</td>
<td>9.0-9.25</td>
</tr>
<tr>
<td>C</td>
<td>9.25-9.50</td>
</tr>
<tr>
<td>D</td>
<td>9.50-9.75</td>
</tr>
<tr>
<td>E</td>
<td>9.75-10.00</td>
</tr>
</tbody>
</table>

Voltages to be used on 250-watt "I" tubes to give 6.25 amperes.

<table>
<thead>
<tr>
<th>Code letter on tube</th>
<th>Voltage to be used</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10.75-11.00</td>
</tr>
<tr>
<td>B</td>
<td>11.00-11.25</td>
</tr>
<tr>
<td>C</td>
<td>11.25-11.50</td>
</tr>
<tr>
<td>D</td>
<td>11.50-11.75</td>
</tr>
<tr>
<td>E</td>
<td>11.75-12.00</td>
</tr>
</tbody>
</table>

Lower voltages can be used in almost all cases.

Use great care in starting these tubes; always turn the filament on and let the tube heat for 5 minutes before applying plate voltage and then use only half of the normal voltage or else put in a high negative grid bias to lower the plate current to half normal. If the full plate voltage is applied to the tube at once, or if the filament is operated at too low a temperature, a destructive arc will follow, instantly burning out the filament. It is not desirable to turn the tube off while receiving.
The normal plate voltage for the 50-watt tube is 750 volts and for the 250-watt tube 1600 volts. The 50-watt tube can be operated up to about 1100 volts and the 250-watt one to 2100 volts but it is not good judgment to do this; the oxide coating is rapidly removed from the filament by overvoltages and the life of the tube greatly reduced. Attempts to use the enormous overvoltages that tungsten-filament tubes will stand is certain to destroy the W.E. tubes, either by arc-over to the filament or by heating the plate to a point where occluded gases are released and the vacuum ruined. The grids and plates are made of metallic nickel coated with black nickel oxide; thus they are likely to emit gas and even to melt at bright red heats and a special effort must be made to keep the plates cool, not over a very dull red, showing at the center of the plates only.

When the plate voltage is applied a blue glow normally appears inside the tube. This effect is probably present in tungsten-filament tubes also but is blanketed by the intense light of the white-hot tungsten. This is not to be confused with the "blue haze" of a poor vacuum, which fills the entire tube and causes the plate current to rise to enormous values whenever the vacuum is poor, either because the tube is defective or else because the plate has been carelessly overheated. The remedy for this is a new tube.

Western Electric tubes operate well in parallel if the proper precautions are taken as to inter-tube oscillations. If the filaments are to be burned in series care should be taken to use tubes with the same code letter.

When the tubes are old the oxide layer becomes worn off the filament in spots, exposing the red-hot platinum core as a bright spot, which finally burns out with an arc between the ends.

Those having experimental licenses (X calls) may purchase these tubes from the Western Electric Co. under certain restrictions. Before the tubes are supplied the purchaser must sign an agreement to the effect that the tubes are for personal and experimental use only, that they will not be transferred except after written permission is secured from the W.E. Co., and finally that the burned out tubes must be returned and an accounting of work done furnished whenever the Co. asks for it. Detailed information may be obtained from R. M. Hartfield, Public Sales Engineer, American Telegraph and Telephone Co., 195 Broadway, New York City. The list prices at this writing are $40 and $110 for the 50- and 250-watt tubes respectively.

"Prof. Bugs."
THE POWER LINES IN A DOUBLE ROLE

(Concluded from page 35)

when the tube is not oscillating.—Tech. Ed.)

A peculiarity about this circuit is that as the strength of the oscillations is increased the power-line hum decreases. Also as the wave length increases the hum decreases.

A better circuit than this could not be wanted for a portable receiver—that is, for any place, such as a hotel room, where one can get at an electric light line. Many a time I have wished for such a receiver while traveling. The whole works will fit nicely in a very small suitcase.

THE JUNIOR OPERATOR

(Concluded from page 58)

mark in the examination. If you failed to pass it will be necessary to wait three months before applying for a re-examination. On the back of the operator’s license is the “Oath of Secrecy.” This must be sworn to before a notary public and the license returned to the Supervisor of Radio for his signature before the license becomes valid. You are then a licensed operator and the government recognizes you as a person capable of operating a licensed amateur station in accordance with the radio communication laws at all times.

The next step is to obtain the license for your station. Write or go directly to the Supervisor’s office for the application forms. They concern the details of the station, such as the dimensions of the antenna, power and wave-length used, etc. When satisfactorily filled out and the station adjusted in accordance with the regulations the license will be issued, along with a specially assigned official call for your station consisting of the number of your district with two or three letters after it.

The first thing an amateur usually does when he gets his licenses is to have them framed and posted in a prominent place in the radio room. This lets all who enter know that Uncle Sam has given him and his station the official “OK” and the amateur has good reason to be mighty proud of that fact.

Being a real amateur means much more than the mere possession of a license, however. It will take you from three to six months to get the hang of things and able to talk to different stations over the air and handle messages with ease. There are dozens of abbreviations to learn and methods of procedure in sending and receiving that should be followed. Then, too, there are the unwritten rules of courtesy; the “rules of the road” that say that you must not interfere with the work of other stations and should not be an “air hog” but should wait your turn and remember that there are hundreds of stations that have the same rights as you. The article, “Ham Traffic in Any Old Shack” by F. H. Schnell, A.R.R.L. Traffic Manager, on page 31 of the September, 1924 QST*, will give you many useful pointers on carrying on communication and handling messages.

If there is a radio club in your town, by all means attend it and meet the rest of the amateurs in your vicinity. A radio club serves a very useful purpose in exchanging ideas between its members and cultivating a friendly spirit of co-operation between them. When you have your station in active operation, have joined your local radio club and the A.R.R.L. and are taking an active part in these activities, you can consider your ambition realized—you have become a “dyed-in-the-wool” ham.

Next month there will appear in this section an article on “How to Handle a Soldering Iron,” the first of a series of practical articles on home construction.

*Can be obtained from the QST Circulation Dept. at the regular price.
THE BURGESS "A" BATTERY
Introduces a New Silent Partner

Notice that: he's exactly my size—same height—same width — same weight. We look like twins. (He's good looking, too.) Look us over.

BURGESS is a big family. I have a lot of brothers. Perhaps the most famous of them is BIG BROTHER "B." He had the field to himself until Burgess introduced VERTICAL "B."

Now comes my new partner. He is VERTICAL "B" JUNIOR. He has the same 22 1/2 volts of pep as the rest of the Burgess "B" family. He is quiet—never talks to himself, and he never lays down on the job.

Burgess calls us "Work-Mates." He ought to know. We are silent partners in your radio entertainment.

Your radio set is no better than your batteries. Without them would be like having a marriage license and no bride. One is no good without the other.

Try it tonight. I'll heat your tube filament while my twin partner takes care of the plate circuit.

A Laboratory Product

BURGESS BATTERY COMPANY
ENGINEERS • DRY BATTERIES • MANUFACTURERS
FLASHLIGHT • RADIO • IGNITION • TELEPHONE
GENERAL SALES OFFICE, HARVIS TRUST BLDG., CHICAGO
LABORATORIES AND WORKS: MADISON, WISCONSIN
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WASHINGTON • PITTSBURGH • ST. LOUIS • NEW ORLEANS
IN CANADA
PLANTS: NIAGARA FALLS AND WINNIPEG
BRANCHES: TORONTO • MONTREAL • ST. JOHN

"ASK ANY RADIO ENGINEER"

BURGESS
RADIO BATTERIES

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Every tube you add to your receiver makes it just that much more important for you to use Eveready "B" Batteries, for each additional tube increases the work the "B" battery has to do. It demands a more capable, long-lived battery.

Here is a table that shows just what each type of receiving tube draws from your "B" battery. The current is measured in milliamperes, or thousandths of an amphere.

Current (in milliamperes) Taken from the "B" Battery by Various Tubes

<table>
<thead>
<tr>
<th>Current (in milliamperes)</th>
<th>WD-11</th>
<th>UV-199</th>
<th>UV-201</th>
<th>UV-201-A</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;B&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&quot;WD-12&quot;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22 1/2</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
<td>0.5</td>
</tr>
<tr>
<td>45</td>
<td>1.5</td>
<td>1.4</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>67 1/2</td>
<td>2.5</td>
<td>2.4</td>
<td>2.5</td>
<td>3.5</td>
</tr>
<tr>
<td>90</td>
<td>4.5</td>
<td>4.0</td>
<td>3.9</td>
<td>6.0</td>
</tr>
</tbody>
</table>

Above figures are at zero grid bias

The table shows that the "B" battery current drain increases much more rapidly than the increase in voltage. For example, if the voltage doubles from 45 to 90, the current drain increases threefold in one case and fourfold in another case. This all means that the life of the "B" battery may be materially lengthened by not using a higher voltage than is necessary to obtain the desired results.

The most popular type of receiver today has at least three tubes, operating a loud speaker. As ordinarily employed, it places a fairly heavy drain on the "B" battery.

Under light and heavy service, Eveready "B" Batteries prove up. More and more fans buy them every day because they are the most economical. According to the work they have to do, so is their life.

You get most energy for your money in Eveready "B" Batteries—"they last longer."
When Radio called,
Eveready was ready

TWENTY-ONE years ago, when wireless telegraphy had its first birthday, National Carbon Company's dry cell batteries were nine years old. Even then, its batteries were world famous as convenient, economical and efficient sources of electric energy.

With the introduction of popular broadcasting, radio leaped into universal service. Radio engineers used Eveready Batteries as their standard in designing tubes and receiving sets. Eveready engineers, backed by the most complete research and testing laboratories known to the industry, worked with them to discover how the known dry cell could be improved for radio work.

The fruit of these efforts is the Eveready family of radio batteries conspicuous for vitality and endurance—the right battery by test and proof for every radio use.

Insist on Eveready Batteries—they last longer.

NATIONAL CARBON COMPANY, INC.
New York, N. Y.

Informative and money-saving booklets on Radio Batteries sent free on request.

Headquarters for Radio Battery Information
If you have any battery problem, write to RADIO DIVISION, NATIONAL CARBON COMPANY, INC.
124 Thompson Ave., Long Island City, N. Y.

EVEREADY Radio Batteries
--they last longer

Radio has moved from the laboratory and amateur worktable out into the refined surroundings of the family living room. In keeping with this new companionship we offer this reliable, long-lived Eveready "B" Battery, in an attractive, new metal case, worthy to stand beside the rich cabinets of fine radio sets.
A PERFECT SET
For
AMATEUR
D.X. RADIO RECEPTION

While primarily building Radio Apparatus for broadcast listeners, hundreds of amateurs everywhere have learned of the wonderful efficiency of ACE Radio Receiving Sets for amateur DX Radio reception.

With their sharp and efficient tuning range over the broad band of wave lengths from below 200 meters to 600 meters, combining Armstrong Regenerative principles with careful design of parts and elimination of high frequency resistance in each unit, and absolutely free from body capacity effects, Ace Receivers in the hands of the DX "ham" will produce better results, tube for tube, than any Receiver that you can build or buy.

Almost unbelievable reports of stations copied have been received by the manufacturers from some of the best DX men in the business.

Ask your dealer to let you try out an Ace Receiver, and you will find that it is just what you have been looking for.

Recommend to some of your young friends who are just entering the game that they purchase an ACE TYPE V $20.00 receiver—for the more advanced amateur, the three tube ACE 3B Combined Regenerative Detector—and two stage Audio Frequency Amplifier will be the best thing you ever had on your table.

THE PRECISION EQUIPMENT CO.
Powel Crosley, jr., President
118 Vandalia Ave., Cincinnati, Ohio
No wit to flatter left of all his store,
No fool to laugh at, which he valued
more."

—Pope

SINCE the earliest days, laughter and
gaiety have been the most sought
after things in life. In ancient times
stately rulers unbent, courtly knights
forgot seriousness; beautiful ladies be­
came more alluring as the clever quips
and merry pranks of the court jester
brought a sparkle to their eyes and
drove dull care away. But they were
limited to the clownish antics and slap
stick comedy of the jester.

Moderns have unlimited sources of
amusement. Every broadcasting station
has its Jester; its humorous stories;
amusing songs and clever comedies.
Each night the air is filled with mer­
riment.

With a Crosley Model X-J radio re­
ceiver, amusement may be brough
clearly and distinctly to your fireside.
Sitting comfortably in an easy chair
you forget dull care. The magic wand
of the radio sends worry scurrying.
The very moderate prices of all Cros­
ley instruments bring radio within the
reach of all. No matter which Cros­
ley Model you may select you can be
assured of the maximum results at the
lowest cost.

Let a Crosley Radio Receiver bring
fun, laughter and good humor into
your home.

CROSLEY
Better—Cost Less
Radio Products

See the Crosley Line
at Good Dealers Everywhere

Write for Free Catalog. This fully describes
the Crosley line of Radio receivers which range
in price from the Model VI, a 2 tube set at
$30, to the graceful Consolette Model X-L at
$140, it also shows the complete line of
Crosley parts.

Crosley Model X-J—Price $65
For tuning out local interference and bringing in dis­
tant stations this receiver is unexcelled. It is a 4
tube set combining one stage of tuned radio fre­
quency amplification, detector and two stages of audio
frequency amplification.

For bringing in distant stations no set can
excel it.
Cost of necessary accessories $40.00 and up.

CROSLEY MANUFACTURING CO.
Pawel Crosley, Jr., President
118 Alfred Street, Cincinnati, Ohio

The Broadcasting Station WLW
is maintained by the
CROSLEY MANUFACTURING COMPANY

MAIL THIS COUPON TODAY—

Crosley Manufacturing Co.,
118 Alfred St., Cincinnati, O.

Gentlemen: Please mail me free of charge
your complete catalog of Crosley instruments
and parts together with booklet entitled "The
Simplicity of Radio."

Name .............................................
Address ..........................................

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Acknowledged Everywhere

AS THE MOST EFFICIENT RADIO ITEM ON THE MARKET

INTERNAL PIGTAIL CONNECTIONS—WAVE LENGTH RANGE 180-570 METERS POSITIVELY GUARANTEED

FROM the enthusiastic reports constantly received from all points of the country, this new type Remler Variometer has proved a winner in appearance and performance from the day it was placed on the market.

The perfect contact and quiet operation obtained by reason of the pigtail connection between stator and rotor is a big feature in itself, but the low minimum and high maximum wave length—the greatest ever obtained in a Variometer is a Remler accomplishment.

