

QST

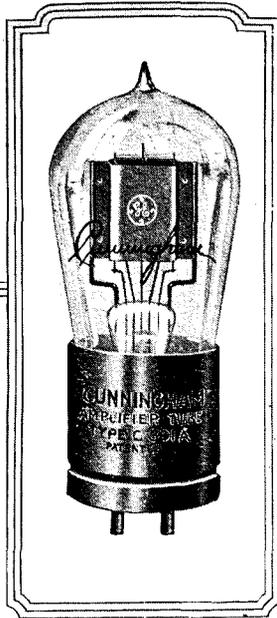
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RADIO**

Published by the
**AMERICAN RADIO
RELAY LEAGUE**



20¢
January 1924

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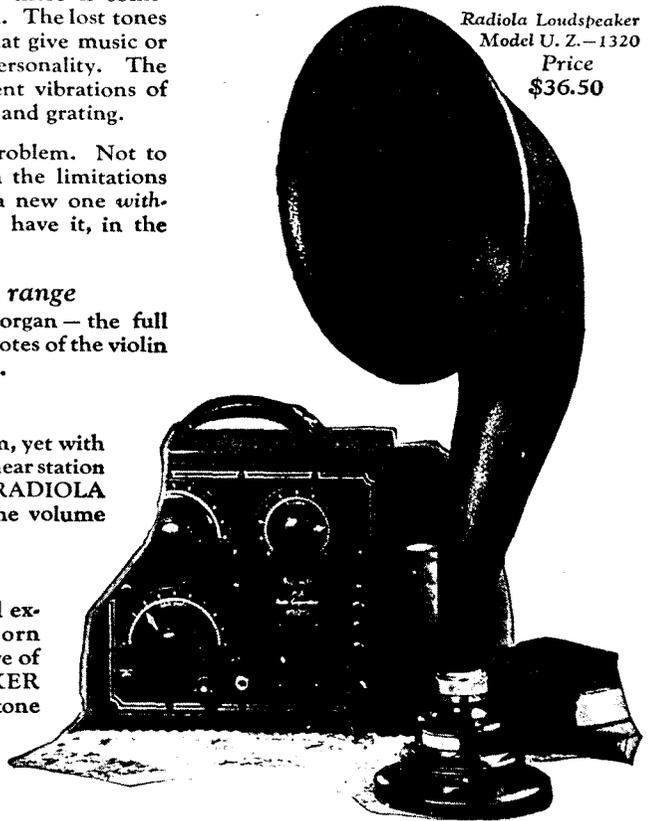
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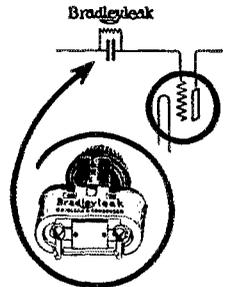
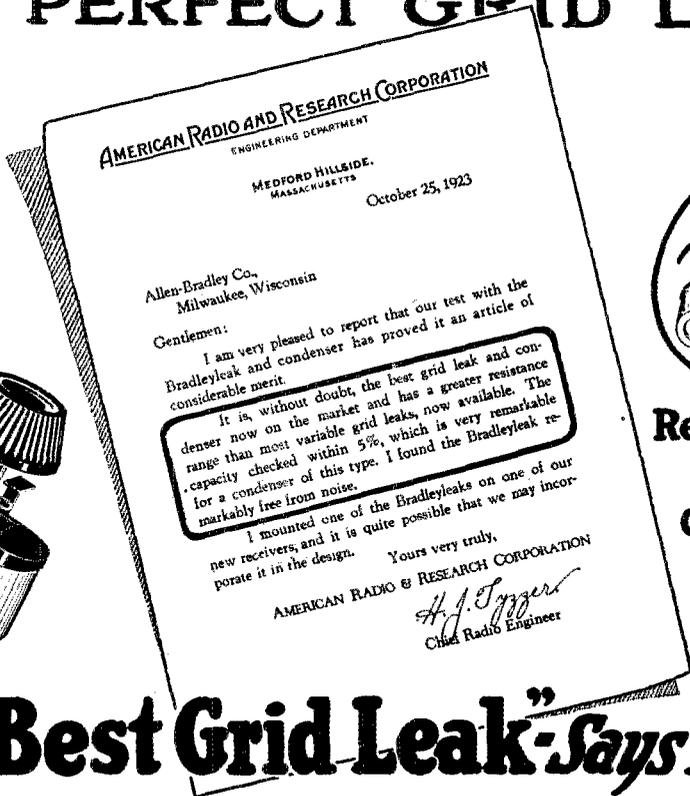
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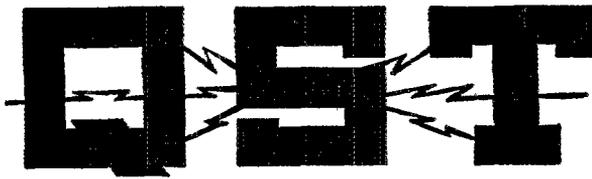
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The Official Organ of the A.R.R.L.

VOLUME VII

JANUARY, 1924

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THE AMERICAN RADIO RELAY LEAGUE, Inc.
HARTFORD, CONN.

THE AMERICAN RADIO RELAY LEAGUE

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.

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

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EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



Achievement

SEE the gentlemen in the upper right who so convincingly graces our heading 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 complacency this morning is the air of easy nonchalance it seems we are to affect as we go about our day's work.

No darn suchything 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 accomplishment actually to chronicle in *QST*; our pages are filled with informative material and the latest dope on improving amateur operation; everybody is busy studying and rebuilding. Then with the first touch of real winter weather we enter a period of *achievement*, where that technical progress of the summer is put to use, and, believe us, fellers, things start to commence to happen! A choice bunch of records has been hung up in the month just ended and it's a man-sized job to write *QST* stories and put out newspaper publicity about them and keep the hook clean. In fact there has been such an epidemic of new records in November that our Publicity Manager suggests a schedule be established for them and that hereafter new records be accepted only three times a day! Seriously, though, just contemplate the November slaughter:

(1) Two-way amateur communication across the Atlantic for the first time in history.

(2) New distance records for amateur 100-meter work in that same communication. First 100-meter Transatlantic work by anybody.

(3) New distance record for amateur two-way talk for any amateur power when

WNP worked 6CEU in Hawaii. And 6CEU had but three 5-watters!

(4) All records for length of relays, speed in relaying, and miles per minute, smashed by the 1HX-6ZW-WNP-6ZW-1HX stunts.

(5) Alaska opens up, and 7AHB and 7MN are QSO the States.

(6) Not only do we continue to be heard in Japan and Australasia, but unconfirmed reports indicate two Australian amateur stations have been heard in California!

Isn't it clear that this is truly a period of achievement? How can we keep our editorial coat on and look sweet while we leisurely dictate polished phrases? This old A.R.R.L. is too busy doing things. This month, too, we have our Transatlantic Tests, and we have another bet with friend Burnham, British 2FQ, this time to the effect that at least a dozen European amateurs will be heard in America. A nice clock says they will. (We've cleaned off a place for it on our mantel.)

And now, good people, come back with us to July of 1914 and read an important announcement in *Popular Electricity & Modern Mechanics* for that month:

"An undertaking of great interest to wireless enthusiasts is the American Radio Relay League being organized under the auspices of the Radio Club of Hartford. The object of the league is to establish wireless communication between far distant points thru the co-operation of amateur wireless operators thruout the country. The results of the organization will be unique in that never before has the transmission of intelligence over long distances been possible except thru the agency of some great corporation or the Government.

"It is hoped, within the next two or three months, that a line of communication between Boston and San Francisco will be established and further efforts will be directed toward the establishment of a line from New York to the Mexican border via Washington.

"Owners of stations having a transmitting range of not less than thirty miles are requested to communicate with Clarence D. Tuska, Secretary, Radio Club of Hartford, 136 Oakland Terrace, Hartford, Conn., and it is hoped that all workers who are sincerely interested in the development of wireless telegraphy will lend all the assistance in their power to the consummation of this worthy project."

Oh, boy, the old world do move, and it's a grand winter we have before us! Excelsior!

What Bothers the B.C.L.

THAT 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 QRM 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 quiet 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 be caused 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 "hum fists" in our number, so some of these are deliberate. We have heard unknown stations falsely signing 6KA, 9ZN, 1AW, 1ARP, 9KW, 9RR, 9AOG, 5IA, 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 at 9 P.M. on the 25th 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-

sage ever sent from France, read as follows:

NICE FRANCE

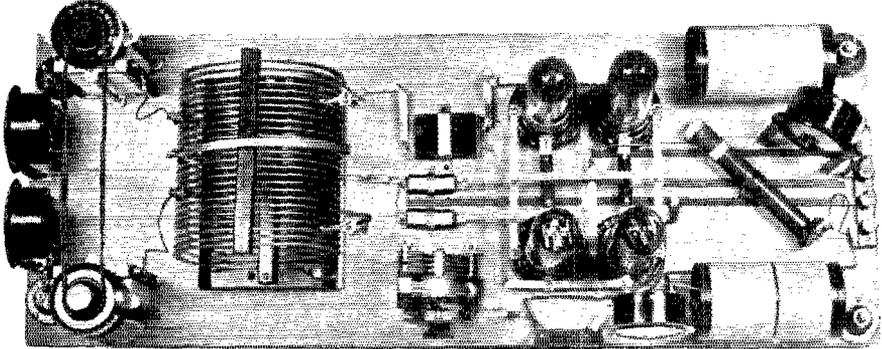
A.R.R.L.

WANT THIS FIRST TRANSATLANTIC MESSAGE TO CONVEY MOST HEARTY GREETINGS OF FRENCH TO AMERICAN AMATEURS.

LEON DELOY

GRATULATIONS 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



THE TRANSMITTER AT 1MO-1BHW 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



1MO And His "Hay-Wire" Receiver With Which He Worked F8AB. (Photo by Foto Topics, Inc.)

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 QRK UR SIGS QSA VY ONE FOOT FROM PHONES ON GREBE FB OM HEARTY CON-

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 "Bow-doin." 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 12:23 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 thruout 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. 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 8AB 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 1XAQ.

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. Hi!). We're going to hand-paint this derby until O.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 re-generating 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.

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

IN the first transatlantic operation between U1MO and F8AB, a message of greetings was sent to the renowned General Ferrié, director of French military radio, reading as follows:

HARTFORD, CONN.

GENERAL FERRIE,
PARIS, FRANCE.
AMERICA GREETES 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 F8AB sent his Nr. 9 to U1MO:

PARIS.

AMERICAN RADIO RELAY LEAGUE,
HARTFORD, CONN.
REMERCIÉ 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.



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

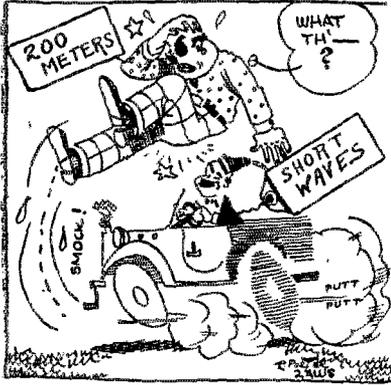
years in that it definitely links us with our European cousins.

Beating the Tests

It seems assured that this is but the fore-runner 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, calling "Test" on D.C.C.W., signals QSA, wave between 225 and 250 meters, 10:20 to 10:30 P.M. E.S.T. Altho 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 1MO and IXAM, our hearty congratulations. You have started a great winter!

—K.B.W.



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 transoceanic contact with any foreign country, and it is the most important achievement of Amateur Radio in

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, al-

most 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

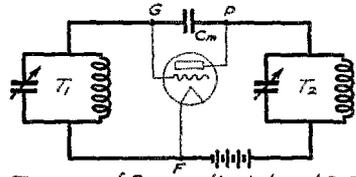
*†Radio Frequency Laboratories, Inc., Boonton, N. J.

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.

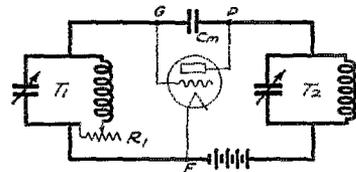
Regeneration in Tuned R.F. Amplifiers

Figure 1 is a diagram of the typical tuned amplifier stage which is subject to these regenerative effects. T_1 is the tuned input circuit exciting the grid of the radio amplifier tube and T_2 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 T_1 would be a tuner and T_2 the primary of a coupling transformer) or it may be an intermediate stage, wherein T_1 and T_2 are respectively the secondary and the primary windings of resonant coupling transformers. C_m is the other important element, the ever-present mischievous go-between which causes regeneration and instability; in other words C_m 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 lumped together and shown on the diagram, Fig. 1, as a single capacity C_m , which represents the total active feedback-producing capacity of the circuit. The primary (amplifying or forward) action of the amplifier consists of

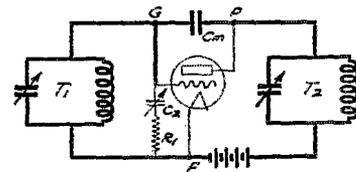
the flow in circuit T_2 , of a magnified copy of the currents flowing in T_1 ; this action occurs in the well-known fashion through the agency of the electron streams within the tube. The secondary regenerative or backward action of the amplifier occurs through the agency of the *capacitive coupling* between circuits T_1 and T_2 , which has just been



The cause of Regeneration in tuned R.F. Amplifiers
FIG. 1



Preventing oscillation by a series resistance
FIG. 2A



Preventing oscillation by a shunt resistance
FIG. 2B

mentioned. As soon as the magnified currents are established in T_2 by the direct action they react upon T_1 through C_m and it so happens that when T_2 is tuned even to approximate resonance with T_1 , the secondary currents set up in T_1 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 C_m 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.

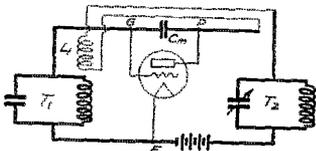
Purpose of Anti-Regenerative Devices

The function of all anti-regenerative devices is not necessarily complete elimination

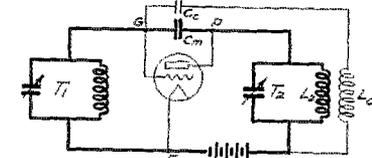
of the effects of capacity coupling through C_m but control of the resulting regeneration such that a cascade amplifier made up of stages like the circuit of Fig. 1 can be rendered stable and easy to tune without producing oscillations in the stages or in the tuner. Many popular circuits on the market 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

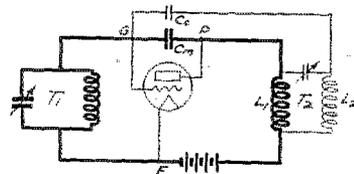
The possible methods of limitation fall into two general classes. The first of these,



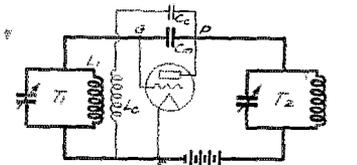
Reversed tickler compensation (as used in Tutka "Superdyne")
FIG. 3A



Condenser Compensation (as used in Hazeltine "Neutrodyne")
FIG. 3B



Condenser Compensation, another useful circuit
FIG. 3C



A circuit giving condenser compensation that does not change with wave-length.
FIG. 3D

dignified not by its merit so much as by its extensive practice, consists of the deliberate introduction of such losses into circuits T,

T₂ 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 inlet condenser, as shown at R₂ and C₂ in Figure 2b. R₂ should have a maximum resistance of about 50 ohms. R₂ should be considerably larger. If R₂ is about 50,000 ohms a two-plate "vernier" condenser can be used at C₂. 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 T₁ 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 over-compensation is possible, with a corresponding reduction in the effective amplification of the circuit below that furnished by the forward action of the tube alone. In the second, of which the Rice circuit is an example (described in U. S. Patent No. 1,334,118) the compensation can be in-

creased 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_1 . 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_1 and T_2 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_c connected from the grid to the high-potential terminal of a coil L_c , which is so coupled to the primary coil in the tuned plate circuit that the voltage across L_c is just opposite in phase and bears a constant ratio to the voltage across circuit T_2 regardless of the wavelength to which T_2 is tuned. Hence by proper choice of C_c the current through C_c can be made to introduce into T_1 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_2 and L_c 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_2 into T_1 would be prevented *equally at all wavelengths*; the neutralization would be truly independent of the frequency and of the tuning of T_2 , 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_c 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_1 and L_2 in series, tuned by condenser C_t . 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_1 is in the plate circuit of the amplifier tube shown, and the grid and filament of the next tube are connected across L_2 . The circuit is tuned to resonance with the incoming wavelength, λ , by so adjusting C_t that

$$\lambda = 2\pi \sqrt{(L_2 + L_3 + LM) C_t}$$

When the circuit is resonant the voltage across L_2 is just opposite in phase to the voltage across L_1 . Hence the feedback currents through C_m can be compensated by connecting C_c between the top of L_2 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_2/L_1 to the plate voltage of the tube shown, at resonance, whereas with transformer coupling, as in circuit (b) these voltages are in the ratio $\sqrt{L_2/L_1}$. 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_c closely coupled to the tuned input circuit, T_1 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_2 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 and L_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_2 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:

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

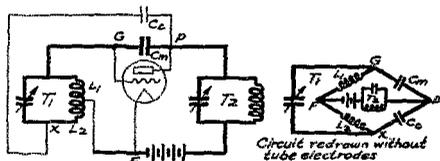
where M is the mutual inductance between L_1 and L_c and N_1 and N_c are the numbers of turns, respectively, in coils L_1 and L_c . Thus, when the turn ratio is determined, the value of C_c for complete suppression of regenerative effects depends, as in the Hazeltine circuit, only upon the grid plate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

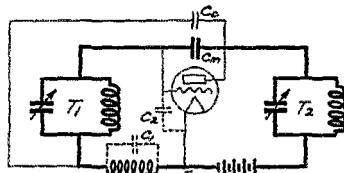
voltage drop between the other pair of opposite points of the bridge. In other words, a balanced bridge is a network in which two spaced points are electrically isolated from two other points. Reference to Fig. 1 suggests the utility of this principle in opposing regeneration. In order to prevent regeneration 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



A Wheatstone Bridge Method - The "Rice Circuit"

FIG. 4A



Another Wheatstone Bridge method

FIG. 4B

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_c 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_c . 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_1 , the resulting voltage across the L_1 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_1 serves as a fixed bypass for radio frequency currents. C_1 is the third arm of the bridge and C_2 the fourth arm. C_2 may be an external condenser but it is convenient to use for C_2 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_e 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.

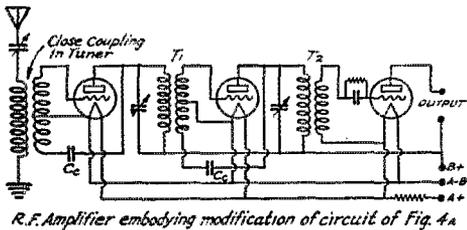
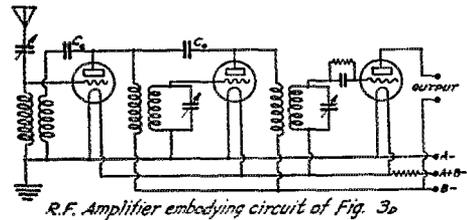
Complete Amplifier Diagrams

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 ref-



erence 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 also 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 Ballantine 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

The fastest relayed message.....	2412 miles per hour.
The longest 3-station round-trip relay.....	12,300 miles.
The longest amateur relay.....	9,565 miles.
The first 4-country relay.....	France, U.S.A., Canada, Greenland.

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

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 5:24:06 A.M. E.S.T., or FIVE MINUTES AND SIX SECONDS AFTER THE MESSAGE HAD STARTED. This represents a distance of 12,280 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 "F8AB" sent 1MO a message addressed to WNP and the message was copied partly 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



"Four on One Hook!"

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 12,300 miles covered. This was good—but it needed improvement to suit these three. They took

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

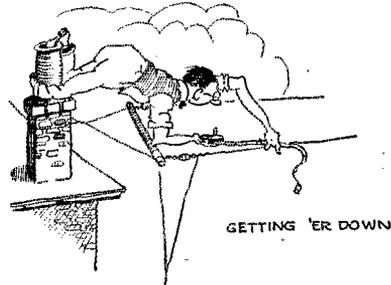
WNP has been described many times in these pages. Mix, the 50-watt tubes and the Zenith sending set, performed brilliantly as always. Wave length 180 meters. Receiving set, Zenith 1R.

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 cur-

rent 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 220 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

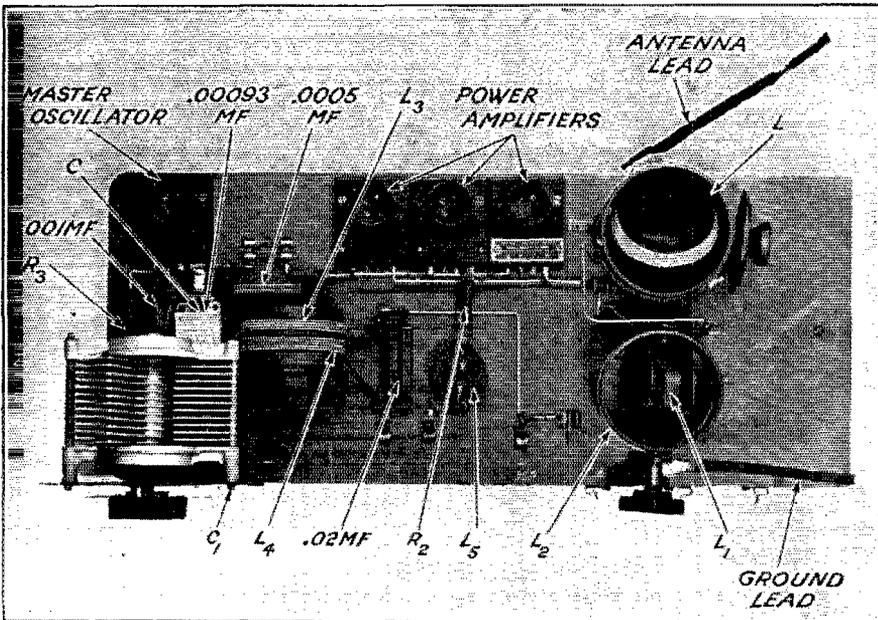
*Radio Station 2CXL, Signal School, Camp Alfred Vail, N. J.

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

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 .00143 and a minimum of .00094 microfarads. This fixed conden-



THE MASTER-OSCILLATOR SET AT 2CXL

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

ser 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 $\frac{1}{2}$ " x $\frac{1}{2}$ " 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

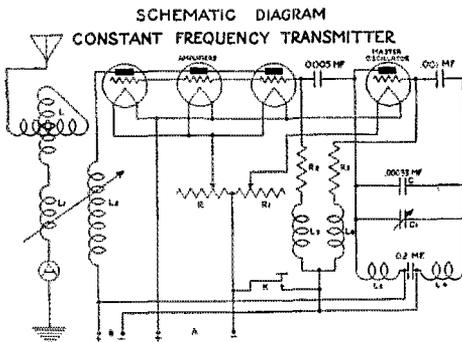


FIGURE 1

these inductances, also for coils L and L_1 . Don't waste time or money on the Litz.

The variable condenser C_1 was a General

to not over three¹ amplifier tubes as shown in Figure 1 and 2. When using three VT-2 or "E" tubes the grid-leak R_2 has a value of 5,000 ohms and is of the same type as R_1 , while the choke L_3 is exactly like L_4 , described before.

The primary of the output transformer, L_2 , is made by winding about 40 turns of No. 26 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_1 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_2 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_2) of the output transformer. Since we desired to work well below 200 meters the 29-turn coil was selected as it gave the lowest

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 am-

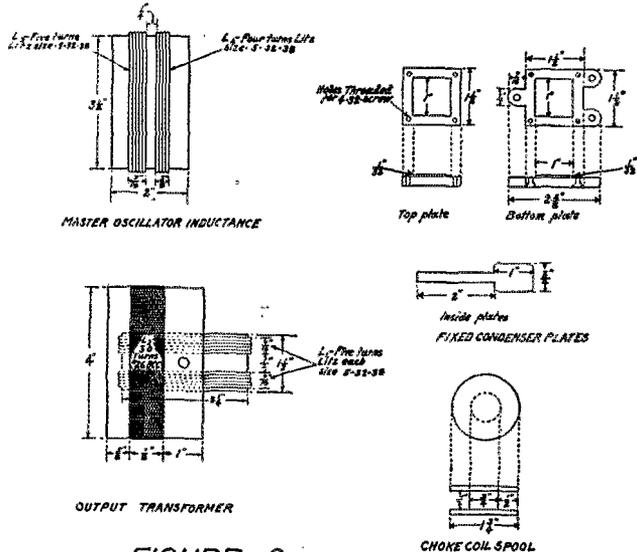


FIGURE 2

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_2 at several turns and use a clip. Thus it can be seen from Figure

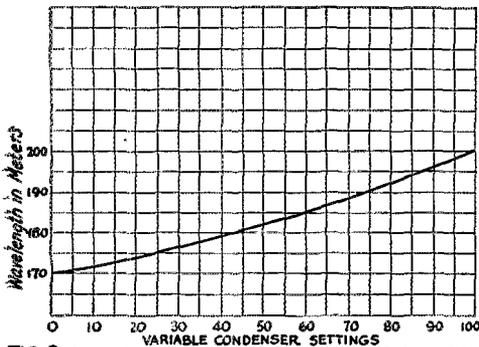


FIG.3 TUNING CHART FOR MASTER-OSCILLATOR AT 2CXL

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

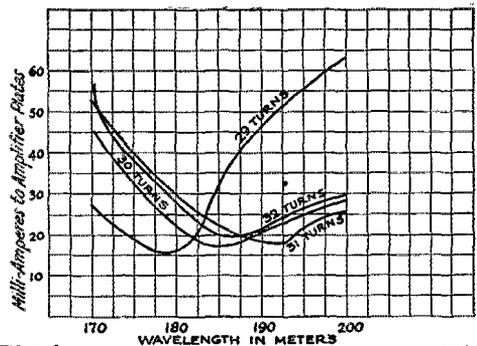


FIG.4 CHART SHOWING METHOD OF ADJUSTING AMPLIFIER PLATE COIL AT 2CXL

This is a thing that causes many master-oscillator sets to fail. The rating of the amplifier tubes must not be over about 8 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 5-watt master.—Tech. Ed.

4 that at 2CXL the following taps would be useful for ordinary amateur work: 28 turns—Below 170 meters; 29 turns—170-182 meters; 30 turns—182-189 meters; 31 turns—189-200 meters.—Tech. Ed.)

The Antenna Circuit

The secondary, L_1 , 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_1 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.²

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.

²—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 Pouth Transatlantic Tests. The A.R.R.L. wishes to acknowledge with heartiest thanks the splendid response and keen co-operation 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 out your 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. B. Warner, Secretary A.R.R.L. and editor of *QST*; 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
C. D. Tuska Co., Hartford, Conn.	200.00
Chicago Radio Laboratory, Chicago	160.00
Zenith Radio Corporation, Chicago	160.00
Adams-Morgan Co., Upper Montclair, N. J.	140.00
The Magnavox Co., Oakland, Calif.	135.00
Colin B. Kennedy Corp'n, St. Louis	125.00
Multiple Electric Products Co., Newark	125.00
Bakelite Corporation, New York City	100.00
Nathaniel Baldwin, Inc., Salt Lake City, Utah	100.00
Premier Electric Co., Chicago	99.00
Radio Corporation of America, New York City	81.50
National Chelsea Radio Corporation, Boston	57.20
Crosley Manufacturing Co., Cincinnati	55.00
Klaus Radio & Electric Co., Eureka, Ill.	55.00
Burgess Battery Co., Madison, Wis.	50.25
The Precision Equipment Co., Cincinnati	50.00
R. Mitchell and Co., Boston	49.00
National Carbon Co., Long Island City, N. Y.	48.15
Electric Specialty Co., Stamford, Conn.	48.00
Tresco, Davenport, Iowa	47.50
Rieger Research Corporation, New York City	45.85
E. T. Cunningham, Inc., San Francisco	39.00
Tower Manufacturing Corp'n, Boston	35.40
Allen-Bradley Co., Milwaukee, Wis.	33.80
Dubilier Condenser & Radio Corporation, New York City	32.85
Chas. A. Branston, Inc., Buffalo	32.00
Maxim Silencer Co., Hartford	31.50
Unity Manufacturing Co., Chicago	30.60
Horne Electric & Mfg. Co., Jersey City, N. J.	30.00
Thordarson Electric Mfg. Co., Chicago	30.00
General Radio Co., Cambridge, Mass.	29.25
Coto-Coil, Providence, R. I.	28.75
Jewell Electrical Instrument Co., Chicago	25.00
Stromberg-Carlson Mfg. Co., Rochester	23.00
Kimley Electric Co., Buffalo	22.50
Newman-Stern Co., Cleveland	19.50
The Automatic Electrical Devices Co., Cincinnati	18.50
Weston Electrical Instrument Co., Newark, N. J.	18.00
Fansteel Products Co., Inc., North Chicago, Ill.	18.00
Valley Electric Co., St. Louis	18.00
Signal Electric Mfg. Co., Menominee, Wis.	16.50
Rauland Manufacturing Co., Chicago	16.50
The Sterling Mfg. Co., Cleveland	16.00
Westinghouse Union Battery Co., Swissvale, Pa.	15.50
Diamond State Fibre Co., Bridgeport, Pa.	15.00
American Transformer Co., Newark, N. J.	14.00
Roller-Smith Co., New York City	13.75
American Hard Rubber Co., New York City	13.85
The Riggs Mfg. Co., Urbana, Ohio	12.50
Post Electric Co., New York City	11.00
U. S. Tool Co., Newark, N. J.	4.75
The Hart & Hegoman Co., Hartford	1.70

GRAND PRIZE

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

GROUP A

First: Zenith 1R Receiver and 2M two-step amplifier; 1 Atlas Loud Speaker; 1 Homecharger; 1 pair Baldwin type C phones; \$8.00 selection from

Howard Radio Co.; 1 Eveready #767 battery; 1 Chelsea A.F. transformer; 1 Chelsea variable condenser; \$5.00 cash from the Bakelite Corp.; 1 Premier Microstat; 1 Burgess #5155 battery; 1 Unity vernier rheostat; 1 601-T Dubilier condenser.