The wave length variation is exactly proportional to the reading of the dial scale. It will cover the entire range of amateur and broadcast wave lengths when used with any varicoupler. When used with a Remler-varicoupler the wave length is guaranteed to be from 180 to at least 720 meters. All metal parts are buffed and nickedel; green silk wire is used on both stator and rotor. The general appearance and quality of the bakelite molding is the best ever built into a radio item.

If your dealer cannot supply you, send the attached coupon direct to us with certified check or postal money order. Write for complete descriptive circular.


Home Office
154 West Lake St., 182 Second Street 30 Church Street
Chicago San Francisco New York City

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
INSIDE the Arctic Circle, nine degrees from the North Pole, a little 89-foot schooner is frozen fast in the ice of Smith Sound. Aboard this schooner a group of brave men are enduring, as best they can, the desperate cold of the Arctic—cold that often drops to 60 degrees below zero. Human atoms in a boundless field of ice!

Cold is hard to endure, but far more terrible is the Arctic solitude—unbelievably oppressive. Radio, at length, has broken this spell forever!

Concerts from Honolulu!

Daily, by means of powerful sending and receiving apparatus, the crew of the "Bowdoin" are in communication with relatives and friends in the far-off States. Daily they listen to concerts as far away as Chicago, Dallas and Honolulu!

When the sanity, the very lives of one's shipmates may depend upon contact with the outside world, none but the BEST is good enough.

Dr. MacMillan's Choice—the Zenith

Out of all the radio sets on the market, Dr. MacMillan selected the Zenith exclusively—because of its flawless construction, its unusual selectivity, its dependability and its tremendous reach.

Already his operator, on board the "Bowdoin" in Northern Greenland, has tuned in several hundred stations. You along the Atlantic who brag a little when you tune in Catalina Island—what would you say if you tuned in Hawaii FROM THE ARCTIC CIRCLE?

The set that Dr. MacMillan has is a standard Zenith receiving set. And you can do all that MacMillan does, and more, with either of the two new models shown at the right. Their moderate price brings them easily within your reach. Write today for full particulars.

Zenith Radio Corporation
McCormick Building, Chicago

MODEL 4R—The new Zenith 4R "Long-Distance" Receiver-Amplifier comprises a complete three-circuit regenerative receiver of the feedback type. It employs the Zenith regenerative circuit in combination with an Audion detector and three-stage audio-frequency amplifier, all in one cabinet.

The Zenith 4R may be connected directly to any loud-speaker without the use of other amplification for full phonograph volume, and reception may be satisfactorily accomplished over distances of more than 2,000 miles.

$85

MODEL 3R—The new Zenith 3R "Long-Distance" Receiver-Amplifier combines a specially designed distortionless three-stage amplifier with the super-efficient Zenith three-circuit regenerative tuner.

Fine vernier adjustments—in connection with the unique Zenith aperiodic or non-resonant "selector" primary circuit—make possible extreme selectivity.

2,000 to 3,000 Miles with Any Loud-Speaker

With the new Zenith 3R satisfactory reception over distances of 2,000 to 3,000 miles and over, is readily accomplished in full volume, using ANY ORDINARY LOUD-SPEAKER. No special skill is required. The Model 3R is compact, graceful in line, and built in a highly finished mahogany cabinet.

$160

ZENITH RADIO CORPORATION

Gentlemen:

Please send me illustrated literature on Zenith Radio.

Name

Address

ALWAYS MENTION Q.S.T WHEN WRITING TO ADVERTISERS
Great!

WESTON Instant Change PLUG

To see this plug is to admire it. To feel its lightness and ease of grip is to want it. But to change from one set of phone cables to another with it—means that you must own it interchangeable in 2 seconds. Merely press triggers to pull cables out. Shove cables in to connect. Always perfect contact. No tools. No broken fingernails, inconvenience or lost time. Operators everywhere admit its infinite superiority. Ask your dealer to let you see it or get it for you. Full information upon request.

Write today for particulars.

WESTON ELECTRICAL INSTRUMENT CO., 158 Weston Ave., Newark, N.J.

AT YOUR DEALER'S COUNTER

Buy a good Head Set.
Good Head Sets must have Powerful Magnets.
Powerful magnets ensure sensitivity, great volume of sound and true tonal quality.
The power of Head Set magnets is easily tested at your dealer's counter.
Unscrew the cap on the ear piece. Place the thin circular diaphragm on the counter. Hold the ear piece above it and see how far the magnet will pick up the diaphragm.
The farther the pick up, the more powerful the magnet, and the better the Head Set.
A Stromberg-Carlson Head Set will pick up its diaphragm at least one-fourth of an inch. Will yours?

Stromberg-Carlson

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Better Batteries—

Better Radio Reception

Every radio fan knows the importance of sustained battery voltage in a radio receiving set. A sudden drop in filament voltage, for example, is exasperating. Right here the name Westinghouse becomes significant. As in automobile batteries, Westinghouse Radio Batteries are the finest Westinghouse can build. The new Crystal Case types are especially efficient. Even-powered, slow-discharging, you'll quickly note their superiority for fine tuning, signal holding and sound volume. So economical too! They last indefinitely and are easily recharged at a few cents' cost.

Crystal Case "A" Batteries—One-piece glass case with solid glass cell partitions and plate rests. Visible interior. 2, 4 and 6-volt sizes. Crystal Case "B" Batteries—The 32-MG-2 (22 volts) is a wonder for steady, noiseless, full-powered service. Rechargeable, of course. Larger types, too. Also "C" batteries in 6-volt units.

WESTINGHOUSE UNION BATTERY CO.
Swissvale, Pa.
Get that extra-DX
a bit more often

Events of great note are those rare occasions when your set far exceeds its usual range. You'd like to keep permanently some of that Extra-DX. And you can—by patient tuning—and accurately adjusting the detector grid leak. Here's where little Omega Durham helps with his reliable plunger control. Try him out—get more of that Extra-DX.

New folder—Free
Little Omega Durham tells how he works—and why he's sure he can help you. Get your copy from dealer.

Omega Durham
—now an author

Buy from your dealer

Durham Variables—75c
No. 100—1,000 ohms to 0.1 megohms
No. 101—0.1 megohms to 5 megohms
No. 201A—2 megohms to 10 megohms

Manufactured by
DURHAM & CO.
Station WCAU
1936 Market St. Philadelphia

Dealers—DX receiving is only one of Little Omega Durham's accomplishments. His many friends bring in lots of DX business.

The Tube’s The Thing!
New Improved

MYERS TUBES

Guarantee Perfect Reception
Hear without noise or tube hiss. Myers Tubes give much greater amplification. They add 50% to the efficiency of your set because they reduce internal interference.

TWO TYPES: Myers Dry Battery Tube 2 ½ Volts—½ Ampere. Myers Universal operates on either 3 Dry Cells or storage batteries, $5.00 each. Ready mounting. No extra equipment needed. Insist on the New Improved Myers Tubes with the Silver Coating. Others not guaranteed.

At your Dealer—otherwise send purchase price and you will be supplied Postpaid.

Sole Manufacturers
F. B. Myers Co. Ltd.
Radio Vacuum Tubes
240 Craig Street, West

THE CUTLER-HAMMER MFG. CO.
Member Radio Section
Associated Manufacturers of Electrical Supplies
Milwaukee, Wisconsin

RADIO SWITCH

Always mention QST when writing to advertisers
MR. ALVIN R. UELEKE (Radio 9DWK) who was officially mentioned as having reached Orleans, France during the trans-Atlantic tests conducted by the American Radio Relay League last December wrote on March 26th as follows:

"I am pleased to inform you that due to the excellent performance of your products, I was able to have signals from my station heard in Orleans, France.

"In my equipment, I am using one of your 600 watt power transformers, unmounted type, to supply plate and filament current; the plate supply, 1000 volts, being rectified by a 48 jar chemical rectifier, and filtered by 8 Mfds. of filter condenser and two of your 500 MA single 1½ henry choke coils. Using Hartley oscillating circuit the antenna current was about 5 Thermo Couple Amperes."

Amateurs desiring to enter the next series of tests or those who have entered previous ones without success, are welcome to write to this company, explaining their intentions or difficulties in detail. Our engineering department will be glad to aid them in any way possible. The coupon below is for the convenience of those who desire to familiarize themselves with the newest Acme Transmitting Apparatus. The Acme Apparatus Company, Dept. 34, Cambridge, Mass., Branches, New York, Cleveland, Chicago, Kansas City, San Francisco.

ACME
for transmission

Acme Apparatus Company
Dept. 34, Cambridge, Mass.

GENTLEMEN:—Kindly send me your latest catalog of:
1] Transmitting Apparatus
1] Receiving Apparatus
1] Booklet on Amplification without distortion
(Enclose 10c)

Name ..........................................
Street ........................................
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Yours truly,

D. T. Vandell

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Write for free descriptive Bulletin 916Q

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American Radio Relay League,
Hartford, Conn.

Being genuinely interested in Amateur Radio, I hereby apply for membership in the American Radio Relay League, and enclose $2.00 in payment for one year's dues. This entitles me to receive QST for the same period. Please begin my subscription with the issue. Mail my Certificate of Membership and send QST to the following address.

Station call, if any.
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Do you know a friend who is also interested in Amateur Radio, whose name you might give us so we may write to him too about the League?

Thanks.

Balkite

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Price $3.75
Experimental Radio Station 9BP
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September 26th, 1926.

Messrs. Adams Morgan Company,
Upper Montclair, N. J.

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I have advised you before that I am very pleased with the results of my "PARAGON APPARATUS" but here is another victory for "PARAGON APPARATUS" which I feel you will be interested to know.

The MacMillan Arctic Expedition which left Nicasseet, Maine on June 23rd, on board the radio equipped Schonner "Bowdoin" planned to keep in touch with the outside world by amateur radio. They were able to do until they got North of Disco Island. After going North of that point nothing was heard from the expedition. All interested became worried at the news. The Chicago Radio Laboratory, on the ship's apparent silence, offered a duplicate of the receiving apparatus to the first amateur to get into communication with the expedition. This prize I have had the honor to win with the aid of my PARAGON Type RA-10 Regenerative Receiver and PARAGON Type DA-2 Detector-Amplifier. Since first getting into communication with the "Bowdoin" (who are in winter quarters frozen in at Refuge Harbour, which is ten miles North of Greenland Latitude 78.50 North, Longitude 72.50 West) on September 7th, I have had a working schedule with the operator and have copied one 500 word and one 100 word press message from them addressed to the New York World, and have forwarded all of these messages to their destinations.

When you consider that the expedition has heard hundreds of amateur stations in the Arctic but that my station has been the only one with whom they have been able to communicate, it is quite a record for "PARAGON APPARATUS" and am glad to have been able to advise you how proud I am of my receiving apparatus.

Yours very truly,

[Signature]

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Have a closed magnetic circuit of the shell type, carefully proportioned to give best performance. A uniform amplification results throughout the entire audible frequency range. Because the entire core and winding are enclosed in an iron case the effect of stray fields is eliminated. Ratios of 4 to 1 and 8 to 1.

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Does your receiving set respond readily to short wave signals? The WC-5-SW set shown above was designed by short wave specialists to help you. It picks up signals on wave lengths from 90 to 380 meters sharp and clear. The WC-5-SW has proven itself to be the most practical receiving set for low wave specialists.

**WC-5-SW**

Built Especially for Transmitting Amateurs

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Write for complete description and illustrated folder on this practical set for low wave specialists. All transmitting amateurs will be interested in this literature.

OTT RADIO, Inc.

224 Main Street

La Crosse, Wis.
Trinidad Government Pleased With KICO Efficiency

"We are ordering this battery on behalf of the Trinidad Government whose wireless officer was impressed with the efficiency of the Kic-o battery we are using with our receiving set." The above extract is only one of the many endorsements we are receiving of Kic-o Batteries. Alkaline type, won't sulphate or buckle. Life unlimited. Not harmed by short circuiting, over-charging or idleness. Panel switches give single cell variations. Recharge from any 110-volt A.C. line with small home rectifier. Charge lasts 3 to 6 months on tube receiver.

GUARANTEE
Your money back on any KIC-O Battery if not satisfied within 30 days' trial. Write for full information on "A" and "B" Batteries.

KIMLEY ELECTRIC COMPANY, Inc.
2666 Main Street,
Buffalo, N. Y.

K I C-O
Storage "B" Batteries—long service, low cost

Volume! Clarity!! Delight!!!

With Kellogg Shielded Type Transformers
Furnishes distortionless amplification of all audio frequencies. Built complete by the Kellogg Company using highest grade wire, maroon enameled case, and molded bakelite top.
Every Kellogg transformer is thoroughly tested before leaving the plant, and we guarantee the purchaser a product of exceptional efficiency.
No. 501—Ratio 4 1/2 to 1—$4.50 each
No. 502—Ratio 3 to 1—$4.50 each

KELLOGG SWITCHBOARD
& SUPPLY COMPANY
1066 W. Adams St., Chicago, Ill.

Here are a few of the items we are selling off at greatly reduced prices. Send for complete list of bargains.

<table>
<thead>
<tr>
<th>Type</th>
<th>Regular Sale</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acmefone Receiver with detector two-step amplifier and loudspeaker. Can be made regenerative at small cost...</td>
<td>$8.00</td>
<td>$30.00</td>
</tr>
<tr>
<td>HZ Clapp-Eastham Amplifier</td>
<td>35.00</td>
<td>15.00</td>
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<tr>
<td>JM-3 6-tube Radio Frequency Detector-Amplifier</td>
<td>95.00</td>
<td>30.00</td>
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<tr>
<td>JM-6 6-tube Radio Frequency Detector-Amplifier</td>
<td>150.00</td>
<td>40.00</td>
</tr>
<tr>
<td>RF DX Tuner for above radio frequency sets</td>
<td>35.00</td>
<td>10.00</td>
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<tr>
<td>No. 8 Federal Detector-Amplifier</td>
<td>52.00</td>
<td>20.00</td>
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<tr>
<td>No. 9 Federal Two-step Amplifier</td>
<td>80.00</td>
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<tr>
<td>20-A FircO Detector</td>
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<tr>
<td>No. 521 Kennedy Two-step Amplifier</td>
<td>55.00</td>
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<td>No. 220 Kennedy Intermediate Receiver</td>
<td>125.00</td>
<td>75.00</td>
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<td>No. 525 Kennedy Two-step Amplifier</td>
<td>85.00</td>
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<tr>
<td>No. 330 Remler Detector Panel</td>
<td>8.50</td>
<td>5.50</td>
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<tr>
<td>No. 331 Remler Amplifying Panel (without transformer)</td>
<td>6.00</td>
<td>5.00</td>
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<tr>
<td>No. 502 Remler Voltmeter Panel</td>
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<td>No. 505 Remler Variocoupler Panel</td>
<td>12.00</td>
<td>10.00</td>
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<tr>
<td>CR-7 Grebe Long Wave Receiver (Slightly used)</td>
<td>210.00</td>
<td>140.00</td>
</tr>
</tbody>
</table>

THE RADIO STORE
562 East Colorado St.
Pasadena, Calif.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
ENTHUSIASTIC TESTIMONY straight from an impartial authority, Re-Production is a fact. The delicate overtones which give music its roundness, resonance and timbre, are faithfully re-born through the modern magic of the patented "double diaphragm." This extremely responsive device is adjustable to the exact requirements of your set and individual receiving conditions. Write for Illustrated Booklet "D."