Second: 1 Crosley Model X receiver; 1 Radiocorp UP-1868 C.W. power transformer; 1 pair Baldwin type E phones; \$8.00 selection from Howard Radio Co.; 1 Metaelectric soldering iron; 1 Burgess #2306 battery; \$5.00 cash from the Bakelite Corp.; 1 type 22-MG-2 B-battery; 1 Premier 23-plate condenser; 1 Eveready #766 battery; 1 Chelsea A.F. transformer; 1 Burgess #5155 battery; 1 Bradleystat; 1 Unity cartridge rheostat; 1 Radion dial.

Third: 1 set Branston 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-301-A amplifier tube; 1 3/16 x 8 x 26 Radion panel; 1 Premier variocoupler; 1 Eveready #766 battery; 1 Eveready #764 battery; 1 Burgess #5155 battery; 1 pair Ambassador phones; 1 Bradleystat; 1 Unity vernier rheostat; 1 Chelsea rheostat; 1 Unity cartridge rheostat; 1 type 601-T Dubilier condenser; 1 Dubilier variadon.

Fourth: \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corporation; 1 Radiocorp UV-216 20-watt Kenetron; 1 Chelsea variocoupler; 1 Chelsea variometer; 1 Horne verni-tuner; 1 5-to-1 Hedgehog A.F. transformer; 1 Burgess #2156 battery; 1 Eveready #766 battery; 1 pair Scientific phones; 1 Bradleystat; 2 Unity cartridge rheostats; 1 Eveready #7111 battery; 1 type 601-G Dubilier condenser; 1 type 601 Dubilier 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 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 G phones; \$8.00 selection from Howard Radio Co.; 1 General Radio 247W wavemeter and filter; \$5.00 cash from Bakelite Corporation; 1 Eveready #767 battery; 1 Premier microstat; 1 Burgess #5155 battery; 1 Unity vernier rheostat.

Second: 1 Tuska type 225 receiver and two-step amplifier; 1 Western Electric 10-D loud speaker; 1 pair Baldwin type E phones; \$8.00 selection from Howard Radio Co.

Third: 1 set Coto-Coil (16) mounted coils; 1 Radiocorp UL-1008 oscillation transformer; 1 General Radio 200-D amplifying unit; \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corporation; 1 Remler variometer; 1 Premier variocoupler; 1 pair Stromberg-Carlson 2A phones; 1 General Radio 231A transformer; 1 Burgess #2306 battery; 1 General Radio 247H condenser; 1 pair Scientific phones; 2 Bradleystats; 1 Bradleystat; 1 Dubilier variadon; 1 Dubilier type 601 condenser; 1 Unity cartridge rheostat; 1 Eveready #771 battery.

Fourth: \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corporation; 1 Horne verni-tuner; 1 Radiocorp UV-202 tube; 1 Chelsea variocoupler; 1 5-to-1 Hedgehog A.F. transformer; 1 Radio panel 3/16 x 7 x 21; 1 Burgess #2156 battery; 1 pair Scientific phones; 1 Bradleystat; 1 Eveready #771 battery; 2 Unity cartridge rheostats; 1 R40 (Signal) crystal detector; 1 Hart & Hegeman rheostat; 1 Dubilier type 601 condenser.

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

GROUP C

First: 1 Tuska Superdyne receiver; 1 Atlas loud speaker; 1 Acme 200-watt power (C.W.) transformer; 1 Roller-Smith 0-5 amp. R.F. meter; 1 pair Baldwin type F phones; 1 Riggs battery charger; 1 Rauland push-pull amplifier; \$8.00 selection from Howard Radio Co.; 1 Burgess #2306 battery; \$5.00 cash from Bakelite Corp'n; 1 Premier 23 plate condenser; 1 Burgess #5155 battery; 1 Premier microstat; 1 Unity vernier rheostat; 2 Dubilier type 601 condensers.

Second: 1 type R2 Magnavox and 3-stage power amplifier; \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corp'n; 1 Bradleystat; 1

Bradleyleak; 1 Eveready #7111 battery; 2 Dubilier type 601 condensers.

Third: 1 Treaco tuner and two-step amplifier; \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corp'n; 1 Radiocorp UV-202 tube; 1 Amertran A.F. transformer; 1 Remler variometer; 1 Premier variocoupler; 1 Rauland 3-to-1 A.F. transformer; 2 Bradleystats; 1 pair Ambassador phones; 1 Eveready #771 battery; 1 Unity cartridge rheostat; 2 Dubilier type 601 condenser; 1 Ducon.

Fourth: \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corp'n; 1 Radiocorp UV-202 tube; 1 Premier variocoupler; 1 Horne verni-tuner; 1 Hedgehog 5-to-1 A.F. transformer; 1 Eveready #766 battery; 1 Burgess #2156 battery; 1 pair Scientific phones; 1 Bradleystat; 1 Unity cartridge rheostat; 1 Chelsea socket; 1 Eveready #7111 battery; 1 Radion dial; 1 Hart & Hegeman rheostat; 1 Eveready #771 battery; 1 Dubilier type 577 condenser.

Fifth: \$8.00 selection from Howard Radio Co.; 1 5-to-1 Hedgehog A.F. transformer; 1 C-301-A amplifier tube; 1 Chelsea socket; 1 General Radio type 156 socket; 1 Unity vernier rheostat.

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.; \$5.00 cash from Bakelite Corp'n; 1 Chelsea variable condenser; 1 Premier microstat; 1 Burgess #2156 battery; 1 Unity vernier rheostat; 1 Dubilier Duratran.

Second: 1 Precision type 3B receiver; 1 Jewell wave meter; 1 Weston 0-10 Model 425 thermammeter; 1 Sterling #900 battery charger; \$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 pair Ambassador phones; 1 Bradleystat; 1 Radion dial; 1 Eveready #7111 battery; 1 Dubilier 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 Acme 30-henry choke; 1 Radiocorp UV-216 20-watt Kenetron; 1 Remler variometer; 1 Premier variocoupler; 1 Premier 23-plate condenser; 1 5-to-1 Hedgehog A.F. transformer; 1 pair Ambassador phones; 1 Eveready #764 battery; 1 Dubilier type 580 condenser.

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 #2156 battery; 1 Eveready #766 battery; 1 pair Scientific phones; 1 Unity cartridge rheostat; 1 Eveready #771 battery.

Fifth: 1 C-301-A amplifier tube; \$8.00 selection from Howard Radio Co.; 1 5-to-1 Hedgehog A.F. transformer; 1 Unity vernier rheostat; 1 Radion dials; 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 #5155 battery; 1 Eveready #7111 battery; 1 Unity vernier rheostat.

Second: 1 A-2 (R. Mitchell) knock-down receiver; 1 Thordarson 900-watt plate transformer (mounted); 1 pair Baldwin type C phones; \$8.00 selection from Howard Radio Co.; 1 Kimley 22-MG-2 B-battery; 1 (Signal) type R21 Navy type receiving transformer; 1 Metaelectric soldering iron; 1 Premier 23-plate condenser; 1 pair Ambassador phones; 1 Burgess #5155 battery; 1 Bradleystat; 1 Unity vernier rheostat; 1 Unity cartridge rheostat; 1 Radion dial; 1 Dubilier type 580 condenser.

Third: 1 complete set of Curkoid coils with triple-mounting; \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corp'n; 1 Amertran A.F. transformer; 1 Remler variometer; 1 Premier variocoupler; 1 Premier 23-plate condenser; 1 5-to-1 Hedgehog A.F. transformer; 1 Eveready #766 battery; 1 Radion panel 3/16 x 7 x 18; 1 pair Ambassador phones; 1 Eveready #771 battery; 1 Eveready #764 battery; 1 Eveready #7111 battery; 1 Bradleystat; 1 Unity cartridge rheostat; 1 Chelsea rheostat.

Fourth: \$8.00 selection from Howard Radio Co.; \$5.00 cash from Bakelite Corp'n; 1 C-301-A amplifier tube; 1 Remler variometer; 1 Chelsea variometer; 1 Horne verni-tuner; 1 Hedgehog 5-to-1 A.F. transformer; 1 Burgess #2156 battery; 1 Signal 23-plate condenser; 1 pair Scientific phones; 1 Chelsea rheostat; 1 Dubilier 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 Bradleyleak; 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.

Mercury Arc Rectifiers.

Building a really good station using one "5-watt" tube.

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 have to prune 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 $3\frac{1}{4} \times 4\frac{1}{4}$ ", should be on glossy paper, and *must* be from a negative much better than those made by the ordin-

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 commercial 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, Hartford, 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 precision, 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 adjusting 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

Radio Service Bulletin, also in the following places in QST—July, 1923,* page 28, "U.S. Will Send Standard Waves for A.R. R.L.;" May, 1923,* page 47, "Laboratory Oscillators." More detailed information can be found in the Bureau of Standards Circular No. 92 which may be obtained on application from the Bureau of Standards, Washington, D. C.

All transmission is by "straight" unmodulated continuous-wave telegraphy. A complete frequency transmission consists of a general call (i.e., "QST de WWV"), a standard frequency dash, and announcements. The call continues for two minutes, including the statement of the *frequency*. (not wave length) being used. The standard-frequency dash is broken occasionally by the signature "WWV" and continues for about 4 minutes. The "announcement" is on the same wave length as the test that has just been sent and gives the *exact* frequency of the signal, measured while that signal was being sent. The next frequency is then announced and a 4 minute interval follows while adjustments are made.

The schedule is as follows:

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

Eastern Std. Time	Jan. 7	Jan. 21	Feb. 5	Feb. 20
11:00 to 11:05 P.M.	150 (2000)	500 (600)	1300 (231)	150 (2000)
11:12 to 11:20 P.M.	205 (1463)	600 (500)	1400 (214)	205 (1463)
11:24 to 11:32 P.M.	260 (1153)	700 (423)	1500 (200)	260 (1153)
11:36 to 11:44 P.M.	315 (952)	833 (360)	1600 (187)	315 (952)
11:48 to 11:56 P.M.	370 (810)	900 (333)	1700 (176)	370 (810)
12:00 to 12:08 A.M.	435 (689)	1000 (300)	1800 (167)	435 (689)
12:12 to 12:20 A.M.	500 (600)	1200 (250)	1900 (158)	500 (600)
12:24 to 12:32 A.M.	570 (526)	1400 (214)	2000 (150)	570 (526)

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

1XAM's Transmitter

By John L. Reinartz, 1QP-1XAM

This article describes an amateur sending set and antenna system that will work easily and efficiently anywhere in the amateur band of waves. Note Mr. Reinartz's insistence upon two series condensers; this is strictly necessary with direct coupled sets using alternating plate supply. The three American stations that have worked French 8AB all reduced in this fashion. The special counterpoise is more a matter of convenience and of the three stations referred to one used the cage counterpoise, a second used a modified form of it and the third used a normal rectangular counterpoise.—Tech. Ed.

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



John L. Reinartz and The Set at 1QP-1XAM.

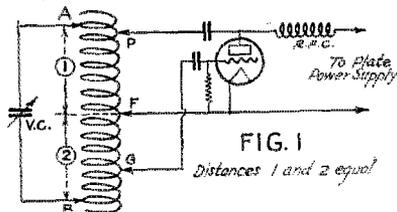
Reinartz needs no introduction; the set was one of the first two American stations to work a European amateur. This was not done once but repeatedly, and at last with but one tube in use. (Photo by Foto Topics, Inc.)

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. F. (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

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

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 pur-

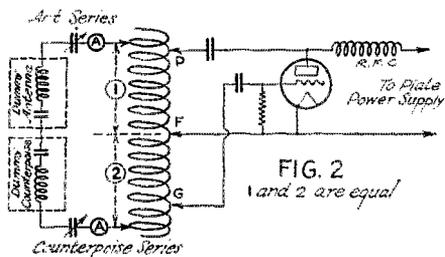


FIG. 2
1 and 2 are equal

pose 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 clips were set the same number of turns from the filament clip, both series condensers set at half scale (same capacity), and the key pressed. See Fig. 4. 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

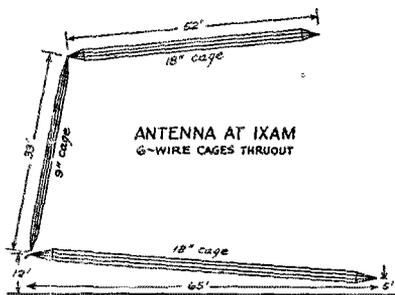


FIG. 3

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

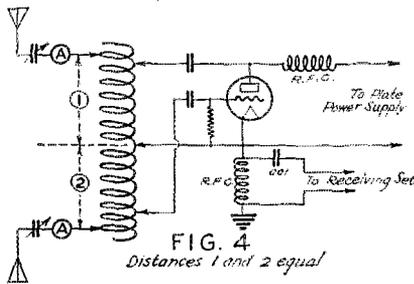


FIG. 4
Distances 1 and 2 equal

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.

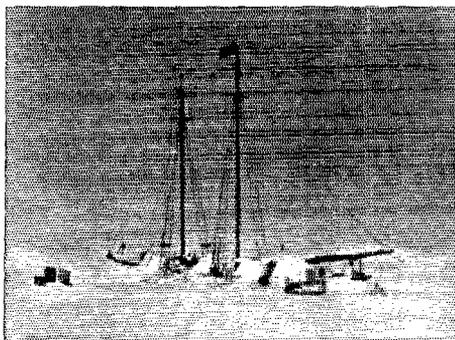
7AIB of Port Angeles, Wash., has the distinction of having worked WNP with but a single 5-watter. Mix said "QRK like bricks here." In fact, Mix reports all the stations he works as very loud. WNP's signals are fairly good in most reports, except for very bad fading, complained of by almost everyone. 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 (5ZAV, 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



How the "Bowdoin," WNP, looks as she is frozen in the ice for the long Arctic winter. (From a photograph made by MacMillan on a previous expedition.)

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 6CMM, San Francisco; incorrectly reported as 6CCM 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.; 8CWR, Dayton, O.

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

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

Nov. 5—6
 Heard by 3GK, Toronto; 3NI, Ft. William, Ont.; 5ABT, Montgomery, Ala.

Nov. 7—8
 Heard by 3APV, 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 5GO, Vancouver, B. C.; 5CT, Duncan, B. C.; 7ABB, Everett, Wash.; 7AIB, Pt. Angeles, Wash.

Nov. 9—10
 Heard by 8CWK, Detroit.

Nov. 10—11
 Reported by 8ARR, Detroit.

Nov. 11—12
 Worked by 7AIB, Pt. Angeles, Wash., one 5-watter, took 1 msg. Exchanged calls with 2AGB, Summit, N. J. Worked by Can. 9BP, 5 msgs. sent, 3 rec'd. Heard by 8IN, Belevue, Pa.; 6AHS, San Diego; 7AIY, Wenatchee, Wash.; Can. 5CT, Can. 5GO.

Nov. 14—15
 Worked by Can. 9BP, 7 msgs. sent, 8 rec'd; 7ABB, Everett, Wash., QRK QRU; 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 6AOI, Riverbank, Cal.; Can. 5GO.

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

Nov. 17—18
 Worked by 4CL, Edmonton, Alta., QSA QRM. Heard by 7AIY; 8CYT, Akron; 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, 2 rec'd including 455 wds. N.A.N.A. press. Heard by 9DLF, Aneta, N. D.;

L. Strobel, Akron, O.; 8BPM, Philadelphia; 6AWT, San Francisco; 7ZU, Polytechnic, Mont.; 4EA, Winnipeg.

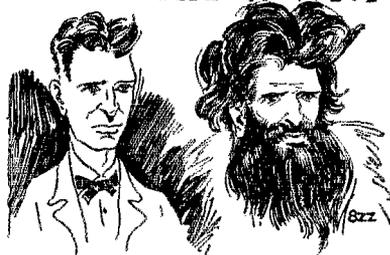
Nov. 19—20
 Worked by Can. 9BP, 4 msgs. rec'd including 1000 words N.A.N.A. press, sent 1 msg. About this date also worked by Can. 4DQ. Worked by 5CT, Duncan, B. C.; QSA QSS, 1 msg. rec'd. Worked by Can. 3NI at 6:30 A.M. for 15 mins. QSA QSS QRU. Most of N.A.N.A. press also copied by 6XAD, Avalon, Cal. 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 9DKB, Minot, N. D., QRU. Heard by 9BSH; Can. 5GO.

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

Nov. 22—23
 Exchanged calls with 9DKB, 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



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Nov. 23—24
 Worked by Can. 9BP; 8 msgs. sent, one with ck 712; rec'd 5. Worked 20 mins. QSA by 9ACK, Jamestown, N. D.; 10 mins. by 9DKB; about this date apparently worked 7SF, 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 7ZU, Polytechnic, Mont., QRZ QSS QRU. Heard by 8BXX, Norwalk, O.; 9DLF, Aneta, N. D.; 7MT, Arlington, Wash.; 2BXW, 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 7 1/2 mins. from his home. Worked by 9AVZ, Pierre, S. D., QRK QRU; 7ABB, Everett, Wash., 1 msg. sent. Heard by 7ABB; H. C. Barney, Providence, R. I.; 3CC, Abington, Pa.; 7MT, 2BXW.

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 7ABR 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.

Nov. 30—Dec. 1.
 Heard by P. H. Prouse, Jericho Springs, Mo.

Information on Receiving Tubes for A.R.R.L. Questioners

By J. C. Warner*

In Two Parts: Part I

It is a privilege to count amongst A.R.R.L.'s friends the Research Laboratory of the General Electric Co. This is the organization which is constantly developing the "G.E." line of vacuum tubes, its latest contribution being the excellent new tubes with "XL" filaments.

This article, by a member of the Research Laboratory, answers the questions submitted by our members in accordance with the special arrangement announced on page 17 of the August issue. The questions were so numerous and varied that this paper, originally intended for the December number, was carried over to this month.—Tech. Ed.

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

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 burn-out* 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

*Research Laboratory, General Electric Co.

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 gives 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.

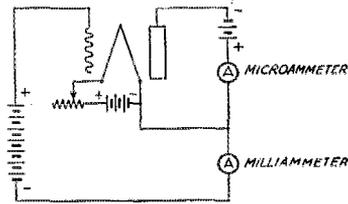
The end of life of the coated filament is usually caused either by loss of emission or by the formation of a hot spot and subsequent burnout at some point where the coating has been evaporated from the metal.

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



CIRCUIT FOR MEASURING GAS PRESSURE IN RECEIVING TUBES

FIG. 2

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

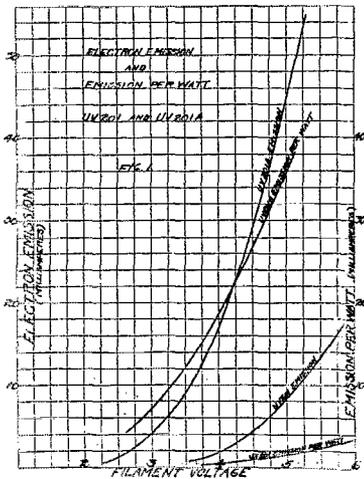


Fig. 1

three materials similarly to the extent that the life of the filament is shortened, but for a different reason in each case. The higher temperature increases the electron

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

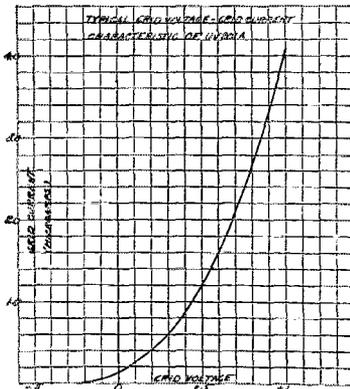


Fig. 3

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 atmos-

pheric 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 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 is, of course, an impossibility 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

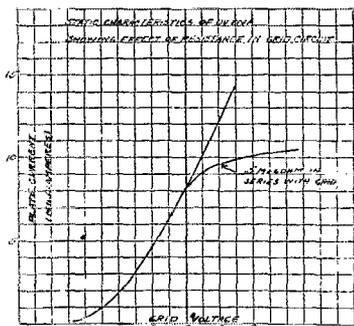


Fig. 4

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 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 bad distortion occurs in the phones themselves, while if the crystal were used, the weaker response would appear undistorted. The sort of distortion which is caused by the curvature of the characteristics, either of the crystal or tube, is such that it can hardly be noticed unless the listener is thoroughly familiar with the voice or instrument to which he is listening. That is, the curvature introduces second and higher harmonics in the output, but equally so for all frequencies, so that the result is a slight change in the apparent pitch and tonal quality which, however, does little to make the reproduction any less pleasing than the original.

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

tube is on the verge of oscillation the grid circuit actually becomes so sharply tuned that the side-bands are partly cut off, causing very objectionable distortion.

Another more infrequent cause of distortion is the use of incorrect values of grid leak and condenser. That is, if too high resistance or too large capacity is used, the condenser may not be able to discharge quickly enough to maintain the form of the original voltage wave. The proper choice of these values will be considered more in detail in a later paragraph.

Distortion in the audio frequency circuits may be due to the characteristics of the interstage coupling or to the tubes themselves, if they are used incorrectly or forced beyond reasonable limits. The impedance and step-up ratio of all transformers varies more or less for different frequencies, hence the amplification is greater for some frequencies than for others.

Under incorrect conditions the tubes may cause distortion in two ways. If the input voltage is made too high for the tube, the relation between output and input is no longer linear and distortion occurs. In general, the higher the plate voltage (assuming correct grid bias) the greater can the input voltage be without causing distortion. This, in fact, is the primary reason for using high plate voltages on amplifier tubes which are used to operate large loud speakers. If no grid bias is used, the grid of the tube becomes positive during part of the cycle and draws current. This current must pass through the secondary of the coupling transformer which has a very high impedance, in some cases as high

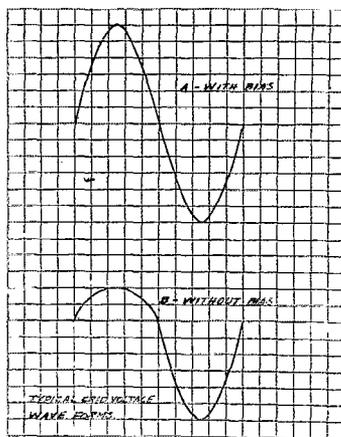


Fig. 5

as 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

	WD-11 C-11	WD-12 C-12	UV-199 C-299	UV-200 C-300	UV-201-A C-301-A
Filament Circuit Data					
Battery Source Voltage	1.5	1.5	4.5	6.0	6.0
Fil. Terminal Voltage	1.1	1.1	3.0	5.0	5.0
Filament Current	0.25	0.25	0.06	1.0	0.25
Plate Voltage					
Detector	20-45	20-45	20-45	15-23.3	20-45
Amplifier	40-100 (Note 2)	40-100 (Note 2)	40-100 (Note 3)	40-100 (Note 1)
Dimensions Overall					
Height Maximum	4 $\frac{3}{8}$ "	3 $\frac{1}{8}$ "	3 $\frac{1}{2}$ "	4 $\frac{3}{8}$ "	4 $\frac{3}{8}$ "
Diameter Maximum	1 $\frac{1}{4}$ "	1 $\frac{1}{4}$ "	1"	1 $\frac{3}{4}$ "	1 $\frac{3}{4}$ "
For Detection					
Grid Leak Megohms	2-3	2-3	2-5	$\frac{1}{2}$ -2	2-5
Grid Condenser μ fd.	.00025	.00025	.00025	.00025 to .0005	.00025
Plate Impedance (Approx.) in Ohms					
	19,000	19,000	18,500	9,000	16,500
Amplification Constant (Approx.)					
	6.5	6.5	6.25	8.0
Mutual Conductance in Micromhos					
	340*	340*	340*	485*
Plate Current in Milli- amperes (With Zero Grid)					
Plate Voltages	20	0.3	0.3	0.25	Detector: 0.25 to 1.0
	40	1.2	1.2	1.1	1.0
	60			2.4	2.6
	80	3.9	3.9	3.9	4.8
	90				6.0
	100				7.5
Internal Capacities (μfd)					
	4.5-6.0	4.0-5.5	3.5-4		6-7.5

NOTE 1 UV-201-A, C-301-A		NOTE 2 WD-11, WD-12, C-11, C-12		NOTE 3 UV-199, C-299	
Plate Voltage	Negative Grid Bias Voltage or "C" Battery	Plate Voltage	Negative Grid Bias Voltage or "C" Battery	Plate Voltage	Negative Grid Bias Voltage or "C" Battery
40	0.5 to 1.0			40	0.5 to 1.0
60	1.0 to 3.0	45	0	60	1.0 to 3.0
80	3.0 to 4.5	60	1.5	80	3.0 to 4.5
100	4.5 to 6.0	80 to 100	3.0	100	4.5 to 6.0
120	6.0 to 9.0				

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.

Fig. 6

give true reproduction in the output of the tube.

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 volt-

ages 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 thot 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 amateur-ing—and we began to suspect that the interest might be large.

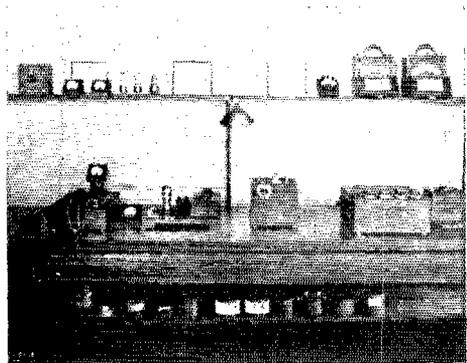
So we printed in a recent issue a modest little note to the effect that we would like to hear from experimenters who were willing to tackle some of the jobs that confront the amateur. We expected replies—we expected quite a number of replies—but we never expected to be hopelessly snowed under by hundreds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



The Laboratory of W. W. Harper at Ottumwa, Iowa.

it to this department. Knowing what men are available, knowing something of their apparatus, it is now possible to write for

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—none 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 co-operative 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.

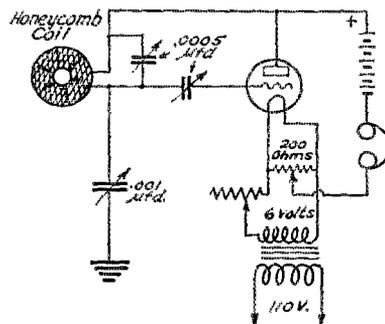
The Power Lines In A Double Role

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 23-plate variable grid condenser—.0005 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, 300 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)

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

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

THE ALLEN D. CARDWELL MFG. CORP

RADIO TELEGRAPH AND RADIO TELEPHONE EQUIPMENT	31 PROSPECT STREET BROOKLYN, N. Y. Telephone MAw 2227	AUTOMATIC TELEGRAPH APPARATUS ELECTRICAL INSTRUMENTS
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October 15th, 1923

Mr. K. E. Warner,
American Radio Relay League,
Hartford,
Conn.

Dear Mr. Warner:

A few days ago we received the following postal cards which struck me as having rather a subtle meaning -

"Please send us your booklet XZ as per the ad I did not see in "QST". (signed) Shelby H. Bentley,
P.S. - My dealer is Mr. Otto Buder of Cairo, Ill. I do not think he stocks your condensers. Please see that he gets your proposition". - Thebes, Ill.

"Please give me the name of Washington dealers stocking and handling your product. also please send Booklet T. Why did you not advertise in October QST. To is a nuisance mailing up your address elsewhere and I learned of you first thru QST". (signed) C. A. Briggs, 1211 Spring Road, Washington, D.C.

Needless to say, I check exactly on what the two writers have to say and we are doing our best to bring things about so that "QST" will get our business when we have any to place.

It might interest you to know we have received stacks of mail from all over the world and the "QST" crowd out-purchased the others by a rather startling figure.

When Mr. Adams took the trouble to look us up at the amateur show held at the Pennsylvania Hotel in March, he, of course, did a good sales job on "yours truly" and as I have been approached by every advertising solicitor in the United States, (I don't think I have missed one), I probably gave him the impression of being a five minute eng. I hope he appreciates the position I have been in and that it is becoming second nature to me to say "no" to any proposition except the good old American stand-by "will you have a drink"?

With kindest regards, I am
Yours very truly,
THE ALLEN D. CARDWELL MFG. CORP
By *Richard W. Spencer*,
Assistant Chief Engineer.

RPS:FMJ

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 definitely just how much interest this advertising is causing. Let QST be your buying guide. With your co-operation 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

them 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

seems even louder at times than he was during the last ones. I think we all agree that his are certainly the loudest Yank 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 wave ineffect 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.