Atlas Loud Speaker Unit
With Phonograph Attachment . . . . $13.50
Without Phonograph Attachment . . . $12.50

Letters From Users Requested
What have you accomplished with your Atlas Ampliphone? Tell us about it.

Sole Canadian Distributors
The Marconi Wireless Telegraph Company
of Canada, Limited

Multiple Electric Products Co., Inc.
ORANGE ST., RADIO DIVISION NEWARK, N.J.
An Absolute Guarantee
with every instrument
made them famous!

SHAMROCK
FOR SELECTIVE TUNING
180°

Vario Coupler

list price, $3.50 each

DOUBLe
DUTy
PIG-TAIL

Variometer

SHAMROCK MFG. CO.
316 Market St. — Newark N. J.

GENERAL ELECTRIC DOUBLE CURRENT GENERATORS
May Be Used as Dynamotors for C.W. Transmission
Driving Voltage Plate Voltage Mills
12 550 130
8 400 90


We also have: CW-936 Sub Chaser Telephone Transmitting and Receiving Sets including:-Remote Control System, Power Amplifier, Loud Speakers, Tubes, Spare Microphone, etc. Can be tuned down to 150 meters. Absolutely new sets. Navy Long Wave Tuners Type CN-240, Tuning Range 1000-30000 meters. You will want one for long wave reception—SPECIAL PRICE $75.00.

EKSAF TRADING CO., 1515 Eastern Parkway, Brooklyn, N. Y.

DE LUXE DIALS

Complete line Radio Corporation Products, and popular parts for amateurs.

Mail orders given special attention.

Complete consultation at your service for the asking.

In emergency telegraph or call 3ZW, W. A. Parks.

National Electrical Supply Co.
1330 New York Avenue, Washington, D.C.

ALDEN MANUFACTURING CO.
Largest makers of Radio Sockets and Dials in the world
Springfield, Mass.

Dept. M
52 Willow St.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Gentlemen: I know that you will be interested in the remarkable reception which I obtained with one of your Type No. 102 Regenerative Receivers.

I received the instrument Friday, November 2, and connected it in the presence of two of the Boston Edison Company's engineers. On this evening, with no previous experience, I heard practically every station throughout the Middle West on a loud speaker. I am very much delighted with the performance of this receiver.

I am attaching below a list of stations which I have heard during the past six days. All of these stations were received on the loud speaker with sufficient volume to be heard all over my home with the exception of Denver. Nearly all of these were received prior to 10 p.m.

WOC Davenport
WOAI San Antonio
KLG Denver
WHN New York City
KFI Los Angeles
WFAX Dallas
WDAR Philadelphia
KDRA Pittsburgh
WBO Washington, D.C.
WEAF New York City
WOR Newark
CPCC Montreal
WGY Schenectady
WBZ Springfield
WJZ Troy, N.Y.
WCBQ Zionsville, Ind.
WAAM Newark, N.J.
WOR Buffalo

Assuring you that I am an enthusiastic booster of Chelsea Receivers I remain
Yours very truly,

AUBrey R. Goodwin

You can secure the same results with this wonderful Chelsea Receiver.

CHELSEA PARTS

The marvelous results obtained by CHELSEA RECEIVERS are largely due to the Chelsea Parts. If you are building your own set you may be certain that the use of Chelsea Parts will give you the maximum results.

Write for our large Catalog No. 4 illustrating a complete line of sets and parts.
The New SIGNAL Vernier Variable Condenser

A Vernier Variable Condenser with positive contact between vernier and rotor plates.

Here is a condenser which ends your troubles. The closest tuning can be obtained with the Vernier the entire range being 2-1/100 of the larger dial. The contact between the Vernier and rotor plates is a special bushing insuring positive contact at all times. Vernier adjustments, close tuning, never before obtained can now be yours. Distant stations, elusive and hard to get, can be brought in clear and strong.

Ask your dealer, to show you the New Signal Vernier Variable condenser. Catalog on request.

SIGNAL Electric Mfg Co.

Factory and General Offices
1915 BROADWAY,
MENOMINEE, MICHIGAN

Boston, Chicago, Cleveland, Minneapolis, Montreal, New York, Pittsburgh, St. Louis, San Francisco, Toronto, Philadelphia, Los Angeles

You'll find our local address in your Telephone Directory

---

Standard of Excellence
for audio amplification
With all tubes
In all stages

AMERICAN
TRADE MARK REG. U. S. PAT. OFF.

Improve your set with an AmerTran
Its flat-top, distortionless amplification curve assures a pure tone rendering of the full musical scale.
It amplifies in one stage from 30 to 40 times in the flat part of the curve, depending on the tube constant—the amplification is approximately 5 times the tube constant. Send for Circular 1108.
Type AP-6; Turn ratio 5:1. Price $7. Ask your Electrical Dealer; or, sent carriage charges collect.

American Transformer Co.
Designers and builders of radio transformers for over 23 years.
176 Emmet Street, Newark, N. J.

---

FERBEND Wave Trap

The Original Wave Filter

Stops Interference!

Eliminates interfering stations.
Improves the selectivity of the set.
Eliminates local broadcasting.
Selects between conflicting stations.
Simplifies tuning.
Often increases signal strength.
Reduces howling and squealing.
The WAVE TRAP is mounted on a Formica panel in a beautiful mahogany finished cabinet 6x5x6, and is a high grade instrument throughout enhancing the appearance of the most expensive sets.

FERBEND Electric Co.
23 E. SOUTH WATER ST.
CHICAGO

CIRCULAR ON REQUEST

---

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Is your battery always fully charged and fit?

Is it always toned up for best results, whenever friends happen in—throughout every concert? Keep it at full strength and prolong its life—the simple, easy, inexpensive Tungar way. Tungar—the go-between from house-lighting circuit to storage battery—attaches wherever there is a lamp or convenience outlet.

You don't have to move the battery. Just connect Tungar, and leave it—any time, day or night.

Tungar is certain, clean, quiet. No moving parts to get out of order or make noise.

Good for the auto battery too—the same Tungar.

See one at any good electrical store, or write for literature. Address Section Q1

Merchandise Department
General Electric Company
Bridgeport, Connecticut

Tungar Battery Charger. Operates on Alternating Current.
2 Ampere Outfits—$18.00
5 Ampere Outfits—$28.00
(Prices east of the Rockies)
Special attachment for charging 12 or 24 cell
8.5 Storage Battery—$3.00
—fits either size Tungar.

G E
Charge em at Home, with
Tungar
BATTERY CHARGER
A GENERAL ELECTRIC PRODUCT
TESTS PROVE IT BEST!

EXPERTS marveled when they tested the SAMSON HW-A1 Audio Frequency Transformer. Never had they used an audio frequency transformer which gave them such remarkable results! One stage of amplification with a SAMSON proved far more satisfactory, in most cases, than two stages of some and better than three stages of other transformers. No howling.

Samson
HW-A1
Audio Frequency
Transformer

You need the results which a SAMSON gets you. Insist on a SAMSON from your supply dealer; if he hasn't it we'll ship one, prepaid, on receipt of $7.00. Ratio 6 to 1.

Helical Winding Does It

Here is the secret of SAMSON’S success. Note that the wire is laid in layers without paper insulation. This reduces the distributed capacity to an absolute minimum, increases amplification, eliminates distortion. Helical Winding exclusive with the SAMSON.

Made by
SAMSON ELECTRIC CO.
Factory: Canton, Mass.
Sales Offices:
Boston, New York, Philadelphia, Pittsburgh, Chicago, Cleveland, Detroit, Indianapolis, St. Louis, Atlanta, Minneapolis, San Francisco, Los Angeles, Seattle, Portland, Montreal, and Toronto.

IF YOU CAN'T BUY THEM AT YOUR DEALER'S SEND DIRECT TO US

"Red-Heads" are guaranteed radio phones. You run no risk when you buy them. Money-back. If, after 7 days' trial, you're not satisfied that they're the best receivers on the market at the price. Why not act right now and get a pair? It means getting the maximum from broadcasting from the day you put them into use.

RED-HEAD
RADIO
RECEIVERS

These remarkable head-sets are made by The Newman-Stern Co., one of the pioneer radio manufacturing houses in America.

JUST OUT
The new 1924 Model F
$6.50 PER PAIR Complete
The new 1924 "Red-Head" Jr.
$5.00 PER PAIR Complete

The Junior Model has most of the quality features of the standard Model F here described. The resistance is 3,000 ohms per set instead of 5,000 ohms. A remarkable value.

THE NEWMAN-Stern COMPANY
Dept. QS
Newman-Stern Bldg. Cleveland

CATALOG E19-112 PAGES FREE
EVERYTHING IN RADIO
One of the largest complete stocks in the world. 40 diagrams of latest Hookups.

DEALERS ALL OVER THE U.S.
Making big profits handling our supplies. 24-hour service. Goods shipped same day order received.

American RADIO Mfg. Co.

WHOLESALE RADIO DISTRIBUTORS
Dept. "T" 107 E. 13th St. Kansas City, Mo.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Impartial Experts Testify!

For a long time, set builders have wanted some definite, authoritative guide to condenser quality. Complying with this demand, HEATH RADIANT CONDENSERS were submitted to two of the greatest radio testing laboratories. Below are salient phrases from their reports. Copies of the complete reports free to anyone interested.

Electrical Testing Laboratories of New York Say—

". . . the equivalent series resistance of each of the condensers is very small. That is, it is so small that it may be considered as negligible."

Radio News Laboratories Say—

". . . considered one of the best condensers we have tested. A dielectric loss resistance of 46 ohms at 1000 cycles . . . "

HEATH RADIANT CONDENSERS

Permanently Flat Plates

Precise, when you examine it at the store and, still more important, p-r-e-c-i-s-e always, for years—the most durable, continuously efficient part of your set. Warping plates made impossible by the Heath process of stamping and hardening which makes each one permanently F L A T—.

Micrometer-Adjusting Geared Vernier

Reducing gear, engaging with teeth cut into the outer rim of the vernier plate, affords infinitely delicate adjustment. An added feature of satisfaction that makes it well worth your while insisting upon Heath Radiant Condensers.

Write for Booklet

List Price—Vernier Type—(with 2 7/8" dial and knob)

13 Plate $5.00 25 Plate $5.50 45 Plate $6.50

HEATH RADIO & ELECTRIC MFG. CO.

207 First Street

NEWARK, N. J.
A $200,000.00 COMPANY stands squarely back of the guarantee on every Scientific Headset. We Guarantee the Scientific Headset to be the greatest value on the market. Try it for five days. If not satisfactory send it back and your money will be refunded immediately. Circular on request. Dealers wanted.

THE SCIENTIFIC ELECTRIC WORKS
98 Brookline Ave. Dept. G
BOSTON, MASS.

WE REPAIR THE FOLLOWING RADIO TUBES and Guarantee Them

<table>
<thead>
<tr>
<th>Tube</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>WD-11</td>
<td>$3.50</td>
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<tr>
<td>WD-12</td>
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<tr>
<td>UV-200</td>
<td>$2.75</td>
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<tr>
<td>UV-201</td>
<td>$3.50</td>
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<tr>
<td>C-300</td>
<td>$2.75</td>
</tr>
<tr>
<td>C-301</td>
<td>$3.50</td>
</tr>
<tr>
<td>DV-6</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

Mail Orders solicited and promptly attended to.

H. & H. RADIO CO.
P. O. BOX 22-W
CLINTON HILL STA., NEWARK, N. J.

WEIGHTS ONLY 8 OZ.

A 200,000.00 COMPANY stands squarely back of the guarantee on every Scientific Headset.

SEND NO MONEY!

20,000 TURNS EQUIVALENT TO 3,000 OHMS by Postcard and Pay Postman on arrival.

WE REPAIR THE FOLLOWING RADIO TUBES and Guarantee Them

<table>
<thead>
<tr>
<th>Tube</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
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<td>C-300</td>
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<tr>
<td>C-301</td>
<td>$3.50</td>
</tr>
<tr>
<td>DV-6</td>
<td>$3.00</td>
</tr>
</tbody>
</table>

Mail Orders solicited and promptly attended to.

H. & H. RADIO CO.
P. O. BOX 22-W
CLINTON HILL STA., NEWARK, N. J.

HYGRADE SPECIALS

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
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<tbody>
<tr>
<td>Skinderviken Transmitter Buttons</td>
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<tr>
<td>No. 763 Eveready 22½ V. Variable B. Bat.</td>
<td>$1.25</td>
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<tr>
<td>No. 766 Eveready 22½ V. Variable B. Bat.</td>
<td>$1.98</td>
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<tr>
<td>No. 760 Eveready 40 V. Variable B. Bat.</td>
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<tr>
<td>2000 Ohm Murdock No. 56 Head Sets</td>
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<tr>
<td>3000 Ohm Murdock No. 56 Head Sets</td>
<td>$4.25</td>
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<tr>
<td>Federal or Brandies Head Sets Complete</td>
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<tr>
<td>Dictograph 5000 Ohm Head Sets</td>
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</tr>
<tr>
<td>Acme Amplifying Transformers</td>
<td>$3.75</td>
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<tr>
<td>Acme R.F. Transformers, Types R2-R3-R4</td>
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<tr>
<td>6 Volt Marko Storage Batteries</td>
<td>$8.95</td>
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<tr>
<td>Frico (Bull Dog Grip) Phone Plugs</td>
<td>$9.75</td>
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<tr>
<td>Federal Amplifying Transformers</td>
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<tr>
<td>23 Plate Var. Cond. Bakelite Ends</td>
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<td>43 Plate Var. Cond. Bakelite Ends</td>
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<tr>
<td>No. 164A Fada Neutrodon Condenser</td>
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<td>No. 165A Fada Neutriformer</td>
<td>$2.49</td>
</tr>
<tr>
<td>No. 165A Fada Hazeltine Parts</td>
<td>$21.50</td>
</tr>
</tbody>
</table>

Mail Orders solicited and promptly attended to.