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

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, 9BZI, 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 wavemeter 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

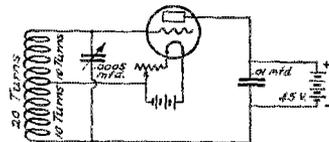


FIG. 1

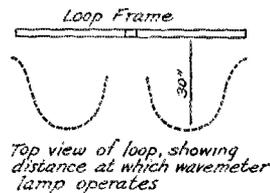


FIG. 2

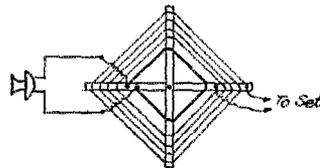
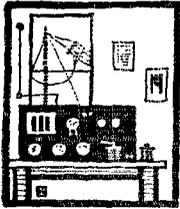


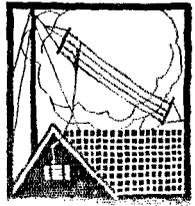
FIG. 3

difficulty was overcome by laying the wires along pieces of wood and fastening them

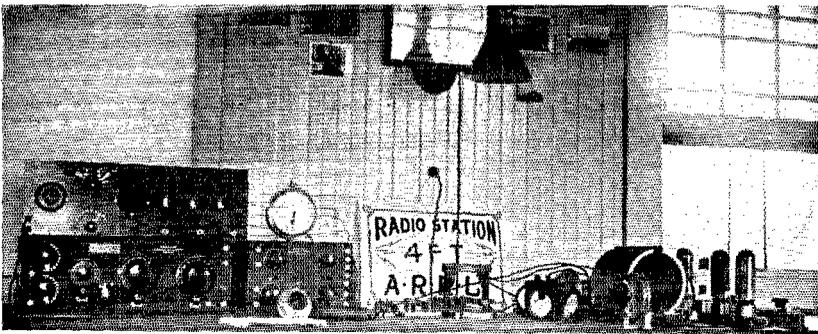
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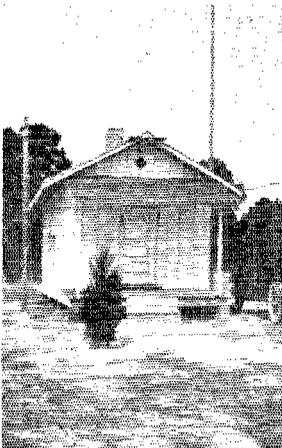
Amateur Radio Stations



4FT, Wilmington, N. C.



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 cur-

rent 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

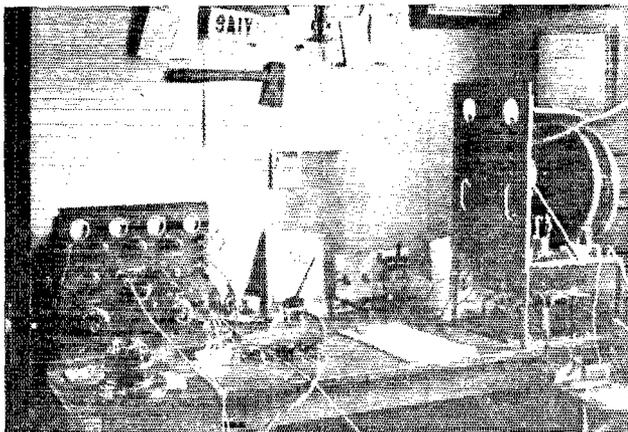
in Canada, England, Holland, France, Porto Rico, New Zealand, Alaska, Hawaii, Japan, Straits of Gibraltar, Mexico and Greenland and by ship operators at distances up to 9500 miles from Wilmington, N. C. The speech from 4FT has been heard by many stations within a radius of 2,500 miles. This station was 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

anted never to get hot. Various rectifiers have been used, a chemical one now being on the job. The jars are located just to the right of the transmitter but do



7ZJ's spark was heard as far as the Mississippi river; and George Sturley, of-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-

anteed never to get hot. Various rectifiers have been used, a chemical one now being on the job. The jars are located just to the right of the transmitter but do not show in the picture. The filter consists of a trap made of a 25-henry choke with a one-half microfarad condenser across it, connected in the positive plate lead. The coupled Hartley circuit, almost exactly like the one shown on page 53 of the November QST, is used. 7BJ says the small ax on the wall is a high power transmitter used for local work, while the brickyard two blocks down the street also comes in handy.

A single circuit receiver with three stages

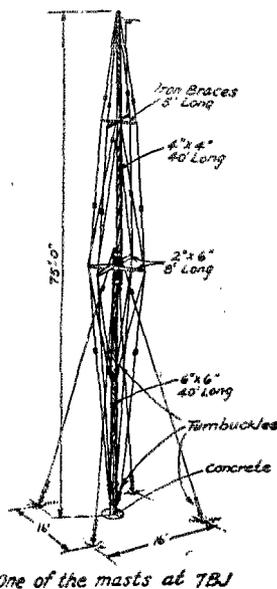
of audio is seen to the left of the picture, one stage being used for DX; the rest for music. A home-made wavemeter beside the receiver is useful for checking the transmitted wave and also makes a wave trap that works wonderfully when the air is congested locally.

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



One of the masts at 7BJ

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 ($\frac{1}{4}$ 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 guying 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 masts 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-L 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



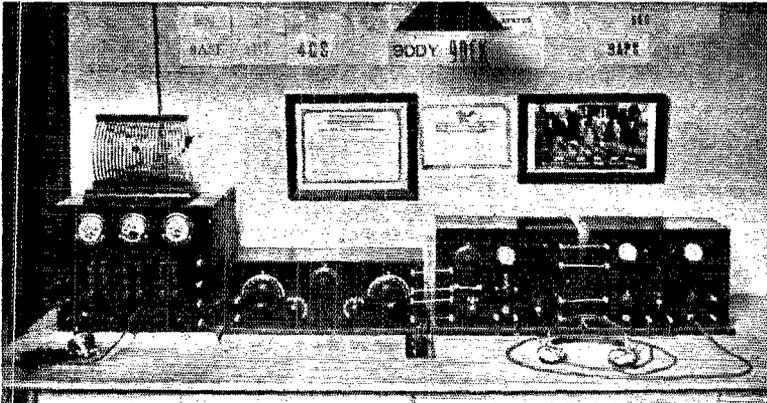
Avenue, Pelham Parkway, Bronx, N. Y., is the owner and chief operator.

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

1500 which is furnished through a home-made 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.



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

The counterpoise is a five-wire fan, each wire being 80 feet long and 10 feet high.

The signals of 5GP have been heard in 36 states and two Canadian provinces. The greatest distance worked to date is 2100 miles. Being an Official Relay Station of the A.R.R.L., considerable relay traffic is handled. John McCaa, 1025 Fairmount Ave., Anniston, Ala., is owner and operator.

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 modula-

tion 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 400 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.

Argentiniens 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 signified 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 Telegrafica*, published in Buenos Aires, has had charge of the test 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 PM Eastern Standard Time is nine PM 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

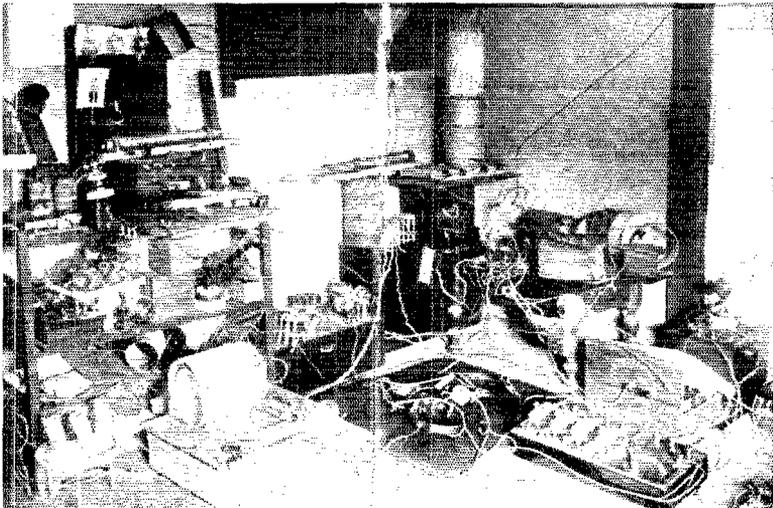
"The main event in amateur radio in Brazil during the past year has been the formation of the 'Radio Society of Brazil' which has for its main object, although not the sole one, the furtherance of amateur radio. In a country where any form of radio is new, it is exceedingly difficult to cultivate amateur radio in these times without going through the broadcast stages first. It is now a simple matter to obtain a receiving license whereas 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.



JFWA, Station of Mr. Hiroshi Ando, Tokyo, Japan

Just as soon as conditions permit, he, as well as several others, are planning to install good C.W. stations. The Brazilian amateurs no doubt will be a strong link in a future Pan-American relay route and we wish them the best of luck in getting started.

Japanese Experimenter Hears U. S. Hams

The American amateur hurled his signals into another far-off land recently when Mr. Hiroshi Ando, Japan's foremost radio experimenter, in company with several of his associates, listened to the signals of fourteen U. S. amateur stations. The complete list was reproduced in the Calls Heard section of the last *QST* and includes prominent stations in the first, second, fourth, sixth, seventh and ninth districts. An eight-tube receiver somewhat like a super-heterodyne but of a special type developed by Mr. Ando was used to accomplish this record reception.

So interested is Mr. Ando in amateur long distance communication that he ar-

ranged 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 wave length 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.

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

(Concluded on page 54)

Strays



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 punctures). 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 bum 60-cycle plate grumbles do not get thru it to speak of and only the beat 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-by-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 8XK 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

sending in lists of calls heard for that department of QST will be doing everyone a great favor by making separate lists for the amateurs of different nationalities. If you do not know the nationality of a station, please so list it, for it is getting to be very difficult to place the credit for a good record. Thanks.

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 us 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.

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.

Who's Who in AMATEUR WIRELESS

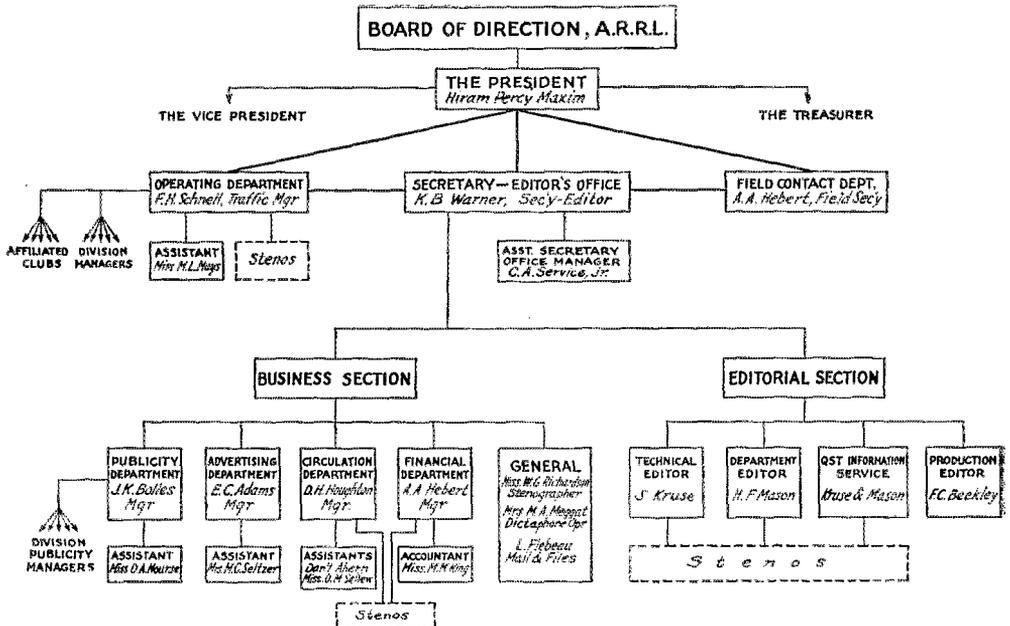


The Crew at 1045 Main Street

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

ing 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



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 build-

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

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. Each week a terrific quantity of mail enters and leaves our office; bulletins from the Publicity Department and the Operating Department, thousands of letters relating to every phase of the League's business; and once a month we turn out an issue of *QST*, which, believe us, means that quite a bit of work has been done by somebody.

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 1AW, which has been heard everywhere from Japan to Holland.



Hiram Percy Maxim

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.



Kenneth B. Warner

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.



Chas. A. Service, Jr.

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



F. H. Schnell

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 FS'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 Stand-

ards, 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 terrific 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), 3XK, 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 the 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.



Mrs. A. L. Sage



Arthur A. Hebert



S. Kruse

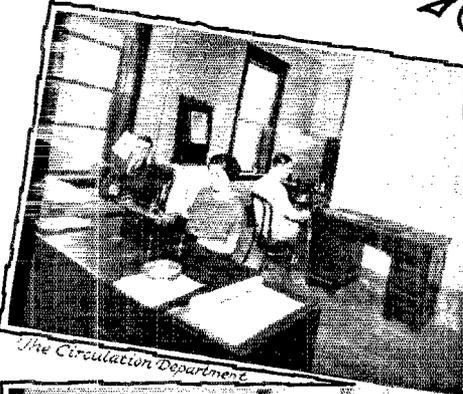


Howard F. Mason



F. C. Beekley

A Few Glimpses Around A.R.R.L. Headquarters



The Circulation Department



The Editorial & Publicity Departments



The Traffic Manager's Office



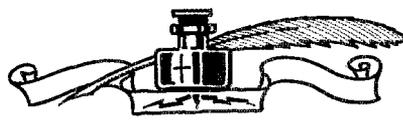
The Secretary-Editor's Office



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 IWC and IAEL—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



Edwin C. Adams

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 main-springs 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



Mrs. Marie C. Seltzer

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. She 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 organ-

ization parallels our Operating Department,



J. Kenneth Bolles

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 fudge pan (ask 9RR, he knows). She's the "DAN" the Inkslingers see on their letters, and she keeps their publicity clippings in big scrap books. When she hasn't anything else to do she's pawing over the incoming mail looking for a letter from New London—wonder why?



Dorothy A. Nourse

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



David H. Houghton

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



Daniel E. Ahern

what we mean.

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

Miss Dorothy M. Sellow 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.



Dorothy M. Sellow

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 Mr. Hebert and Peg



Margaret M. King

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.



Mrs. M. A. Meggat

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.



Winifred Richardson

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.



Lawrence G. Flebow

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.

Photos of Messrs. Maxim, Schnell, and Warner, by Bacharach; of Mr. Adams by Blackmore, Hartford.

INTERNATIONAL AMATEUR RADIO

(Concluded from page 45)

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 two-way 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 *fone* 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 barrel 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-watter 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 3ZZ can draw a cover.

The Junior Operator

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-

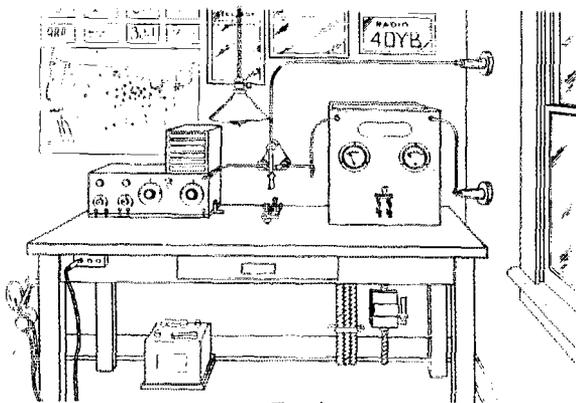


Fig. 1

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 $\frac{3}{4}$ 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 $\frac{3}{4}$ inch wide and $\frac{1}{8}$ 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)

(Continued from page 56)

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 for 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, insofar 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-

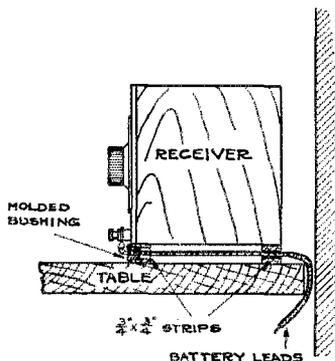


Fig. 2.

tering insulators is copper tubing about $\frac{1}{8}$ inch in diameter. It will hold its shape and, when polished, adds considerably to the station's appearance. The entering insulators should be located so the leads connecting to them will be short and direct. The antenna and counterpoise leads should not run parallel, however, and should be as far apart as possible.

Lightning Protection and the Lead-In

Antenna and counterpoise grounding switches are required by the National Board of Fire Underwriters. Their installations not only puts you right with your insurance company, but protects your station as well. They are a practical necessity throughout the greater part of the country, but in parts where electrical storms never occur they are necessary only to satisfy the requirements.

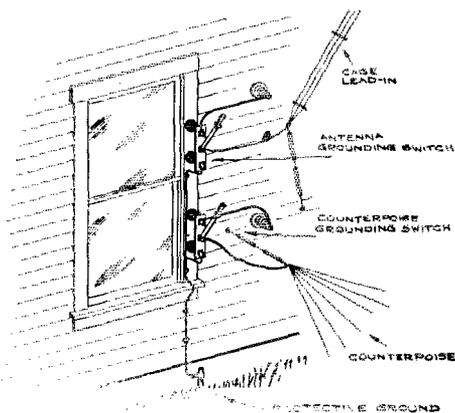
Each of these switches is a double-throw knife switch having a break distance of four inches and a blade not less than one

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 of 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 is no reason a 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:

District	Name	Address
1	Charles C. Kolster	Customhouse, Boston
2	Arthur Batcheller	Customhouse, New York
3	R. Y. Cadmus	Customhouse, Baltimore
4	Walter Van Nostrand, Jr.	Federal Bldg., Atlanta
5	Theodore G. Deiler	Customhouse, New Orleans
6	John F. Dillon	Customhouse, San Francisco
7	O. R. Redfern	2301 L. C. Smith Bldg., Seattle, Wash.
8	S. W. Edwards	Federal Bldg., Detroit
9	E. A. Beane	Federal Bldg., Chicago

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

The Publishers of QST assume no responsibility for statements made herein by correspondents



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 20 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 kiddie 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 shuffle to bed in early morn, whipped 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 honey-comb 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, N.S.S. 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 were 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*:

Wonder if anyone ever went to the trouble to examine a chart of the N. Atlantic Ocean for the purpose of finding 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, 1,230 miles from Brest, France and 1,275 miles from Lands End, England.

To prove that sigs come thru out that way, heres a list of the most consistent stations copied on April 29th while 230 miles N.N.W. of Flores: 1AR, 1ARY, 1ASI, 1CNI, 1CRE, 1GV, 1SN, 2BMR, 2CEI, 2CQZ, 2RM, 3BG, 3BSS, 3HS, 3JJ, 3TR, 3ZO, 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 sigs 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 fiancée 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 opinion; 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 DX 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, 9MC (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.

Code letter on tube	Voltage to be used
A	8.7-9.0
B	9.0-9.25
C	9.25-9.50
D	9.50-9.75
E	9.75-10.00

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

Code letter on tube	Voltage to be used
A	10.75-11.00
B	11.00-11.25
C	11.25-11.50
D	11.50-11.75
E	11.75-12.00

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 over-voltages and the life of the tube greatly reduced. Attempts to use the enormous over-voltages 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 36)

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, 1923 *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 freindly 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.

[This is the last article of this series. 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.]

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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 22½ 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

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ENGINEERS • DRY BATTERIES • MANUFACTURERS
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"ASK ANY RADIO ENGINEER"

BURGESS

RADIO BATTERIES

Equal to All Demands

THIS IS NUMBER FOUR OF A SERIES

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 ampere.

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

"B" Volts	WD-11	UV-199	UV-201	UV-201-A
	WD-12	C-299	C-301	C-301-A
22½	0.5	0.5	0.5	0.5
45	1.5	1.4	1.5	1.5
67½	2.5	2.4	2.5	3.5
90	4.5	4.0	3.9	6.0

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.

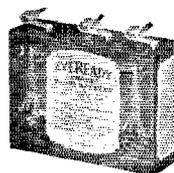
"the life of your radio"



The Metal Case Eveready "B" Battery No. 766. The popular 22½-volt Eveready Battery in a new, handsome, durable, waterproof

metal case. At all dealers, \$3.00.

Eveready "B" Battery No. 767. Contains 30 large size cells, as used in the popular No. 766. Voltage, 45. Made especially for sets using detector and one or more stages of amplification. The most economical "B" Battery where 45 volts are required. At all dealers, \$5.50.



Eveready Radio Battery No. 771. The Eveready "Three," the ideal "C" Battery. Voltage, 4½—three terminals permitting the use of 1½, 3, or 4½ volts. The correct use of this battery greatly prolongs the life of the

"B" Battery. At all dealers, 70 cents.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, INC.
Headquarters for Radio Battery information
New York, N. Y.

EVEREADY

Radio Batteries

—they last longer

NOTE—This is No. 4 of a series of informative advertisements, printed to enable users to realize the utmost in battery economy. If you have any battery problem, write to G. C. Furness, Manager, Radio Division, National Carbon Co., Inc., 124 Thompson Avenue, Long Island City, N. Y. Ask for special booklets on "A", "B" and "C" batteries.

"THE AIR IS FULL OF THINGS YOU SHOULDN'T MISS"



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.

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

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

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 "B", 22½ volts,
No 766 with Six Fahnestock
Spring Clip Connectors

Radio has moved from the laboratory and amateur's work-table 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.



EVEREADY Radio Batteries

—they last longer

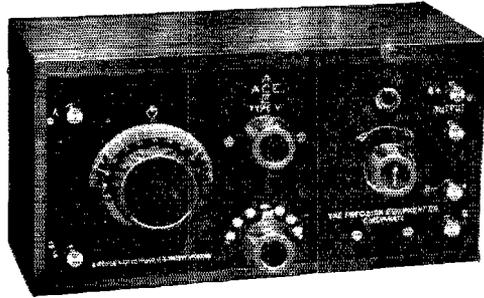


A PERFECT SET

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.

All Ace Radio Sets
Manufactured Under
Armstrong U.S. Patent
No. 1,113,149.

THE PRECISION EQUIPMENT CO.

Powel Grosley, Jr., President

118 Vandalia Ave., Cincinnati, Ohio

The COURT JESTER of TODAY

"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 became 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 merriment.

With a Crosley Modey X-J radio receiver, amusement may be brought 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 Crosley instruments bring radio within the reach of all. No matter which Crosley 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

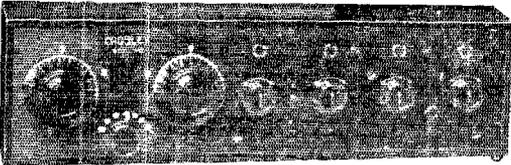
See the Crosley Line
at Good Dealers Everywhere

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 Console Model X-L at \$140. It also shows the complete line of Crosley parts.



CROSLEY \$
Model X-J **65**

The Broadcasting Station WLW
is maintained by the
CROSLEY MANUFACTURING COMPANY



Crosley Model X-J—Price \$65

For tuning out local interference and bringing in distant stations this receiver is unexcelled. It is a 4 tube set combining one stage of tuned radio frequency 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.
Powel Crosley, Jr., President
118 Alfred Street, Cincinnati, Ohio

MAIL THIS COUPON TODAY

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

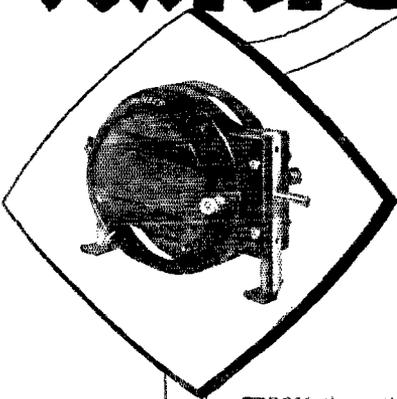
Gentlemen: Please mail me free of charge your complete catalog of Crosley instruments and parts together with booklet entitled "The Simplicity of Radio."

Name

Address

ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

REMLER VARIOMETER



**Acknowledged
Everywhere**

**AS THE MOST EFFICIENT
RADIO ITEM ON THE
MARKET**

**INTERNAL PIGTAIL CONNEC-
TIONS—WAVE LENGTH
RANGE 180-570 METERS POS-
ITIVELY GUARANTEED**

**TYPE
500**

**WITH
CLOSED
ROTOR**

\$7.50

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 variocoupler. When used with a *Remler variocoupler* the wave length is guaranteed to be from 180 to at least 370 meters. All meta. parts are buffed and nicked; 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.

Remler Radio Mfg. Co.,
182 Second St., San Francisco
Gentlemen:—

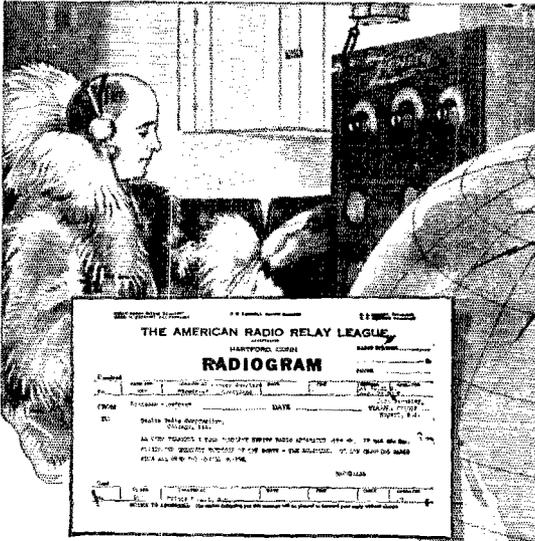
As my dealer is unable to supply me with your new Remler Variometer I wish to place my order direct with you and am enclosing certified check or money order for \$7.50. It is understood that if after a 10 day free trial I find that this Variometer does not conform to your statements, my money will be refunded upon return of the instrument to you in the condition it was received.

Name

Address

Remler Radio Mfg. Co.

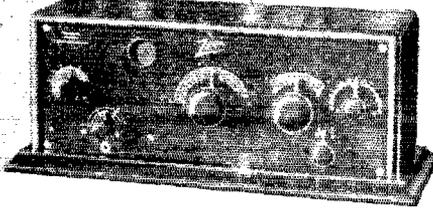
Home Office
154 West Lake St., 182 Second Street 30 Church Street
Chicago San Francisco New York City



ZENITH

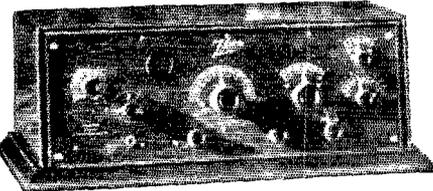
Licensed under
 Armstrong
 U. S. Patent
 No. 1,118,118

AT THE NORTH POLE



MODEL 4R—The new Zenith 4R "Long-Distance" Receiver-Amplifier comprises a complete three-circuit regenerative receiver of the feed-back 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**

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 ship-mates 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?**

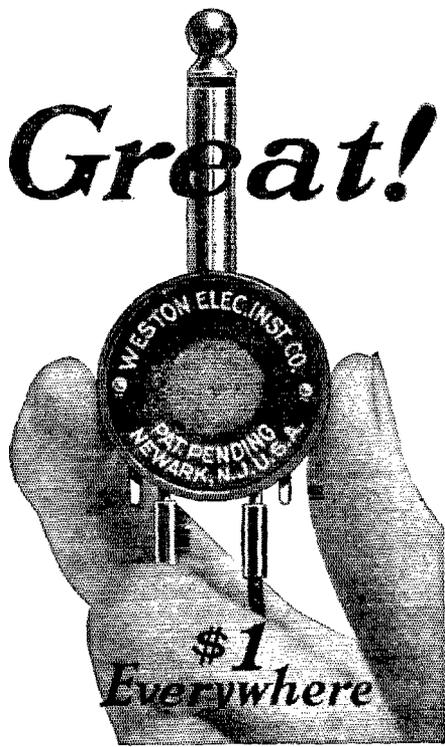
The set that Dr. MacMillan has is a standard Zenith receiving set. And you can do all that MacMillan does, and more, with either of the two new models shown at the right. Their moderate price brings them easily within your reach. Write today for full particulars.

Zenith Radio Corporation
 McCormick Building, Chicago



ZENITH RADIO CORPORATION,
 Dept. D 328 So. Michigan Ave., Chicago, Ill.
 Gentlemen:—
 Please send me illustrated literature on Zenith Radio.
 Name
 Address

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.
Branch Offices in All Principal Cities

Electrical
Indicating
Instrument
Authorities
Since 1888

WESTON

STANDARD - The World Over



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?

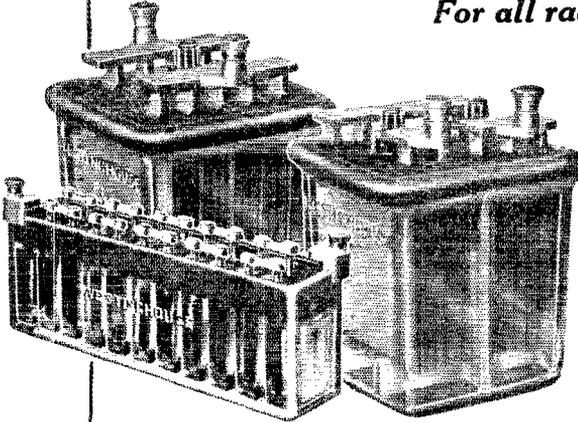


Stromberg-Carlson

WESTINGHOUSE

CRYSTAL CASE "A," "B" and "C" BATTERIES

For all radio requirements



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 22-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.

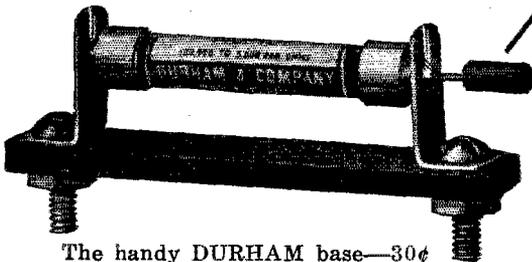


Get that extra-DX a bit more often

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.