H. & H. RADIO CO.
P. O. BOX 22-W
CLINTON HILL STA., NEWARK, N. J.

RADIO "B" BATTERIES
At Factory Prices

Greatest radio "B" battery on market. Full number voltages available. QUALITY GUARANTEED: LOWEST PRICES: brings in entire range LOUDER AND STRONGER; will work on any tube or loud speaker. Order by number TODAY with check, money order or pay postman O. O. D.

<table>
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<tr>
<th>Number</th>
<th>Type</th>
<th>Voltage (volts)</th>
<th>Price</th>
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<td>22½</td>
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<tr>
<td>222A</td>
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<td>$3.00</td>
<td>$1.85</td>
</tr>
<tr>
<td>245A</td>
<td>45</td>
<td>$3.60</td>
<td>$2.25</td>
</tr>
</tbody>
</table>

Hygrade Electrical Novelty Co.
41 West 125th Street
New York, N. Y.

104

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS
Build a receiver where the numbers on the dials have a real meaning—

EASY TO BUILD

Complete instructions for assembling and blue-print for wiring are included with each outfit. Instructions written so everyone can understand them. No special skill or technical knowledge required.

HAZELTINE NEUTRODYNE

Panels Drilled Free

Specially drilled panels are included with each of the sets illustrated and described below. We give this free service only on panels included with complete sets.

HAZELTINE NEUTRODYNE PANELS DRILLED FREE

With Fada or Freed-Eisemann licensed parts

1 7 x 21 x 3-16 drilled Formica neutroformer.
2 Grid neutralizing condensers.
3 4-inch Radion Dials.
4 John Firth bakelite sockets.
5 Binding posts.
6 4-inch Radion Dials.
7 23 plate variable condensers.
8 Wave control neutroformer.
9 Radio frequency amplifying wire and complete instructions for assembling and wiring.

What "Salvage" Really Means---

Sometimes a manufacturer over-produces and must sacrifice his surplus stock for cash. Sometimes a dealer misjudges market conditions and must unload again for cash. Our business is to buy—"Salvage"—these special offers by paying spot cash for the entire surplus. But in order for us to keep on taking advantage of such offers, we must make a quick turnover. That is why for example we offer you the $10.00 Automatic Electric Headset for $3.65. "Salvage" to us does not mean something that has been used. We handle no second-hand merchandise. Every item we sell is guaranteed brand new—in fact 95% of our merchandise is in the manufacturer's own carton and carries his guarantee along with ours. "Salvage" to YOU means buying quality radio merchandise for less.

Automatic Electric HEADSETS

Formerly sold by the Automatic Electric Co., makers of telephone exchanges, at $10 each. We bought their entire stock—40,000 phones—paid spot cash and because of this unequaled buying power, we are able to offer you a $10 headset for $3.65. 30 years of experience have produced the Automatic headset. Coil is wound with about 6500 turns No. 100 enameled copper wire. DC resistance 1600 ohms. Impedance, at average music and voice frequency (500 cycles) 21,000 ohms. (Effective impedance rather than DC resistance is the big factor in a good headset.)

Genuine Western Electric MICROPHONE

Including:
6 ft. of cord
Attachment Plug
Breast Plate
Shoulder Straps
Transmitter
Special at $1.95

PromPTly—Address Dept. Q-6

ALWAYS MENTION Q.S.T. WHEN WRITING TO ADVERTISERS

1.05

SALVAGE STOCK STORE

509 SOUTH STATE ST.
CHICAGO, ILL.

Mail Orders shipped To You
Promptly—Address Dept. Q-6
A Variable Condenser:

the plates of which actually vary in area—an engineering feat never accomplished before—giving especially fine adjustment for selective tuning.

For Transmission or Reception

The highest class Variable Condenser, "FRESHMAN SELECTIVE" Mercury Variable Condenser will stand more than 5,000 volts. Plates are dust and dirt proof, thereby eliminating leakage which creates noises. No plate vibrations—absolutely quiet. Compact and attractive in appearance. Mercury plates give intimate contact with Mica Diaph.

Near 100% Efficient as a Variable Condenser Can be Made

Do not confuse the "FRESHMAN SELECTIVE" Mercury Variable Condenser with any other hereetofore on the market.

.0003 m. f. (equivalent to 17 plate)
.0005 m. f. (equivalent to 23 plate)
.001 m. f. (equivalent to 43 plate)

ALL TYPES $5

At your dealer, otherwise send purchase price and you will be supplied postpaid.

Chas. Freshman Co., Inc.
Radio Condenser Products
106 SEVENTH AVE., NEW YORK
The Supreme Insulation
RADION Panels
are easiest to drill, saw, or engrave with simple tools at home

18 Stock Sizes Radion Panels

Mahoganite and Black

<table>
<thead>
<tr>
<th>Size</th>
<th>6 x 10 1/2</th>
<th>6 x 14</th>
<th>6 x 21</th>
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<tr>
<td>7 x 9</td>
<td>7 x 10</td>
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<td>10 x 12</td>
<td>12 x 14</td>
<td></td>
</tr>
<tr>
<td>12 x 21</td>
<td>14 x 18</td>
<td>20 x 24</td>
<td></td>
</tr>
</tbody>
</table>

Look for this stamp on every genuine RADION Panel. Beware of substitutes and imitations.

AMERICAN HARD RUBBER CO., 11 Mercer Street, N. Y.
Clear as a Silver Bell

O-T SIVERTONE TUBES
(Registered)

in your radio set assure—
sharp, clear, mellow tones—
music with its delightful and thrilling modula-
tions—
speeches without distortion, audible down to a
whisper—
and all the other joys of Radio at their best

Three Models
O. T. 1A—2 to 4 volts,
Battery Draw .15 amps. Price,$6.00
O. T. 9—2 to 4 volts,
Battery Draw .06 amps. Price,$6.50
O. T. Power Tube—5 volts,
Battery Draw .25 to .35 amps. Price,$7.50

At your dealer or direct by mail.
Write for complete literature.

Manufactured by DeForest Tel. & Tel. Co.
Exclusively for the
O. & T. Electric Corporation
1819 Broadway, New York

The O-T is the only genuine Silvertone Tube.
Fully guaranteed. Beware of imitations.

BRANSTON RADIO
D.L. Honeycomb Coils—
Interchangeable with all coil mountings. Wave
lengths 190 to 21,000 meters. Use the two or
three coil combination that gets the wave
lengths you want. Furnished unmounted or
mounted with standard plug mountings.
GEARED MOUNTINGS

Licensed under De Forest Patents
(Front or Back Panel)
Neat, sturdy, permanent—capable of extremely
fine adjustment. Genuine Bakelite throughout.
Substantial gears give vernalier adjustment.

Send 2¢ Stamp for New
Honeycomb Coil Hookups
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FOUR: 2 Fifty watters $17.00 Each, 1 250 Watter $65.00, 3 Five Watters $4.00 Each. 1/2KW 300 Cycle Self Excited Alternator $23.00. Sid Lohman, Worcester, Massachusetts.

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MURAD six tube set, MA thirteen, with finely finished cabinet, with microphone, tubes and Esco Generator motor driven. DX 2000 miles, can also be used below 200 meters. The Manz Electric Company, Lima, Ohio.

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PURE SHEET ALUMINUM and lead 1/4", 75/ square foot. Electrical Specialty Company, Valparaiso, Indiana. 8787.

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AMATEUR RADIO STATION—ERY. 100 letterheads and 500 printed on good bond paper, special radio size, $1.65. Send for name and address and station call. Printed by 9AVO (member A.R.R.L.), Springfield, California.

COPPER BRAID—best conductor known for RF circuits. Surface is what counts. Many mechanical advantages over solid wire ribbon or tubing. Ideal for CW inductances, loops, O.T.'s, pig-tails, lead-ins, etc. Twenty sizes. No. 16 for wiring receivers, fifteen feet for 50e. 9CZP.


FOR SALE: Stock brand new genuine Radiotrons No. 201 while they last at $3.00. Also WD11 & 12 new at $3.00. Also new well made 10-20 watt phone, C.W. or I.C.W. with 5 tubes Hartley-Herling with speaker amplifier, huntsman type, complete minus D.C. $125. Also complete portable cabinet receiver 200-500 meters and amplifier, D.C. coast to coast used, but new in condition minus accessories $30. worth $70. Also cabinet receiver 1 stage tuned R.F. de­ tector and 1 stage audio, minus accessories, solid mains very fine piano finish. $75.00. Omnilith, Western Union receivers and parts less than wholesale. D.C. motors and lighting generators 36 watt to 5000 watt. Tesla Coil 1,000 volts, 1 foot spark length in south, primary 4 ft. diameter, for use with wireless transformer 1 to 3 KW for stage or experiments, Price $75. 2 new 50 watt radiotrons $25 each or trade. 1 Kenotron UV217 used 6 hours $18.00 or trade. All apparatus guaranteed as represented. Send 25% deposit, balance C.O.D. REAL Florida contacts in natural, fair, good, strong, fresh, and will grow in Northern hothouse, 25¢ each, plus parcel post on 2 lbs. Quantities by request. Write for name of Richardson, Associate I.R.E., Box 1013, Fort Lauderdale, Florida.

RADIO CALL CARDS printed TO ORDER. Red, blue, black printing, $1.50 a hundred, $1.00 a dozen. Color changes 35¢ extra. Government post 1¢ each extra card. LETTERHEADS 8½x11½ AND ENVELOPES, 100 EACH, $2.25; 200 EACH $3.50. A.R.R.L. compliant to be used on cards or stationery if required by federal law. w.h. Send Sand TODAY. 11-C, Radio Printers, Mendota, Illinois.

HAMS: Let 9EBH have your orders for Acme, Radio Corporation, Thordarson, Jewell, General Radio, Baldwin, Brandes, Grebe, Federal and practically all other leading makes of radio transmitting or receiving apparatus 15% discount on all goods. All apparatus shipped prepaid. Edward Gieske, Radio 9EBH, 312, So, Liberty St., Egin, Ill.

DEFOREST RECIPITERS tubes handle 1000 volts, 20 watts, used slightly, $3.60; Electros, 4 inches, $7.00, 3 Austrian Tu­ bes $5.50; Advance spiral receiver $75.00; and one complete power transmitting apparatus. Edward Page, Baldwinsville, N. Y. 8AOX-8AX.

CARICATURE of yourself in action for your radio room. Send photo and two-fifty, Cartoonist Schmidt, Sinton Street, Portsmoutb, Ohio.

FOR SALE: Omnigraph No. 2, ten dials, practice key and buzzer, fifteen dollars; Radio Corporation loop, fifteen dollars; Atwater-Kent variocoupler with panel, ten dollars. All guaranteed absolutely new. Emmons Stone, 39 Franklin Ave., New Rochelle, N. Y.

SWAP—Complete 1 KW inclosed rotary spark set in perfect condition. $25. 8RBC.

SIXTY CYCLE one eighth horse new motor $10.00. 280 watt 32 volt generator slide base pulley $25.00. long life batteries lighting or use, as motor. 250 Watt tubes $70.00, Marshall, Texas.

$110.00 EDISON CHROME NICKEL 6 volt 150 amperes. Four stage A battery at an equally wonderful price, 6 volt 330 amperes at $37.50. Edison Type A (large size) battery at $85.00. Edison plate at 45 cents, 4 pairs. Parts for making rechargeable B storage battery from Edison plates (Type A) for 100 volts at $8.95, 150 volts at $12.95. B Storage battery, 3 lb. roll, enam­ elled wire, perforated separators, chemical electrolyte and simple instructions for assembling and making charge. B. Q. Smith, 31 Washington Ave., Danbury, Conn.

SPECIAL MID SEASON SALE: UV 199's, UV 201's, WD11's, WD12's, $5.75 each; UV 200's and UV1's $3.75; 100 A.H. Cooper Storage "A" Batteries $13.50.
Crosley 80 A.H. Storage Batteries $12.00; R-3 Magneto $24.50, 2 step Power 2 step $30.00, Prismophone loud sounders $4.50; RCA Potentiometers (200 ohms) $1.00; UV 1714's transformers $3.50; UV 712's $4.50. Magnetron and radio transformer, 150 to 700 watts. Marshall-Carlson, Brands Superior Federal and Roller Smith head sets, $5.00 each; Marshall-Gerken variously. Crosley loudspeakers, $3.00 each; Paragon sockets and rheostats, 50 cents each; Clapp-Eastham H.R. and H.Z. units, $20.00; Crosley receiving sets (150 to 700 meters) mahogany cabinets, $10.00 each; Consolidated Call Book Regenerative Receiver Plans No. 1, 10 cents each; 2 step amp. plans No. 2, 10 cents each; 14 Radio Diagrams, 10 cents each; These parts and a lot more. $30.00. R-3 Motors Ringer, $0.65 each; 2 Amp. Tungars, $13.50; Aeriola Sr. Complete with aerial equipment, $35.00; Aeriola Jr. Complete, $12.00; Ford Motors, $30.00 each; 30 cm. inc. for sale. $4.00; Rectifiers, right, left, $0.65 each; 12 cm. inc. for sale. Stromavox NAVY Rochester, N. Y. Marshall-Gerken Type C.W. 936A Transmitter and Receiver $150.00; Magnavox Power Supply Store, Champaign, Illinois. Twelfth years experience and up-to-date. 9CZP.


BIG BARGAIN: UV 199, 201A, WD12, $5.65; Loud Speaker with Baldwin Unit, $11.00; Freshman Variable Grid Leak with Condenser, $0.80; 100.00. Phones bought at auction, $4.00; Rheostats up to 40 ohms, $0.50. Everything postpaid. Anything in Radio line cheap. Walter Wickstrom, 2224 Melrose Street, Chicago, Illinois.

BARGAIN: OARD PHANTOM RECEIVER New Portable. At less than half price, $85.00. Act quickly. Webster Electric Co., Racine, Wis.

THREE W.E. 216-A tubes, never used, original packing $15.00. H. B. Wooten, Coldwater, Miss.

HERE THEY ARE FELLOWS. Edison element storage batteries. Complete in attractive dust and acid proof cabinet, electrolyte and handles. 4½" surface between cells. The last word in storage "B" battery design. 22 volt battery $5.25 48 volt $6.75. 72 volt $9.50. 100 volt $12.25. Prepaid anywhere in the U.S.A. Shipped from stock. Send for circular. For the month I am offering you. A 25 tubes wired with heavy nickel plated iron wire at 6¢ per pair, ½"x6 containers 3½¢. 1x6 containers 4½¢. Separators ½"x6 lb. can electrolytically. Everthing for that storage "B." J. Zied, 530 Callowhill St., Phila. Pa.


FONE TRANSMITTER, 8KG HOOK-UP, 10 watt oscillator, 1 modulator, 10 speech amplifier, or 20 watt, 150 watt Esco motor-generator $250.00, sell $150.00. Motor-generator separate $50.00. SELL OR SWAP for synchronous rectifier. Newington, Hartford. Portable Transmitter. $255.00. Harold Schaefer, 733 Madison Avenue, Reading, Pa.

SELL: Jewell 500 volt D.C. meter, pattern 54, mounted, $12.00. 83 ft. sectional steel tower & antenna $50.00. Magnavox Tone Arm, $15.00. German Phone, $10.00. Geo. Sawyer, 356 Hazelwood Ter., Rochester, N. Y.

FREE: 50 watt tube to the Ham who buys my Esco 1000 Volt 200 Watt M.G. $90.00. 20D. S. Swan St., Schenectady, N. Y.

NAVY TYPE C.W. 936A Transmitter and Receiver complete including remote control power supply, Power amplifier, Loudspeaker, Phone transmitter, two generators, Switchboard, Spare box, etc. No tubes. Plans $150.00. Nathaniel Tylee, 314 Sumter St., Charleston, S. C.


MOTOR GENERATOR for sale, Esco 200 watt 400, 600, 1000 volts. Four bearing, double commutator. Operates on 110 volts, 60 cycle. Purchased new April 16, 1940. W. S. Thompson, 1301 Findley Ave., New York, N. Y.

SOME BARGAIN: New Fada Neutrodyne receivers, 2 radio detector, 2 asto, $80. list for $15.00; Also Tungar 10 battery rectifier, slightly used, $50. Tully Battery Co., Tully, N. Y.

SALE: New Grebe Rork 2 step amplifier, with tubes, $45.00. Radio 9CIN.


TRANSMITTERS AND RECEIVERS overhauled, repaired, rebuilt and made to “percolate.” Any circuit. Twelve years experience and up-to-date. 9CZP.


QRA SECTION

50c straight, with copy in following form only: CALL—NAME—ADDRESS. Any other form takes regular HAM-AD rates.

1BGK—R. B. Consaugty, Army Navy Y.M.C.A., Newport, R. I.

1BJR—S. Forrest Martin, The Choate School, Wallingford, Conn.

110—Amateur Radio Club, at Wesleyan Univ., Middletown, Conn.

2ADH—E. Peacox, 52 Radford St., Yonkers, N. Y.

2AG—C. R. Runyon, Jr., 25 Cortland Ave., Yonkers, N. Y.


3CKL—E. D. Gray, Church St., Blacksburg, Va.

3CKK—Frank E. Vaughan, R.D. No. 4, Box No. 115A, Hampton, Va.

3ZI-3CS—Ed. G. Raser, 931 Edgewood Ave., Trenton, N. J.


4JL—W. Justice Lee, Ortega, Fla.

4JR—Robert S. Morris, 413 S. Broad St., Gastonia, N. C.

5OT—A. B. Tinsley, 1317 Allen Ave., Ft. Worth, Texas.

5XAC-8UE—Ben H. Woodruff, Conway, Arkansas.

6BLZ—T. W. Kelso, 305 South Eye St., Madero, Calif.

6TF—L. E. Farrow, 322 W. 54th St., Los Angeles, Cal.

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS.
FEATURE OFFER

Variometers with Dials... $2.50
Loose Couplers .............. 4.90

Complete parts and Hookup Diagram including Bakelite Panel and Phones.

Special prices on all apparatus in our Special Bulletin.

Send for this.

Whitall Electric Co.
Westerly, R. I.
**FOR YOUR CONVENIENCE—**

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**ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS**
Radio Broadcast Contest reveals Bradleystat supremacy for Long Distance Reception

RADIO Broadcast recently conducted a prize contest, open to all radio enthusiasts, for the purpose of interesting amateurs in long-distance reception. Ninety contestants were entered, and the names of all, including prize winners, were published in several issues of Radio Broadcast, after the contest closed.

How the remarkable Bradleystat records were discovered!

After the names were published, a letter was written by the Allen-Bradley Co. to each contestant to ascertain what filament rheostat was used in each radio set. Seventy-two reports were received, and after they were tabulated, the most amazing discoveries were made about Bradleystat performance and Bradleystat popularity.

The Bradleystat captured first place in all leading events!

The superiority of the Bradleystat was proved conclusively by these facts:

1. The First Prize Winner used the Bradleystat in his set.
2. The greatest mileage record of 305,420 miles, total, was made by a Bradleystat user.
3. The Bradleystat was the most popular rheostat in the entire contest.
4. More Bradleystats were used than the next four types of rheostats, combined, "see diagram."
5. No carbon or metallic powder rheostat was reported in competition with the Bradleystat in this record-breaking contest.

Your radio set needs a Bradleystat. Try one tonight!

THE ALLEN-BRADLEY CO. HAS BUILT GRAPHITE DISC RHEOSTATS FOR OVER 20 YEARS

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS
The Golden Rule Tube

The discovery of the principle upon which the Sodion Tube was developed marks a new and better Era in Radio.
The tube itself is different from any you have ever known.
Different in principle—different in operation and different in results.
As its name implies, it makes such effective use of the peculiar properties of the sodium ion that there is no need of regeneration to build up the strength of your reception.

The fact that it does not oscillate not only eliminates all semblance of whistles and howls in your own reception, but makes it impossible for you to interfere with the reception of others. It is the practical application of the Golden Rule to Radio.
Crystal tone reception.
Unusually sensitive to weak signals.
Stable and uniform in operation.
Runs for hours without adjustment.
Operates on dry cells or storage battery.

Bulletin A-100 upon request
OWNERS DELIGHTED WITH "S" TUBE

"I believe I was the first station in town to use "S" Tubes. I bought two old style from the Braun Corporation here, and used them for three months on 15 watts. They were passing 100 Mil. at 1800 volts steady every day for three months, and stood it fine. I sold them a month ago for $12.80 second-hand. While using them I was heard in Greenland by WNP and in Honolulu by KHL... I had the purest DC in town. But soon after I shot three filter condensers (not yours) and wasn't able to afford new ones... Now I want full information and hookups on the Improved Type of "S" Tube."

(Signed) W. H. Hardy (Radio 6CMS) 4928 7th Ave., Los Angeles, Calif.

"Enclosed find money order for two solutions of your Mershon Electrolyte... While writing I might say I am more than pleased with the "S" Tube. I am using 5 watts now instead of 10 and among the best stations worked are 9DMJ, 9BJR, 8CYO, 1MY, 1A00, 2WR, 2BNZ, 3BWT, 3CHG, Canadian 2BE and 2BN. I have a very good radius and my note is excellent, not causing the least bit of interference to BCLs. About the most remarkable record is that I was heard SEVERAL times in one evening by 3NF, Richmond, Va., on a single circuit detector only WITHOUT ANTENNA OR GROUND, Hi."

(Signed) Canadian 3SP 50 Lorne Crescent, Brantford, Ont.

"Yours of the 18th regarding shortage of "S" Tubes received. Have been hoping to receive the last two orders, but as yet they have not arrived. They sure work great. The two I have are doing splendidly and are running on about 50% overload (We do not advise overloading)... At distances over 150 miles they all think I have a filtered DC generator. I am using phone now, and even at distances of 30 to 50 miles, the modulation is reported very good."

(Signed) Edmond P. Crocker, Nantucket, Mass.

These are typical of the letters we are receiving from all parts of the Country and Canada. And these letters refer to the former type—NOT THE IMPROVED No. 4000. Owners of "S" Tubes tell their friends about the wonderful results they are obtaining. We are always glad to receive these reports.

Write for Descriptive Bulletin J-2

Write for new Bulletin J-2 describing the "S" Tube and containing diagram showing methods of connecting tubes for obtaining various voltage and current.
CANCELLATIONS, CORRECTIONS IN DIRECTORY

Cancellations

DISTRICT OF COLUMBIA—Dist. No. 3: C.M. PHILADELPHIA—Russell Means, P.O. Box 120, Philadelphia, Pa.

DISTRICT OF COLUMBIA—Dist. No. 1: O.R.S.—SAWF.

DISTRICT OF COLUMBIA—Dist. No. 2: O.R.S.—SAWF.

Some abbreviations which will be of great help to those who have been suggested by Royd L. Leaue, 9R, of Kansas City, Mo. To start the gang off with a few to see how they fall into use is the purpose of this column, just seven new abbreviations. There are many more available, but before we try to overload you with something new, we feel it would be better to try out a few. If they "take" well, we can give you a few more next month. There has been a need for further abbreviations which will eliminate a good deal of long rag-chewing and it is with that thought we present the following: Tack them up in your shack and use them whenever you can.

QROD—(Question) In which direction are your messages going? (Answer) My messages start from (North, South, East, or West).

QRR—(Question) From what station did you receive message No.?—(Answer) Message received from (Call Letters).

QSL—Please acknowledge my signals by card. I will return the favor.

QSRM—(Question) Will you forward message No.—by mail if you cannot relay by radio at once? (Answer) I will forward your message No.—by mail if I fail to relay by radio within 12 hours.

QSYF—Please call me by wire telephone at once.

QSYT—I shall shift my transmitting wave to—

QSYU—Please shift your transmitting wave to—

There is a world of good dope there and there is no question that the above signals, if used, will save much time. Give them a try-out. You might drop 9R a card and tell him what you think of his ideas. His street address is 3020 Mercey St., R.F.D. 1, Kansas City, Mo.

The last mention of some more additions to the Operating Department Personnel than has been shown in many months. About seventy-five new stations were taken into the ranks. Can we grow that fast and maintain the quality? It would be IF we could as the greater number of amateurs we can get into the A.K.R.I—can be the greater the better and we need more. Mr. Reid, manager of the East Gulf, has been a ball of fire both in getting new members and in erasing old divisors. The East Gulf Division is in very fine shape. West, manager of the Northwestern Division, is keeping his division going and just as fast, as it would be best to receive, it will appear in QST. We want it complete before it is printed.

The Pacific Division, especially California, has taken a big hold of amateur affairs and amateur radio is beginning to feel the effects of such good men as W. N. Galen, C. E. McCreery, Mr. Babcock is always on deck with the right kind of advice when called upon.

Mr. G. L. Bidwell, 1245 Evarts St., N.E., Washington, D.C., is appointed chairman of the Emergency Railroad Committee and with the assistance of A. L. Budion is whipping an organization for the purpose. Those interested in having railroad communication experienced are requested to get in touch with Mr. Bidwell for appointment. When this plan is well prepared to handle communications for railroads this winter when severe storms cut off other communication.

Cancellations

PENNSYLVANIA—Dist. No. 1: O.R.S.—SAWF.

QST FOR JANUARY, 1924

1
South Carolina
A.D.M.—C. E. Wells, 1309 Buncombe St., Greenville. 4JK
O.R.S.—4DX, 4PV
(Complete S.C. personnel will appear in next issue)

ATLANTIC DIVISION
C. H. Stewart, Mgr.

WESTERN PENNA.—Dist. No. 8: 8AKI has been appointed D.S. Wayneboro; 8DY, 8AWL and on a spark and has installed the C.W. set. Luck has turned against 8AWL, who is blowing all of his tubes lately. Altoona; 8AKI has been very active this month. The message column has been increased.

Dist. No. 9: Washington; 8LJ’s C.W. is still doing its little trick. 8DKK is having considerable trouble with his transmitter in East Pittsburgh. 8SS worked 6XAD. (FB, OM) This station has a consistent range of about 1000 miles all directions at night. 8SYC’s C.W. schedule did not work at all one in this town and shows lots of A.R.R.L. pep. Freepont; There has been a little break in 8VQ’s schedule due to sickness. The three ops still hold the record for this district.

Regular communication is being made with 8AWT. Scottsdale has been reporting 10-watt work. 8LJ’s C.W. set will not work because of the air waves. The generator at 8GLO burned out one A.M. during the R.P., and 8HIC is working in a very consistent manner. 8DKS has been off the air, but is doing a good deal in keeping Washington on the map.

DISTRICT OF COLUMBIA—3SU and 8AB seem to be doing excellent work. 8BFT reports six operators having trouble keeping watch on account of the Y.L.G. but they are doing excellent schedule work. Our Y.L. stations are working out well on a 5-watt and is keeping early morning schedules with 8BCK one of our YL stations in Baltimore. 8SHS is doing very well, and is doing a great deal in keeping Washington on the map.

DELWARE—8AIU has installed 3 steps of radio frequency. Several stations have been copied in one night on the ground. 8BSS has not been able to do much work. 8IOM reports 8DOL has been doing very good work since changing the transmitter to Hartley circuit. We are glad to hear 8HJR on the job again as it has been exceedingly hard to get traffic into Baltimore from the north.

MARYLAND—8TB is back from France with a flock of French 50’s in his bag. 8LJY has heard the tune of 8 amps. 8WF and 8FK have installed 100 watts and are reaching out in fine shape. 8AFD has put in a new mast and is located from the Pacific coast. 8LG is doing fine work on 10 watts and reports, the highest total of maps for Baltimore. 8BU 8ALY and 8DQY are doing good work at home. 8NYX has been reported in England. (FB, OM) 8SF is having trouble with his tubes lately. Altoona; 8KRM is having considerable trouble with his tubes lately. Altoona; 8BU 8ALY and 8DQY are doing good work and 8DBT has moved, but is again on the air doing good DX. He is very much elated over having been able to keep DX. 8PE and 8PR are getting out in good shape. 8MF is on the air occasionally, and is heard working good DX. 8FM has been reported in England. (FB, OM) 8SP is the only DX station; has done good work in spite of this. 8FB, the combined station of 8TTP and 3J, is doing clear much traffic, but fails to report it. 8BMO is doing the usual good work. 8HUR is keeping things moving in Annapolis when NSS shuts down. 8HG is on the air again.