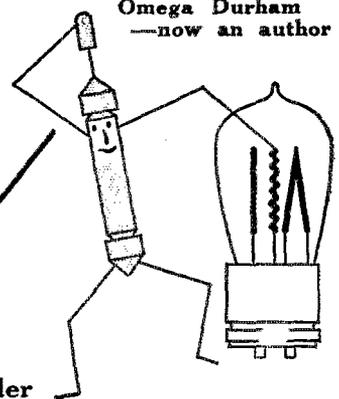
New folder—Free

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



The handy DURHAM base—30¢

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 2½ Volts—¼ 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.

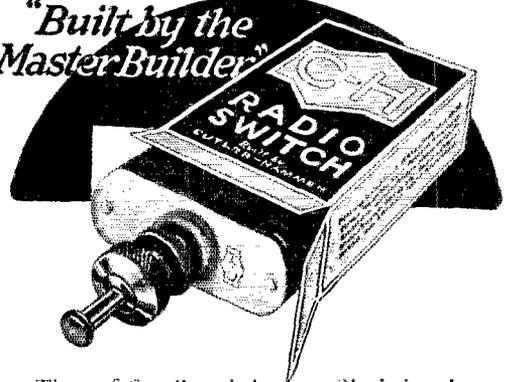
At your Dealer—otherwise send purchase price and you will be supplied Postpaid.

Sole Manufacturers

F. B. Myers Co. Ltd.
Radio Vacuum Tubes

240 Craig Street, West
MONTREAL, CANADA

"Built by the
Master Builder"

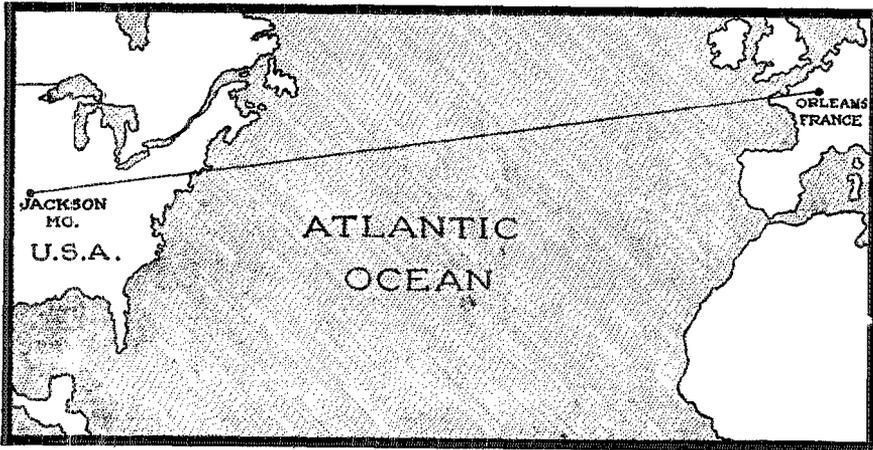


The perfect radio switch—correctly designed and skillfully constructed. Installed on any panel in five minutes to add hours of convenience, and protect both tubes and batteries. At dealers everywhere—insist on the genuine—in the orange and blue box. If your dealer has not been stocked send 60c plus 10c for packing and you will be supplied direct.

THE CUTLER-HAMMER MFG. CO.

Member Radio Section
Associated Manufacturers of Electrical Supplies
Milwaukee, Wisconsin

RADIO SWITCH



MISSOURI reaches *FRANCE* and thanks *ACME*

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 $1\frac{1}{2}$ 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:

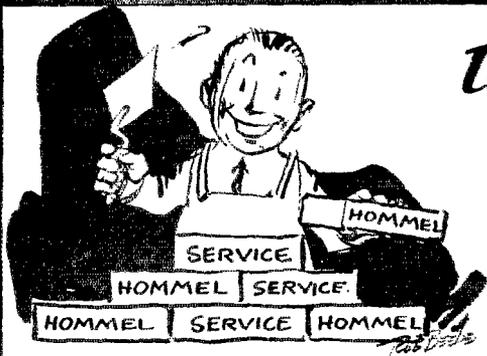
- Transmitting Apparatus
- Receiving Apparatus
- Booklet on Amplification without distortion (Enclose 10¢)

Name

Street

City

State



Use **HOMMEL SERVICE** to build your radio business

AMATEURS—Tell us what you are interested in—send us the name of your dealer and we will see that you are supplied promptly.

Complete stocks of strictly high grade nationally advertised radio apparatus are constantly carried by this company to enable you to build your radio business on the right foundation. Your success is dependent largely on the products you sell, and your ability to serve your customers promptly.

Aligning yourself with the Hommel organization makes it possible for you to always have access to ample stocks of the leading lines of radio equipment without the necessity of tying up your working capital.

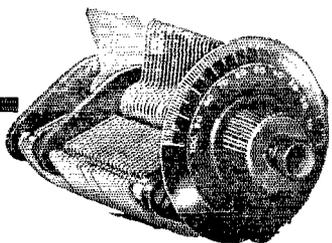
*Let us show you how you can advantageously use Hommel Service—
Write for Hommel's Encyclopedia of Radio Apparatus 2236-T.*

LUDWIG HOMMEL & CO

530-534 FERNANDO ST.



PITTSBURGH, PENNA



U. S. TOOL CONDENSERS

Oxidizing of ordinary plates and spacers, creates a high resistance to the weak radio frequency currents. U. S. Tool Condensers are protected from this deterioration by a special counter-chemical treatment. End plates of Laminated Condensite-Cel-eron. Reasons for the persistent efficiency of U. S. Tool Condensers. Unconditionally guaranteed.—Write for booklet.

**U. S. TOOL
COMPANY INC.**

**112 Mechanic St.
Newark, N. J.**



The Champ—VARIOMETER No. 53

Approved as a Record Breaker

Approved—because it makes 800 Meters.

Approved—because perfectly constructed.

Approved—because it has a genuine mahogany stator and a kiln dried rotor.

Approved—because of Fahnestock spring clip connections and non-conductive adhesive.

Approved—because you'll know why when you

GET ONE FOR \$3.50

20 Diagrams FREE with Each

For sale at your dealer's—otherwise send the \$3.50 directly to the manufacturer and you will be supplied postpaid.

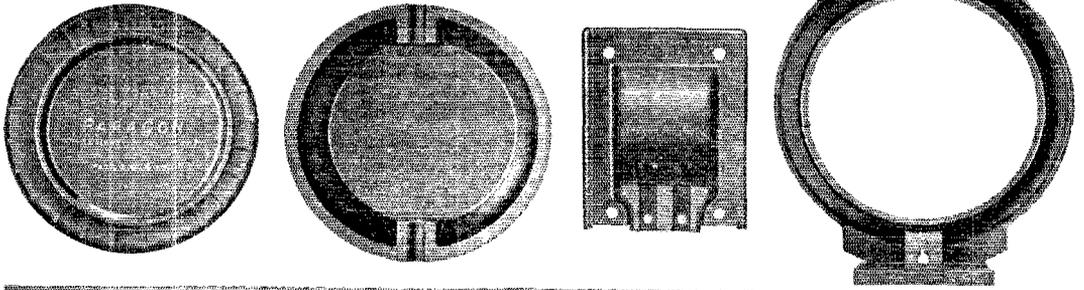
G. H. FISCHER & CO.

123 Liberty St.

New York City

BAKELITE

REG. U.S. PAT. OFF.



Paragon and Bakelite

The pleasure and satisfaction that the Paragon Receiver brings to the family circle is appreciably increased through the use of Bakelite.

Bakelite possesses a combination of properties not found in other materials, which makes it peculiarly suitable for this service. Its excellent electric properties provide complete insulation that remains unimpaired under all atmospheric conditions. Because of its high temperature resistance and non-absorbent properties, Bakelite performs equally well in all climates.

Its great mechanical strength, permanent beauty of finish and color enhances the value of any Radio Equipment in which it is used.

The Adams-Morgan Company chose Bakelite because of these desirable qualities and, for the same reason, leading Radio Manufacturers have adopted Bakelite as standard insulation for the manufacture of parts and complete units.

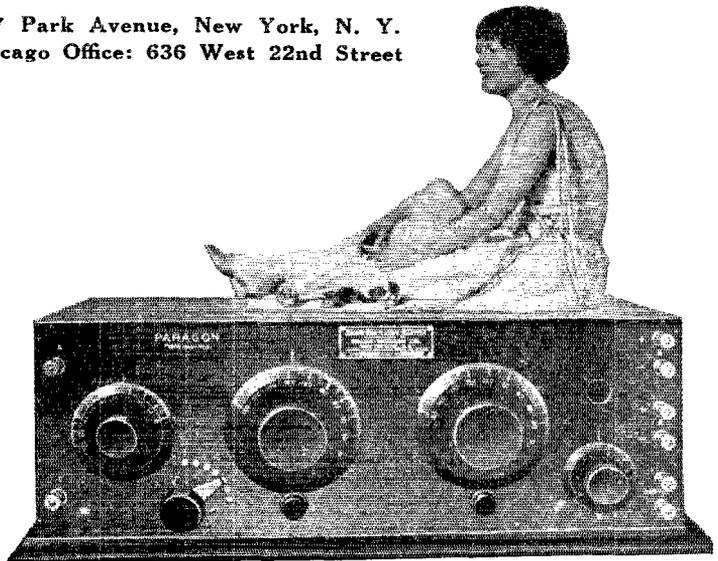
Send us your name and address and we will mail you a copy of our Radio Booklet C.

BAKELITE CORPORATION

247 Park Avenue, New York, N. Y.
Chicago Office: 636 West 22nd Street

BAKELITE Condensite *REDMANOL*

are the registered
Trade Marks for the
Phenol Resin Products
manufactured under
patents owned by
**BAKELITE
CORPORATION**

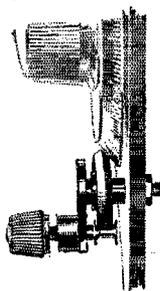


THE MATERIAL OF A THOUSAND USES

TINY-TURN

A New and Superior Vernier Control

TINY TURN makes possible an exactness in tuning never before attained. It has a 30 to 1 gear ratio instead of only 4 or 5 to 1 as in the ordinary vernier. No lost motion! The vernier turns in the same direction as dial. It can be instantly disengaged, leaving dial free. **INSTALLED ON ANY SET IN 3 MINUTES.** Handsome nickel and black finish. Packed in individual containers. We furnish counter display demonstrating boards.

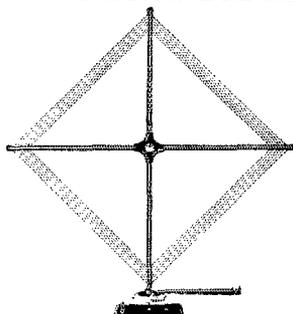


*Pats. Pend.
Side View showing friction drive against dial.*

Price 75 cents

DUO-SPIRAL

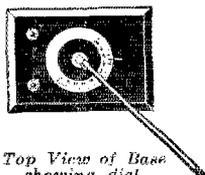
The Leading Loop Aerial With New Dial and Handle



Pats. Pend.

Careful tests of all variable loop aerials by leading manufacturers and radio engineers proves the superiority of the DUO-SPIRAL Loop. It is used exclusively by the largest manufacturers of radio frequency sets. It is trim and neat in appearance and handsomely finished. It rotates freely on its base.

Adjustment is made easy by handsome dial and a long handle which eliminates all body capacity effects. The green double silk covered wire is kept always taut by hidden springs. The DUO-SPIRAL



Top View of Base showing dial.

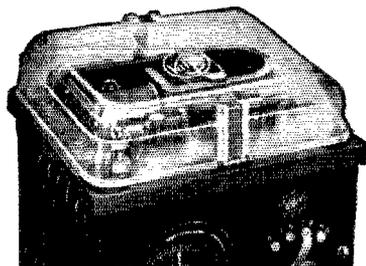
loop completely replaces roof antenna and ground practically eliminates static. It is right in every detail.

24-inch size...\$8.50. 12-inch size...\$7.50
(These prices include new dial and handle)

The above products (folders on request) are sold through dealers and jobbers. If your dealer cannot supply you, write us direct.

RADIO UNITS INC

Suite 508, Webster Building,
Chicago, Illinois



For All Batteries

One Charger for Every

RADIO BATTERY

Longer distance and clear signals are the pleasing results which you can be sure of when both the A and B batteries of your radio set are storage batteries. No other source of power for radio equals the storage battery.

The Valley Type ABC Battery Charger is so simple and so easily operated that it makes storage batteries the most convenient and inexpensive source of power for radio. Enjoy radio at its best. Use storage batteries and charge them with the Valley Type ABC Battery Charger.

The Valley Type ABC Battery Charger is made to charge:

- 2-volt Peanut Tube Batteries
- 6-volt A Batteries
- 6 and 12-volt Automobile Batteries
- 1 to 4 B Batteries

Bakelite panel, glass top. Harmonizes with any receiving set. And as simple as ABC to operate. Plugs in on the light socket like a lamp and connects to battery by means of regular battery clamps.

At all good radio shops.

VALLEY ELECTRIC CO.,
3157 S. Kingshighway, St. Louis, Mo.

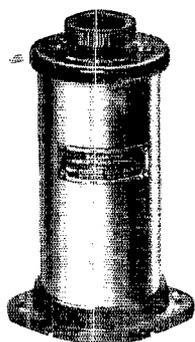
Valley Battery Charger

RADIO FREQUENCY AMPLIFICATION

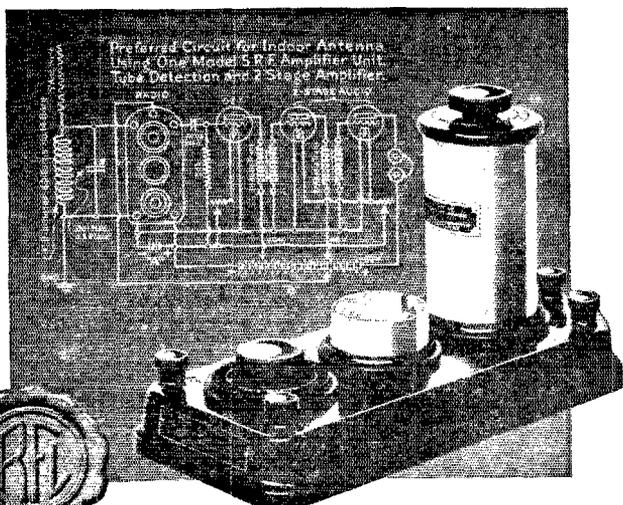
WITH

Ballantine Variotransformers

(Patents Pending)



Model 5 \$9.60



Complete Unit \$15.00

"TURN THE KNOB"

1. Continuous variation in wave length.
2. Self-contained and shielded.
3. Control of regeneration and tuning by single knob: *no potentiometer.*
4. Fits your set — either base or panel mounting.
5. Improved tone quality.

"Radio Frequency Amplification with the Ballantine Variotransformers" — a 25-page booklet — mailed free on request.

BOONTON RUBBER MFG. CO.