EASTERN PENNA.—Dist. No. 1: Reports are not up to the standard this month, many are missing. 8RJ has been receiving A.R.R.L. reports, pushing it hard. 8BTL increased to 50 watts and hopes for a better report. 82EN is working on his transmitter to get more effective results. There are no reports from Chester.

Dist. No. 2: 8YO is back on the air again and looking forward to more traffic. The signal reports from 8NBU have been heard in Alaska, Hawaii, California, and England. (FB, OM) The call of 3A4U has been changed to 8DM. Same QRA.

Dist. No. 4: 3ZQ is having trouble with messages for the west coast. He says: “A fellow will get you OK, and will say QR or any message you have until you try and give him a west coast—he will then answer with QRM, or never come back.” 8C2G is out one 50-watt but not busy with a 300-watt. Another 8C2 is on the air. 8Dik manages to handle his share. Philadelphia; 3G0D topped them all with 10 maps, just got out to pereciolate. 3ADV worked 1300 miles with 8 watts.

CENTRAL DIVISION
R. H. G. Matheis, Mgr.

This month we have reports from every A.D.M. and from nearly every district. Many new O.R.S. appointments are being made.

WISCONSIN—Dist. No. 1: 8CCD leads this time in traffic handling with 906 for the month, which makes him 906 for the second and third, respectively. We still have two spark stations handling traffic in this district, 9AMA and 9BII. You might develop if operators could be found to set up the apparatus and keep it in operating condition. 9AEB, is reaching out well. 8BCB has sold his transmitter, 9DXT will not be on this winter. 8AFK is studying medicine, hence has no time for radio 9IN is wrestling with the difficulties of getting a 50-watt tube working. 9BZT is on with a M.G. 8CTV is erecting another mast and will then open up with K.W. strength.

Dist. No. 3: 8EMU now has a DX record of 5000 miles and 38 states and hands in one of the best reports. 8A6U is installing a 40 volt transformer. 8BKU is pressing along more kick to his signs. 8BGG is giving school work part of his time. 8C9J has a motor-generator and will have his DXQ reports on in week. C.W. 8BHE has been reported off the coast of England.

SOUTHERN INDIANA—Dist. No. 5: 8BRR hands in a big total. He reports pereciliate to districts in less than six hours this month. 9CIC

QST FOR JANUARY, 1924

III
on spark is the only other active station in this district, and is discarding the none still for a 20 watt. This will make the southern D.S. 100% C.W. 9ASP is on again with 20 watts after an absence of 18 months.

D.S. House Bros., 9BYZ, (newly appointed, succeeding C. E. Kliney, Indianapolis; Several of the old stations are back on the air including: 9ARK, 9MRC, 9BQR, 9arity, 9ARZ, 9BZF, 9AKW, and 9AWG are on regularly. 9BZF is still having trouble getting a satisfactory plate supply. 9UB found that he was over 20 watts since changing to a lower wave can't get out of the state.

Dist. No. 8: Ralph Schwartz, 9BRL, 616 Monongahela Ave., Morgantown Ind., has just been appointed Supt. of this Dist.

NORTHERN IOWA—Dist. No. 1: H. G. Turner, 616 Main St., Pella, Ia., is now in line for appointment as D.S. since E. E. Pippenger is away at college and cannot therefore handle the work. 9AV has worked seven districts C.W., 9VZ and 9FZ has been doing wonderful work.

Dist. No. 2: 9M2 is using ten watts and has worked seven districts on 50 watts, 9YT is using 5 watts, and has worked seven districts and twenty-two states. 9DJH is a new one working with a quarter K.W. spark. 9DVK has a 50 watt radio with a new sine rectifier and he has worked into Washington and Idaho. 9CP blew his 50-watt and has been in Chicago. 9TV is a good part of the time. 9CTE is going good with his 250-watt, having worked all but six states since he put it in a short time ago. 9CP has been reporting satisfactory in Calif. and by WNP, 9AXY burned out two 5-watters, but he has come back with others. 9AKD has made a new one of the air. 9CN0 has no maps to report. 9DJL has opened up with a 5-wattter. 9YB has been doing good work in spite of a few spots.

MICHIGAN—Dist. No. 1: Wish every man could understand how much a report is wanted from him every month, if no traffic to let us know he is still on the job, the old reliable gang come across each month, the other fellow can too if he wants to.

Dist. No. 2: A meeting of district No. 2 was held October 6th at Battle Creek which every one attended. 9BTR worked 100 watts set on 15 meters on the receiver at 8BWR proved the main attractions. Dist. No. 4: 9GCQ hands in a good total and is still on the air.

ILLINOIS—The A.D.M. has moved from Hoopes to Peoria, and is now located at 912 N. Glen Oak Ave., Peoria, Ill.

Dist. No. 1: 9CFF now has two ops and an all night schedule. 9DAY has worked all districts but the north with 10 watts. 9VM is back on the 93QZ with spark coil toned 300 miles. 9BZ has erected on 80 ft. stick—reports FB. 9DBU has a new antenna and hopes to work Kentucky stations. He is moving to California very soon. He expects to work on a 6 license soon. 9CFK worked two sixes in twenty minutes and has been here. 9DC has on 10 watt set and worked 10BBO using 50-watt phone.

Dist. No. 2: D.S. Bergman reports holding position as D.S. for a year. 9ZC. 9AWF and 9HB0 all with C.W. have also been doing good work. Kentucky is coming to the front again.

DISTRICT No. 3: 9MC using 500 watts blows a sink rectifier but falls back on M.C. set. 9BYX has a new house but is now in the job. With over 10 watts he has worked all districts but six and seven. 9CMN is quarinized and his message total is picking up. (FB) 9TV sends in his total, but it looks as though he has built his own 50 watt set and all the messages he receives, 9CLZ turns in a good total.

Dist. No. 4: 9BGC using 10 watts and a low wave is performing consistently, working the east coast nightly on schedule. 9BIX is constructing a new station at Western Electric and C.H. B. A. says C.W. is the dope. 9DQU has worked 6 west coast stations and has been heard by WNP. 9CLJ is putting one of his west coast calls on the air. 9DK is coming to the front slowly but surely.

Dist. No. 5: 9FDA is using 10 watts, 10 watts available for emergency. 9CDE will have two ops and is increasing power to 50 watts. 9AYX worked 22 states on 5 watts. 9DLR is increasing power to 30 watts. 9DWU is using 50 watts. (Hope you break into the big League next month, CM-O.S.)

Dist. No. 7: 9AAW leads as usual with both spark and C.W. but 9BWS, 9BEF, 9AOU, 9BIL, 9AZP, 9PLU, and SRC are all giving him a close run. For the october 10 watt total 9SSU is in 1st place. 9EL is in 2nd, 9CAY in 3rd, 9EPR in 4th, 9DQ in 5th, 9PV in 6th, 9SSU in 7th, 9SST in 8th, 9FST in 9th, and 9SPR in 10th. 9DQ has been out of the 10 watt pick for some time. The ten watt total is turned in from Chicago, with thirteen C.W. and seven spark stations reporting. (FH fellows, let us have a 100% report, from all Chicago stations next time.)

OHIO—Dist. No. 1: Lima has six active stations, 9ER, 9AA, 9AYN, 9SD, 9SCF, also. Where only one has been on the air. 9BWS has 40 watts and the rest 10 watts, 8FU was only on for two weeks account bad power but worked several times. 9CMU has just one fine wave and has been doing well. Van Wert is QRV for traffic with 8B, 8MQ, 8COS, 8CIE, 8AZA and 8BZQ who has a new 70-watt phone and 10 watts 8FXU is doing fine work and sent in a good report.

Dist. No. 2: 8AJJ takes the lead and was also heard by WNP. 8SPH worked all districts in 24 hours with 50 watts.

Dist. No. 3: 8RNH leads this month with 8BRN second.

Dist. No. 4: 9EB sends in a good spark total, but has a 250-wattter coming up. 8CWR heads the Dayton up with 50 watts. 9ZC worked eight sixes in October.

Dist. No. 5: 8GZ runs 40L a close race for spark. He has been doing a good bit of work. The Rocks east 8PL has installed a sine rectifier with 100 watts and has worked 3 west coast stations.

Dist. No. 6: 8CRG and 8AL turn in good totals. 8CRC worked 7ABB and Canadian 4TH. SAL claim 8F has tried to get away with a whole bunch of letters at a big chicken dinner of the Radio Club of Canton, but the rest of the gang saved some by sending an SOS to the wasters.

DISTRICT No. 7: 8AOU working with a powerful 10 watt rig. He has been doing well this month. 8MV on the air with a pair of fifties in self-rectifying circuit. The owner, Mr. Hill is a prominent attorney of the state. 8CMU is 100 watts at the air. 8DKX, 91WG will be on the air shortly. 8OX leads the district with 9ED second. Good totals were also turned in by 8OX, 8WC, 8BZQ, 8SP, 8VZ.

Dist. No. 2: 9APS shoots in a great total this month leading not only district No. 2 but the whole state. (FB. OM—D.M.) 3JJ is second. District No. 1. 9AEW, 9AWF and 9BOO all with C.W. have also been doing good work. Kentucky is coming to the front again.

DAKOTA DIVISION

N. H. Jensen, Mgr.

The big news from this division is that a number of stations have hooked up with WNP and successfully worked DX during the past few weeks. Reports have come from 9EBT, 9AVZ, 92T, 9HTT, 9DKB. Apparently 9EBT was the first DX call to station 90WF after the Bowdoin reached its present location.

MINNESOTA—Dist. No. 1: 9BAV is high this month with 106 messages 90RE is too wobbly to handle traffic with Duluth direct, so he relays thru 9CE, 9DQE has been heard by WNP. 9ZC reports being very QRV.

Dist. No. 3: Minnesota traffic is picking up in fine shape. 9BPN is getting out in fine shape. 9FK is working well on the jobbers is still knocking the phone in properly with the DX stations. 9DVE is learning how to sign his call properly and DX stations are calling him. 9DPX has a new pole and has a newly designed 10 watt set. 9CAG is a five watter is getting out well to the Fifth district. 9BEI leads the district with 561 messages D.C. Wallace, A.D.M., reports that on October 17th during the latter part of November. 92T was the only link between the east and west coasts in the immediate WNP-Hartford-Alexandra Relay. On one morning the route reached Alaska, the route being 1CKP, 92T, 7ABB, 7ABB (Alaska) and return. On October 25, 92T worked WNP direct for 25 minutes.

NORTH DAKOTA—Dist. No. 1: 9ADZ reports the direction of 9ADZ is always westerly, 9DSP started out being the delayed arrival of a motor-generator. WNP has reported most of the stations in the district is in good shape and has an active DX activity.

The honor of working him, however, goes to 9EBT, as he took a message during the month.

Dist. No. 2: Activity has been carried on by 9ADC and 9DKB. 9BZF has been doing local...
work with a spark coil operated 5-watt tube and has been able to reach out as far as Waco. He has the honor in this district of doing the work.

SOUTH DAKOTA—Dist. No. 1: 9BPF has ditched his old high-twin antenna installed at 500 watts. 9DKR and 9DRG are doing good work as are 9DKQ and 2AQE. 9BNH has been having some rectifier trouble. 9CFT and 9CRA are among the leaders in handling traffic.

Dist. No. 2: 5CGA is on the air consistently and leads the district in traffic handled. 9DKL is doing good work but has been doing excellent work. QRA of 9AGL is H. M. Crosby, Brockings, S. D. He reports good DX on 10 watts. 9AJT is doing a fine job on 250-watt tube and is now on with a 50. 9BRI has moved his station off the back porch and has a new location. 9KXN has moved his station off the back porch and has a more comfortable location. 9BNH uses a 500-watt outfit ready for work. 5OO has a 750-watt outfit ready for work. 9GAH is getting a new station of the 1250-watt class. He is putting up a house and will cost a more comfortable location. 9BNH has quit (Better keep it). OM—It will cost a more comfortable location.

Delta Division

W. W. Rodgers, Mgr.

Several changes have been made during the last month and will be shown in the reports for the states in which they occurred.

MISSISSIPPI—No activity report received.

L O U I S I A N A—Dist. No. 1: We are very glad to announce that 5WY will remain in the game while 5WG will raise his tone to 20 watts and short a short. 5WY, using 15 watts on motor generator, was reported by WNP. (FB—OM—D.M.)

Dist. No. 2: This district leads all districts with the exception of the first and fourth, using 50 watts. 5YW, the new station of the Louisiana State University, is on the air with 100 watts and a fine cage antenna. Ex-5S5F of Fort Worth is the brass-pounder there. 5ABA is learning how to pull teeth at Tulane University and will be working where he hopes to erect a transmitter. 5ABC wants more time to devote to radio. 50C was a visitor at 5KC's shack recently. 5AA is putting up a 150-watt outfit ready for work. 5QO has a 50-watt transmitter and will help cut the traffic jugglers in his section. 5EE does not operate very often, but makes time count when he is on. 5AR has his link working, so we look forward to some traffic from him. 5TIA canned the flat top and does better with a cage. 5M, 4O, and 5UV announce they sold their junk and has quit. (Better keep it, OM—it will cost money when you start again—D.M.)

This state has been divided into three districts, superseding the former arrangement of two districts. The counties lying in the First District are: Shelby, Tipton, Fayette, Overton, Hardin, Houston, Humphreys, Lauderdale, Haywood, Hardeman, Chester, Henry, Wayne, Urey, Weakley, Crockett, Henderson, Benton, Perry, Madison, and Webster. The Second District consists of Craighead, Jackson, DeKalb, Marion, Poinsett, Poinsett, Izard, Newton, Newton, Lawrence, Lawrence, Madison, Sevier, Gibson, Cross, Desha, Pulaski, Poinsett, Monroe, Sunflower, Independence, St. Francis, and Nevada. The Third District consists of Arkansas counties.

ARKANSAS—Dist. No. 2: 5MAH is on with C.W., doing good work. 5GE is getting out well, but handling few messages.

EAST GULF DIVISION

H. L. Reid, Mgr.

ALABAMA—Some real traffic has been handled in this state during this month, 19 stations reporting 1717 messages for the month. This is the highest total to date this year, and the prospects are very good that this will be doubled next month.

Dist. No. 1: This district leads with a total of 748 messages handled by 11 stations, an average of 68 per station. District No. 3 follows with 646 handled by 10 stations, an average of 65 per station. Individual reports from separate districts show that everyone is on the job and working hard to get the work done.

In District No. 1 things are booming. OM—It worked 550 and 75E. 5VV has worked 5ZA in daylight.

Dist. No. 2: No additional stations, the only two doing anything being in Montgomery. 5AJP has been appointed an O.R.S.

Dist. No. 3: New and concerted new interest is being shown around Mobile. A real live "Ham" club is going in that city and is doing much to get things along. Operating schedules have been adopted and are being exercised.

DIST. No. 4: Practically nothing doing at 5AX this month.

FLORIDA—Dist. No. 1: Jacksonville stations have come to the short jump relay system of traffic handling, and are doing an excellent job of traffic handling in line and other nearby stations. Reception is good. 5TH at Rome has been heard nightly and this station has been running the entire month, building his rectifier, 5TH lived up to his promise and forked over his first report. 5PI and 4SB are still doing well. 5SD has come into good voice and is receiving some attention. 5BX has performed some excellent work but the operators are deprived of its use because of the excessive fee required of them by the University heads. 5M. 105S has popped up with a flyover coil and works 5UP.

Dist. No. 2: 4IZ, the old standby, is out of operation completely this month. 44Z is doing good work as usual. 41I handled 12 maps with 5 watts. 4RO is a new station and will soon be ready with 3 watts. "I'4S handled 4S and 4V, has resigned because of business pressure.

Dist. No. 3: 4DL is working and we want to thank him for his efforts. He is away on business and expects to get back soon.

Dist. No. 4: 0DP is having hard luck. He gets 5 good snaps but can't raise a soul.

SOUTH CAROLINA—Dist. No. 1: 4JK handled 14 messages.

Dist. No. 2: 4SH and 4RR are the only stations reporting handling 5 and 28 messages, respectively. 4SH and 4KO are troubled with falling masts. 5KK is on both C.W. and phone, does good work on both of them. 5KQ has been around the shack a little more. 5PF is back with 18 watts and stepping Moran 50Y, has a swing and is doing well. (Sure is nice—D.M.) 5PY will use at least 100 watts if he can get all his fixtures together at one time. 5AT is getting out well with the traffic and broadcasts. 5NT is getting started with a fifty.

Dist. No. 2: 5B. F. Painter, 5MB, D.S.—5MB is not on the air so he is putting up a House Beverage antenna and a super-heterodyne receiver for the Trans-Atlantic. (Here's wishing you luck, OM—D.M.) 5ANT uses a lone fiver with 2 tubes and is building into a real ham station. All back from a trip to a trip in New Mexico with 50 watts soon. (We welcome you, OM—A.D.M.) 5AJM is still striving to attain that elusive DX. 5AIE handled a few, but with the new antenna he hopes to get for Christmas, he intends to do better. 5DA managed to pound the knob a little this month.

Dist. No. 3: 5WO was elected D.S. of this district; a short time ago, he got his A.R.R.L. card. This leaves Knoxville without a C.M., but one will be appointed shortly. 5WO is recovering from an auto wreck, which ruined his chance of taking that 250-watt WAC test. 5SD and 5'OZ are planning on installing transmitters. (Give 'em a boost, you guys.—D.M.) 5AKW is away at school. 5UV worked everybody and when he opens up will be doing some good buttons. 5LF-5XK is still in a state of coma. Mr. Powell May of Knoxville, Pre-war MAY, has a bug and when he opens up will be doing 40L7A.

PORTO RICO—No news from Raxach yet. We sincerely hope to get the cooperation of the islanders in the near future.
Dear Gang: By the time you read this report, the holidays will be at hand. Therefore, I desire to thank you all and for your splendid cooperation and support during the past year, that has been one of the most successful and one of the biggest in our history. It has been a pleasure to work with such a loyal gang as we have down here in the Midwest division of the A.R.R.L. 

For the last year we have been trying to keep the O.M. in the middle of the past be a stepping stone to all that is bigger and better during the ensuing year. A very merry Christmas and Happy New Year to all.

IOWA—THE NEW C.M. GETS ON THE JOB:

MISSOURI—A SPECIAL STUDY ON MESSAGE DELIVERY:

NEBRASKA—A NEW TYPE RADIO CLUB OR 100%. A.R.R.L.

IOWA—9AMA has been heard in Maine on a single 5-watt, 9AMU has a new 100-watt set. 9DPW is putting in 50 watts. QRM in Marshalltown is increasing with 9AMU, 9DES, 9DMV, 9PWM and 9MGT full going. 9HZI is doing his DX work before daylight hours. 9DSL doesn’t seem to be able to stop as old 9SI has continued using rubber stamp messages. We have a new Route Manager, gang. Mr. J. F. Gillett of Rippey, Iowa. The C.M. of Des Moines recently returned from a trip which he says was a huge success. He says the gang is pretty well fired up. 9AYE, 9ACH, 9LKA, 9DAI, 9DIP, 9RBF and 9CSY. 9RIF has his 20 watt set going full blast. 9GL has been active during the past month. 9FKI handled a web of traffic and then sold out to 9AMU. 9ATN is doing good work on 20 watts. The A.R.E. is active during the month despite a spell of sickness. He has drawn up a map listing thereon all the active stations in his state. He reports that the winter is soon, although he says he has Iowa cross-coupled with relay routes. In order to insure your station being included, write the C.M. of Marshalltown the names of the messages you wish to be handled by Iowa stations during the past month.

The new members of the A.R.R.L. at Wamego, Kansas—Welcome!

MISSOURI—The oft’ repeated statement that delivery of messages by the amateur is pure bunk is becoming a thing that requires serious attention. The A.D.M. has been conducting personal experiments to determine what methods are not being delivered. A series of messages numbering 127 during the month of November were logged, properly checked, dated and timed. A series of messages numbering 76 during the month of December were logged, properly checked, dated and timed. A series of messages numbering 258 during the month of January were logged, properly checked, dated and timed. 

The total for Kansas this month—1072.

As a test of the efficiency of his equipment, WNP has sworn to go after that nifty transmitter by WATC has sworn to go after that nifty transmitter by WNP. Another station putting it over is 9ATG.

Nebraska—Hurry, gang! Nebraska is peping up 9EB has been appointed O.R.S. and C.M. of Emporia. (One on now, 9M, pop ‘er up.) 9CSS is very active. 9BQI is very active. 9PCM has been heard doing good work despite the fact that he possesses only 150 watts. 9BKG handled about 2 weeks supply of messages; total 68. (FB) He will have 15 watts next month. 9AYE is reaching home on 5 watts. 9AYE is good. 9BOA has sworn to go after that nifty transmitter they are offering you. He added that he had a few hundred cards printed to acknowledge receipt of the QST for January, 1924 and the A.R.R.L. also when the dues are levied monthly. The beauty of this scheme lies in its
simplicity. Best of all it

antenna from 76 to 110 feet. ItAPF hopes to have the stations leave it in Maine. Twenty-four stations reported and 11HG, 7CJG knocks'em dead with his 100 watts. Their report hearing over twenty O's out of ninety reports on one no-watter. But as Burrying electrical attention are 1AQK, PAQO, HOTM. ICTP is dropping out of radio traffic. I ALT replies hard luck with his tubes but likes his rectifier. I RRQ was reported but liked A.D.M. for Pla:tern Mass. The vacancy caused a stir. State.

Let's make Nebraska's 100% C.W. state. Nebraska accounted for 166 messages this month.

NEW ENGLAND DIVISION

I. Vermilya, Mgr.

MAINE—1BDI heads the list with 127 messages for this month. Maine shows a total of 716 messages which is very good. There are only two spark stations left in Maine. Twenty-four stations reported traffic. 1AJI reports hard luck with his tubes but likes his rectifier. 1CBO was reported to have handled 100 messages with 120 watts on a single 40-foot counterpoise. 1CDO has just reported handling all of nine. 1CRO will be on with a 20-watt transmitter 1CPT is dropping out of radio for a while. 1PFM and 1KX still need competition for the honors. 1KX is having trouble raising his antenna from 75 to 110 feet. 1APF hopes to be on with D.C. soon. 1BNQ is changing from 20 to 60 watts and will be ready with 80 watts.

VERMONT—1ARY seems to have a king up here. They are heard in England very consistently and their work is matched with cards from the third and fifth districts. They report hearing over sixty's and sevens. 1ARY handled 109 messages. 1AIO handled all the rest.

NEW HAMPSHIRE—1BCI as before has been appointed A.D.M. in place of Mr. H. R. MeLaue, is doing a wonderful work. The report this month is the best ever received from this state since it was taken over by this office more than a year ago. 1BIC has been doing some very fine work. They handled 455 messages and have been heard by 6XAD and three other Callifer-handlers. 1BIC handled 115. 1BZ handled 34, 1AZT-71, and 1CSS-36. These three latter stations are the only supporters of the spark in this state.

MASSACHUSETTS—1CK, felt as though business and A.D.M. for eastern Mass. did not fit together, so family. 1HDU, Boardman Chase has been appointed A.D.M. for eastern Mass. The contest manager is Mr. Robinson's resignation as C.M., which place he also held, has been filled by H. W. Crocher, who is also a member of the Commonwealth Radio Association of Boston. Lee Bates, who resigned his position as C.S. of Worcester County, because of work, is now carrying on tests with the roadpike, TNT, etc., again threw his hat in the ring and at an election of the men of Worcester County was elected to the office of D.S. by a substantial majority. 1ER has been heard in Idaho and Cuba during daylight and he has worked 6XAD and five amateurs from the West Coast. 1ER handled 92. 1CIT is working 8's and 4's very easily. 1CPI is overhauling his station. 1CRI has increased his powers.

NARRAGANSETT—1AF part of the time. 1CCO handled 100 messages. 1BNT reports 12. 1SK handled 131 messages and 1L7 put over 227. 1DIY is putting on 75 points. He has been heard in Los Angeles. 1DY is working in C.W. and will probably junk the spark. A. S. McLean sends in a 120 watt signal, but totalizing the messages, we feel proud of the way Western Mass. is coming through. Among the headliners is 1ADN with 1AF, 1CBK with 103, 1BZ with 90 respectively. 1IL and 1CIT have taken the lead on the new O.K.S. certificates and are practicing on all messages immediately. The station has been caught delivering a message to the waste basket and his O.K.S. has been revoked. The E.A. has been heard by Daniels, accompanied by 1BSZ visited 1BWY and found a very sociable crowd. President Curney served coffee and 1BSJ passed the cake. IAJX has worked 7LN, 2100 miles, on three 5 watters. 1CPN is carrying on tests with English stations. 1BQK is heard regularly on the west coast. The summer contest on messages was won by 1CPN. This was a contest instituted by Bates of Worcester and held 12 months. 1CKN handled one message from WNP and delivered by phone. He is rightly proud of this report. He has handled all messages in 12 hours. 1CBN has tube troubles. 1AQY handled 12. 1BBM handled 31 and reports his 1CW, getting out fine for a small set. IAR handled 6.

RHODE ISLAND—Fancher still continues to keep Rhode Island going in extra fine shape. He reports 1234 messages. He is doing good work and is on consistently. He handled 171. 1ANX has 100 watts going. 1BVH handled 256, 1VG reports 121. 1CHM reports 1BES another old time traffic-chaser. reports 14. 1ANX puts out 184. 1BQD handled 163, but expects to move messages.

CONNECTICUT—J. L. Reinhartz has resigned from the berth of A.D.M. of this state due to other duties, such as being a judge and Mr. Comstock. 1MY has been appointed in his place. Mr. Comstock by the way, was inquiring in contact with several red hot amateurs and our chief H. P. Maxim. Now, he is converted and never thinks of coming back. This month this is a fair warning to other B.O.L.s and what the League does to 'em once they get their wires crossed with 5 or 6 A.R.R.L. men. He doubts however it is in order to drop a line of thanks and congratulations to 1MY. 1CPV handled 137 this month. 1P.O, 911, 1AFJ, 10; 1BQO, 204, 1BQO has been entirely rebuilt and is now rectified 200 volts radiating 7 amps. They have worked 68B and received cards from 6TU and 6BGY. This station is being operated by 1CDM, 1TF, 9BPV, and 1BOE.

NORTHWESTERN DIVISION

Glenn E. West, Mgr.

WOOPPEE!! Northwestern gang is back to old time form again. The spirit of honest competition and friendly rivalry seems to have hold of every man in the division. Fine work, men!

WASHINGTON—Dist. No. 2: Stations operating are 1ABB and 1PF, with one in Port Angeles just getting started. 1PF seems to be going good with three ops, while 1ABB is putting good along on the line and putting traffic into every district. California and Alaska and the North Pole. Kick is as regular as a clock. Consistency is his middle name. When the special "WNP Dispatch Route" was tested, 1ABB grabbed the message from 92T and shot it to 1AHB, Alaska. (FB, OM, keep it up‼)

Dist. No. 3: Things have been running fine in this district. 1AIF and TDC are combining stations. 1AIF has been running the month, while 7AAO has just started up.

Dist. No. 4: This is the Gray's Harbor district. Their powers range from 6 watts to 600 and any station can QSR with ease. The most active are: 7AD8, 7SF, 7LIH, 7NO, 7SH, 7AFC, 7NN, ex-7RI, whose new call is unknown, and 7ADF.

Dist. No. 5: This happy family is growing, growing—b. Excitement on 88. 7DN and 7AYJ are the latest additions along with 7AZ.

Dist. No. 6: Considerable traffic is moving through 7NE and 7AIY. 7NE is using the old reliable spark since the two 5 watters went to the dogs. 7AIY has changed QRA's again and is on 1010 for a good location.

Dist. No. 9: The only station operating is 7GE who gets out OK in all directions and is ready to QSR whenever called. 7GE

OREGON—Dist. No. 1: A new D.S., 7ZK has been appointed. Traffic is moved through 7LB, 7WI, 7CT, and 7UQ, 7CE. 7CR is east, in Junction City, traffic is moved by 7AHI.

Dist. No. 2: 7HA is still working out FB, as is the new station 7HA.

Dist. No. 3: 7TT, 7QJ, 7LIW, and 7TP are handling the traffic. Niners and eights are being worked nightly by 7DAK. 7DAK is in the city, but the man that stays up earliest in the morning is working FB. 7AA is working with RF on his 5 watter.

Dist. No. 4: The D.S., 7KS, is working nearly all districts with his "So called" five-watters. 7GT is also using 15 watts and 7AIX is reaching
out with a 5. 7SN and 7ABU are holding down the air in Seattle.

Dist. No. 3: 7QD and 7EM are handling the bulk of the traffic. 7F7 has his 20 watts pecking again. 7QO is too busy building a DX spot set to help. 7TQ is handling most of the traffic in Pendleton.

Dist. No. 10: In Milton all the traffic goes through 7ABY. 7KR is on the air again with a 20 watts, and is doing consistent work. 7AJQ is busy until after 9 P.M. 7DI is handling most of the traffic.

QST—Disc. No. 1: 7JF is building a 100-watt station.

Dist. No. 2: 70T is on with 50 watts again, after several months absence. 70B has been doing excellent work on a single tube about 7EP. Type through in great style. 7FX has been heard several times. A new station has opened up with 10 watts. The call of 7OL is a new relay station if the wind storms, which Pocatello is noted for, will permit his mast to stand. 7IO has taken over the work of 7FY and 7RNA in the eastern bird's case like dynamics. 7LM has been getting out also. 7O7, 70B, 7AGR, and 7LN have worked on a thousand miles using loop modulation.

MONTANA—Dist. No. 1: 7AIX has resumed as D.S. and his place has been taken by 7HD Anah. At this time the only active stations are 7WP and 7AGF. Both did some good relay work. 7AGF is still having trouble of getting away. 7FX is not heard very often. 7DZ, 7XBC, and 7D, the station of the A.D.M. at Butte, handled 145 messages. The best work which our operator has had has been on his accident and his family here could not reach his relatives in Los Angeles and called on 7ZL to get the news through and have his relatives rush here. The quiet hours were disregarded and the message gotten in to L.A., within an hour, and M. F. Gravely, manager, says that he has yet to see a situation more impressive than this.

Dist. No. 4: L. E. Croiter of Billings, address T.Y.M.C.A., is now the D.S. and this is his first report. He has shown all indications of becoming a real nut. The only active station is 7CFI who is doing his best with relief, but he has yet to get on the job properly. 7ZU works every district with ease. He reports hearing WNP nearly every night.

PACIFIC DIVISION

J. V. Wise, Mgr.

Under the new form of administration in California, amateur radio is taking a very strong hold out here and the stations are holding their own in the mid-night oil. With three very capable assistant division managers, California is all decorated with the best doing the work of the rest of the country that she means business.

SOUTHERN CALIF: Message reports were turned in by 6SR, 6WE, 6UC, 6LI, and 6ERK. That is the most we have seen in many moons and the sum total was about 200 messages. 6ALG is installing 25-200 watters. 6VP has blossomed forth with a 250 watt, 6KA, using 2-250 watters pushes 21 amps into his antenna. 6LI is experimenting with 200 watts, using all the methods of plate supply available. Three will be on the job for traffic and schedules will be established. 6LI has 6UP's old spark ready for his new work who will beat school this year. Poor Lester Piker—had the misfortune to break an arm in an auto accident and has his grip and back in harness by the time this reaches you.

Due to reorganization, some few reports got accumulated up in the mail and the route and didn't reach their proper place in time to appear in this issue.

SOUTHERN CALIF: Dist. No. 3: 6BH is the outstanding star this month. 425 messages passed thru his station and he is QSO 6UH in Hawaii now. Dame rumble has it that he is tuning up a 250 watt. 6ABX and 6ARF are stringing up a Beverage Wire for Transpacific work.

Dist. No. 4: Five new special licenses were issued this month. 6AGM is the same QRA as 6AMK; 6ZAI same as 6TU; 6ZAR same as 6TV; 6ZAU same as 6ATC; 6ZAT same as 6UW. There were some some 500 messages handled by 6EM; 6EX—50 watts; and 6ZAJ, 6HC with 10 watts. 6ACM was left out of the September report when he handled 9M. It has been reported from 25 states and 3 districts in five weeks of operation.

Dist. No. 5: 6BYA says you can take your choice of routes from his place as he gets out FB on his 250 watt, 6CHL, with 100 watts handled 25 messages.

Dist. No. 6: 6ZI has joined the ranks of the beneficent. 6TI is on the job again with 50 watts. A total of about 600 messages was handled by 6XX, 6AUY, 6BK, 6KAC, 6FPU, 6BHL, 6ULZ, and 6ACT.

Dist. No. 7: 6BVIA is doing best traffic work for this district with 6DD, and 6CLI. He has been having a lot of experimenting with tone. There has been a lot of activity in that vicinity. 7ZL is on the air again with 20 watts, 7L'H having taken over the job.

A total of about 250 messages was handled by 7AGC. 7H or 7F in all the traffic in Pendleton. 7AGC was about 100. See the July report.

WEST VIRGINIA—Dist. No. 1: 8SP is not on the air very much, one operator has too much business and the other too much school. 5AEF handled his traffic in daylights with a 10-watter. 5AFD, 5RPU, and 5ZW are getting on a little.

Dist. No. 2: 5D. S. Rhoads of Henderson and the radio game on account of other business preventing and the others suffer. 5CMX handles a few; only about the boys and hunting for fun.

Dist. No. 6: 7BDIA seems to have carried off the honors this month. 8TH knocked off a few with his spark. HAM radio.

NORTH CAROLINA—Dist. No. 1: Traffic seems to have fallen off, but some of the stations are getting the air and reposing and 4J is on the air every night. 4GW has a 20-watt tone going. (Get on the key. OM and let's handle a few messages, 4J, 4PF, and 4FA are all gone, hence the lack of traffic handled.

Dist. No. 2: 4KC does fine work and always 4J, reinforced by 4EM. He has a new phone and 4J reaches the west coast frequently. 4CM is back with 16 watts. 4OU has just opened up. 4MT will be back on the air. 4JR Dares to be going good now.

Dist. No. 4: 4NT is back installing a 100-watter. (FB, OM) 4FT works the west coast all the time now, but no more reports. 4DX is back on the air and going good.

FLASH—4MV has started 15K.W. rock crusher at Winston-Salem. (Boy, page the list again with the who-fong!) VIRGINIA—Dist. No. 1: 5UO gets out in fine shape and knocks off some good traffic. 5BHT. 5UV showed over a few messages this month. 5GFX and 5KCA will be with us next report.

Dist. No. 2: 5ATB was heard on west coast the first week of operation. He has a 100-watter—worked into North Dakota and 5AUH as an assistant winding M.G.s for the gang. The supply of "hams" will run out some day and then we will
get a traffic report. 3ICH just finished a new antenna and uses 20 watts. 3AOT by consent moves from the cellar to the attic. 3AHE, after getting his new 20 meters has to get to the gang to work with him. 38G can't work when the tubes won't burn. 3AHS just finished rebuilding and his power is not good. 3BMN will be going at the good next report. 3RHN has a M.O. hooked up and is doing good work, also rebuilding the shuck too. He is doing quite well. 3KVN will be good for the others have quit or at any rate they make no reports.

Dist. No. 2: 38ZB, however, is back on the air and we applaud and to hear him again after an absence due to overwork. 3AEV is not heard any more.

Dist. No. 7: 3A still shows some pep and is on the air often. 3BHS and 3BKX are getting out. 3KCL, a new station is hammering all around the house, is sure EB, OM, and it shows pep all right. 3SN is getting on the air and we expect to see a report from there soon.

This above was prepared by J. E. Wohlford, 3CA.)

ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

3AMB—285 Mags.

Hathaways

C. W. Denver

COLORADO—The Denver district piles up 1518 this month. 3D1J, 9CAA, 9CVY and 5APF each put thru considerably more than 150 messages. Due to traffic schedules and schedules with those who are a station with, Denver finds they must have one of the best regulated "ham" towns in the county. The relay stations are on the job, reporting is better and all around Denver will have a bumper crop of real stations.

Dist. No. 1: 5BVO is the only station reporting from this district.

Dist. No. 2: The storm routes thru this district are complete so let Johnny winter do his best. 3D1F leads in this district with 114 mags. 5APF is a new O.R.S. in Colorado.

UTAH—The only reports received this month were from 21 stations. The report of 5574 messages to his credit. 5HM comes next and 6BUI follows. Stations are now reporting better and soon as the rebuilding program that still seems to be in full swing, is completed, Utah intends to look after her laurels. The new O.R.S. certificates will soon be issued and certificates will be issued only to deserving stations. (This applies to the entire Division—D. M.) (To the entire O.D.—T.M.)

West

WEST GULF DIVISION

F. M. Corlett, Mgr.

In old Mexico, a provisional section of this division, the A.R.R.L. has the distinction of having an O.R.S. "BX," owned by Harold T. Mapea, Guanajuato, Mexico. It being the farthest south station. On November 7th a message of greeting to the A.R.R.L. station farthest north, WNP, reading—

"Mr. D.,

This passed from 3X to 6L. Can. 9BF, WNP, on November 8th, the following message—November 18 and received the same data by DX, passed via WNP, 7ABR, 52A, BX.

"N. C. WNP to Mexico, BX"

Many tnx this acknowledges and returns best 7BA's.

(Signed) Mix—WNP"
health and resides as D.S. Mr. Chron. 5AEW is acting as D.S. San Antonio; 5MN has moved to D.S. Wor. 5AZK has gone to the west coast and 5ZAK is going. 5KG is the star station of the "Almo" City—handled 158. 5AEW—2. 5AZK is now on the fast track with 5VO and is saving for a 5-watt. San Angelo; 5JC has been spending all his time blowing 5 watt bottles, and reports 15. 5GE is attending A. & M. His O.S.S. apparatus is gone and he is now living in San Benito. 5ADI reports 57. 5AY is a new A.R.R.L. station, as is 5PY. 5DW, Brazil, is moving to California. 5ADB has been making some SOS (speed of service) records, moving every message within five minutes they were received. He is another one of our fast operators at both ends and the "fast circuits" are with 5AMA, 50V, 6EC, 6ADY, 6ADY and 5ZAC. 5DE reports as he is only on Saturday, Sunday and Monday nights. 5NR is a new A.R.R.L. station. 5UC is under construction.

Oklahoma—Dist. No. 1: Enid; 5ANC handled 145 and was out of commission 9 days on account of blizzards. There was a tube "go west" too, but reports 25. 5SR is starting to rebuild his station. 5ZM passes 55 of com along. Oklahoma City: 5ZAV "Am using good, blow 3 more 50 watt tubes, have a regular schedule with 9AAU and 6CMR twice a week for traffic, also a schedule with 5GQ every day morning 3-6K.S."

Dist. No. 2: Muskogee; 5BM is out of commission since Halloween night—pole down. Tulsa; 5GQ leaves with 55. 5GA handled 17. 5SG will have to keep FS out of his QSLs. K. is a very operator. Springs: 5GJ has a new tower up, and is on consistently. His operating hours are 5-80 and 9 P.M. and 3-6 A.M. 5FM reports 25, while 5GQ reports 10, as he is only on Saturday, Sunday and Monday nights. New York—Dist. No. 3: New York City; 5AT reports 60. New York, L. I.: 5WY is working USA 5WSW out in New York, with 20 watts, and has returned to his normal tube. He reports 3 making a break by not turning in a report. Kitchener; 5XAD. Now with this running pretty, Kitchener stations are working to improve their signals. 1EB and 1DT have their neruals and should be on for traffic by now. 1EF and 1DF are still building. 5WD has recently started his station and has not yet received or delivered any traffic. 1EB and 1DT have their neruals and should be on for traffic by now. 1EF and 1DF are still building. 5WD has recently started his station and has not yet received or delivered any traffic.
QUEBEC DIVISION
J. V. Argyle, Mgr.

Good progress has been made during the past month. All stations are operating better and handling more traffic than ever before. The actual traffic total is somewhat lower due to the absence of 28N, who is unable to work except on weekends, due to college duties. 2IC, 2BG, 2AM, and 20G, the usual gang, are being assisted these days by 2CH, 2BY, 2HY, 2FH, and 2EK, which is FB as we require good new stations in this section all the time. 28N is to be congratulated on being the first man in this division to work a "5" having worked 6XAD for half an hour. 20G receives cards from the sites but has yet to work one. A get-together party held at 2IC's station has convinced the D.M. that if some of the gang could handle DX traffic as well as they handle the scrape-line, we would have the best traffic totals of any district in the A.R.R.L. 2H, our wake-up man, has some fine stunts planned—watch us, Ontario and the west, we are cleared for action! 2PB threatens to open up with 20 watts D.C. (Gosh! We could ask for nothing better. Come on, old timer!) 2IC, 2BG, 2AM, and 1DE is really excellent as is communication west through Ontario stations. No direct communication with Canadian fours has occurred, but it is one our pet ambitions.

VANCOUVER DIVISION
A. J. Ober, Mgr.

Records are made every day and in every way. West coast stations are QSO East Coast regularly, 9BP has found the Ganges have arrived and are working WNP, Division Message report has hit the mark of 607, and the Operating Department has got all going to start. All stations are on the dot with reports and the D.S.s are sure making a good job of reporting activities, O.B.S. are burning up the ether, in the west division is ablaze, scrambling for traffic and DX. GANG, this D.M. work is no Golden Harp and Marble Chair job, but no one asks you up your "PEPP" and help as you have done so far. I am willing to let you call it whatever you think. For more information and addresses all matters to D.M. as A. P. Ober, Vulcan, Alberta, and no street number.

SASKATCHEWAN DISTRICT
NOV. 1923.

ACTIVE A-RRL MEMBERS

WINNIPEG DIVISION
J. L. Birkett, Mgr.

Saskatchewan—4DN broke his collar-bone playing rugger and is off the air for a while. 4GH is on with a 60-watter; its mate is longing for a pal. 4HP is on with 10 watts and is doing fine work using a Melaner circuit. 4CL warns all Boiled Owls that his district will be hard to beat next month. 2XQ has some DX for 10-watt reports from 1s, 2s, 3s, and WNP and has found WNP consistently on Reimartz and detector, 4SO Canadian 9s, and has done FB handling traffic with WNP. Got three messages from 4CN to WNP at 12:40. At 12:40 they were in HZ's care.

QST FOR JANUARY, 1924

XI