Pioneers in Bakelite Moulding

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BOONTON, NEW JERSEY

The unexcelled performance of Federal Standard Radio Products

is the audible evidence of the fine material and engineering skill which go into every Federal part. And the Federal guarantee is the insurance of satisfaction to every Federal purchaser.



Federal Head Sets are one of the more than 130 radio products which Federal manufactures and guarantees. Your receiving set is no better than its weakest part. Insist on Federal.



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The Satisfactory Charger For Ten Years Past

The F-F, the first successful mechanical charger, is now the most popular. F-F features are distinctive, its construction is simple, and the absence of breakable parts which are expensive to replace, is almost sufficient reason for you to own the F-F; but the satisfaction you will buy with the low purchase price of the F-F is further reason why you should insist on the F-F.

Buy from your dealer. There's a type for every need. If he cannot supply you, write for literature or enclose remittance covering express or postal charges on 9 lbs.

IT'S FREE—Write for Bulletin No. 31

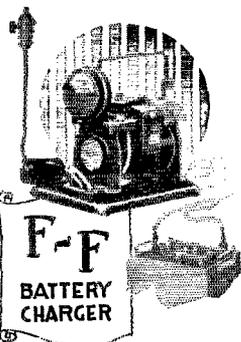
\$15.00

F. O. B. Cleveland

Type 6 charges 6 volt Storage Battery from any 110 Volt 60 Cycle lamp socket at average rate of 6 amperes, or over if battery needs it.

The France Mfg. Co.
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Oldest Manufacturer of the First Successful Mechanical Charger.



The New Freshman CAPACITY FINDER

permits you to actually measure the condenser values necessary in your hook-up

31

Capacities for
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5

FIND OUT

just what value of a condenser will give your hook-up the best results in the grid circuits, across the phones, in the Antenna Circuit, across transformers, battery circuits, etc.

Price \$2.25

including the 5 special Freshman Condensers.



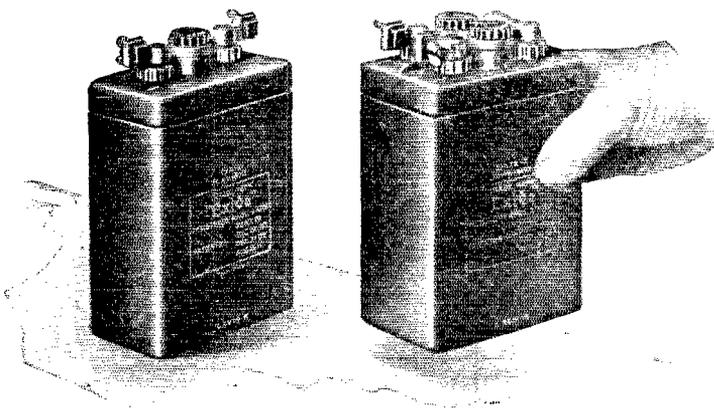
At your dealers, otherwise send purchase price and you will be supplied postpaid. Ask your dealer or write for complete instructions free.

Chas. Freshman Co. Inc.

Radio Condenser Products

106 Seventh Avenue

New York

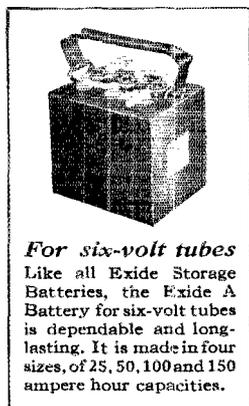


What you have been waiting for

HERE are two rugged little storage batteries designed particularly for low-voltage tubes.

Although they weigh only 5 and 6 pounds, they are of true Exide quality. Highly efficient and with ample power for long-distance receiving, these batteries will give you a type of service that you would find it hard to duplicate.

These sturdy little batteries are neat and compact. They were specially designed for WD-11 and UV-199 vacuum tubes, but can be used with any low-voltage tube. The two-volt Exide A Battery consists of a single cell. It will heat the filament of a WD-11 or other quarter-ampere tube for approximately 96 hours. The four-volt A Battery, having two cells, will light the filament of a UV-199 tube for 200 hours.



For six-volt tubes

Like all Exide Storage Batteries, the Exide A Battery for six-volt tubes is dependable and long-lasting. It is made in four sizes, of 25, 50, 100 and 150 ampere hour capacities.

adjustment that make radio receiving an unalloyed pleasure.

As you know, any variation of current in the plate circuit produces weird sounds in your phones. With an Exide B Battery hooked up to your set, static is the only undesirable sound you will have to contend with. The Exide B Battery supplies steady, noiseless current. It permits the niceties of

The Exide A Battery for six-volt tubes has extra-heavy plates, assuring constant potential and uniform current over a long period of discharge. Like all Exide Batteries, it embodies the finest materials available.

In marine and commercial wireless

On sea and on land the Exide plays an important role in the industrial life of the nation. In marine wireless, Exide Batteries provide an indispensable store of emergency current. A majority of all government and commercial wireless plants are equipped with Exides.

Exide Radio Batteries are sold by radio dealers and Exide Service Stations everywhere. Ask your dealer for booklets describing in detail the complete line of Exide Radio Batteries. Or write direct to us.



Exide B Batteries

give noiseless, full-powered service over a long period of discharge. Designed throughout to prevent electrical leakage. Capacity, 3 ampere hours.

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Oldest and largest manufacturers in the world of storage batteries for every purpose

Service Stations Everywhere

Branches in Seventeen Cities

Dr. Wm. D. Reynolds,
Denver, Colo.

Hyattville, Wyo.
May 30. 23.

Dear Dr:

As to results obtained with the little Electric Specialty Dynamotor, I am pleased to say I have been getting wonderful results with it, but instead of running off 6 volt battery, have been using an 8 volt, which gives me a high voltage of 600 Volts and, what everybody says, a Beautiful Tone, every card I get mentions that a fine note I have; I have talked Fone (using loop modulation) with 5SK at Fort Worth Texas, after daylight in the morning, Falconi at 52A Roswell New Mex. says my fone so QSA he can hear it 10 feet from Fones, and work him with CW way after sun rise, which is going some; I work most all the Boys in Denver and they're all crazy about my tone. I am more than pleased with the Dynamotor, and any time I can be of service to you regarding its action just let me know.

Yours truly,

L. G. Van Slyke

TRADE "ESCO" MARK

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ELECTRIC SPECIALTY COMPANY
STAMFORD, CONN, U. S. A.



TRADE MARK

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REG. U. S. PAT. OFFICE

LOUD SPEAKER

A REAL REPRODUCER
OF THE ORIGINAL BROADCASTING

It is easy to listen to the reproductions made by the Audiophone because they are so perfect. The speech, the songs, and instrumental music are not blurred or disguised by mechanical distortions. You will get all the fine shadings and every inflection. In fact, the very personality of the artist seems to be present as you listen.
Made in three models—

Senior Audiophone.....Price \$32.50
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THE BRISTOL COMPANY
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Get this new
**MURDOCK
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and you can connect
four pairs of head-
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Radio Set at
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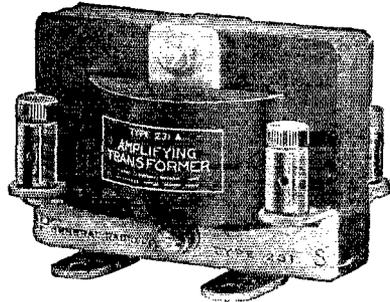
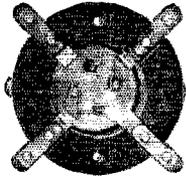
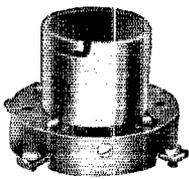
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MURDOCK Radio Apparatus
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by General Radio amplifying units saves time, money and patience.

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Types

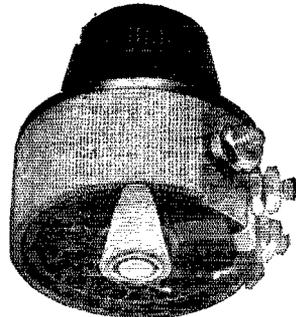
Prices

300C for UV 199 tube \$7.75

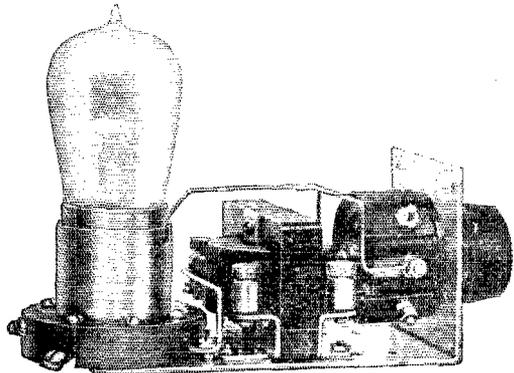
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Write for free descriptive
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Plus a
**QUALITY
RHEOSTAT**



Makes a
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Manufacturers of
ELECTRICAL AND LABORATORY APPARATUS
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**ANYONE Can
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RADIODYNE

"The Voice of the Nation"

You don't have to be an expert to install and operate the RADIODYNE effectively. It is operated by simply grounding to a water pipe or radiator and throwing a few feet of wire on the floor. No outside antenna or loops necessary. For use in apartments, boats, automobiles, railroad trains, etc., the RADIODYNE is enjoyable where other types of receiving sets would not be practical.

Stations within a radius of 2000 miles can be picked up on the loud speaker any wavelength from 200 to 700 meters. The RADIODYNE is so sensitive that it picks up Radio telephone speech and music when other types of equipment fail.

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We appreciate your efforts in boosting W.C. sets and are always pleased to furnish full information about them to members who have not yet had the opportunity to operate a Radiodyne. We want every member to know the merits of this efficient outfit. If you are interested we will gladly send you a complete description of the Radiodyne together with information as to where you can see one in operation.

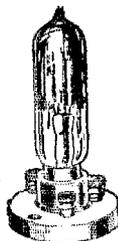
Just drop us a line and we will see that your inquiry gets prompt attention

Western Coil & Electrical Company
305 5th St. Racine, Wisconsin

ELECTRAD PRODUCTS

\$2

Socket 50c

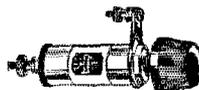


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Reflex Cir-
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The NEW DIODE

Discard crystals! Use the Electrad Diode in all circuits. Overcomes former difficulties with reflex work. Gives greater volume, greater selectivity and steadies the circuit. Eliminates tedious adjustments for change of wave lengths. A perfect detector tube. Real results. Absolutely guaranteed.

Radio's Greatest Invention



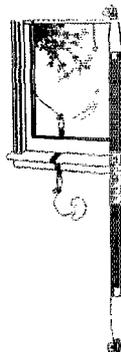
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Double your receiving distance. Give the precision value of grid leak resistance your detector tube requires. Variohm does the work of a thousand ordinary grid leaks. Resistance variations secured are infinitely close and gradual, not by steps and jumps. Range $\frac{1}{4}$ to 10 megohms. Increases volume. Eliminates circuit noises. Enables you to get distant stations clear and distinct. Absolutely guaranteed.

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Fits right under closed window. Can be bent into any shape to fit ledges. Covered with fire-proof insulating material which prevents grounding of circuits on wet window sills. Takes the place of ungainly porcelain tubes and holes in the window sash. Always presents a neat appearance.



40c

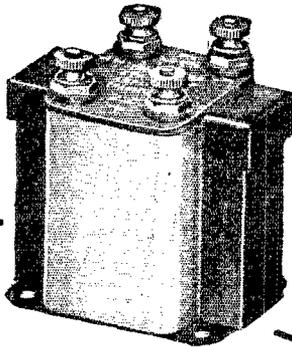
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THORDARSON KENNEDY

The Royalty  *of Radio*

The Colin B. Kennedy Co., internationally renowned for their **QUALITY RECEIVING SETS**, are equipping all their sets with Thordarson super-transformers.



BE

CONVINCED



The Zenith Radio Corporation, manufacturers of **LONG DISTANCE RADIO RECEIVERS**, famous for the Berengaria record and their accomplishments on the S. S. Bowdoin at the North Pole, also have adopted Thordarson super-transformers as standard equipment.

SUPER TRANSFORMER

YOUR "B" BATTERY!

Test it with a

\$2.50

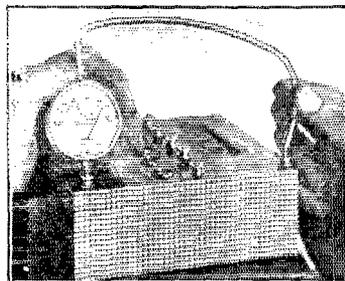
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Pocket Meter

Range: 0-50 volts

In addition HOYT builds a complete line of meters for receiving work: PEEP-HOLE—specially designed to fit in the peep-hole on the panel—will protect your tubes—no guess work. Built as a volt-meter or ammeter.



RADIO ROTARY—a general testing volt-ammeter of exclusive design.

SWITCHBOARD METERS—A complete line ranging in diameter from 2 1/4" to 8".

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RADIO METERS.
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Get a U. S. Government Commercial License

New Term Begins
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We give separate
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The radio profession pays well. Amateur experimenters are in great demand. Your present knowledge will shorten your course with us. Commercialize your amateur experience. Special amateur stations with wave power privileges demand extra first grade amateur licenses which require 20 words code speed and definite knowledge of tube circuits. There is a great shortage of commercial operators. Wages are rising; some companies are paying as high as \$140.00 a month. Sail on American ships to all parts of the world. Positions guaranteed. Through our favorable connections with operating companies as well as our continued success in training operators we are now supplying about 90% of the ship operators sailing from Boston.

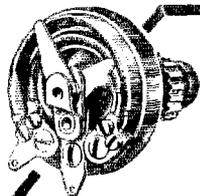
G. R. Entwistle, Radio Director

Mass. Radio & Telegraph School, Inc.

18 Boylston Street

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Entirely New Principle

Premier

MICROSTAT

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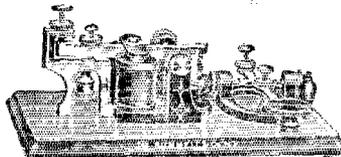
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\$3.00 Two windings in parallel—one 6 ohms—other 40 ohms. Absolutely noiseless. Infinite control. Handles any tube. Cap. 3 amp. Bakelite molded. Silver etched dial. Fully guaranteed. Ask your dealer. Get our Free Bulletin No. 92.

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One dry cell is all that is required to operate this instrument.

Made by the best Telegraph Instrument Makers in the World.

Other types carried in stock.

Send stamp for Telegraph Manual No. 43Q.

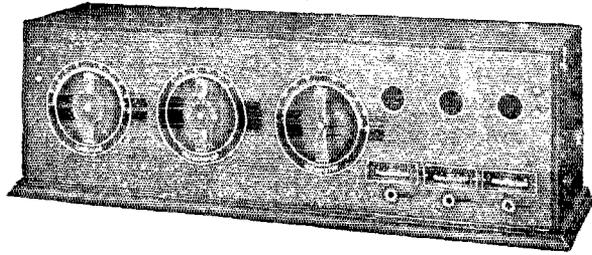
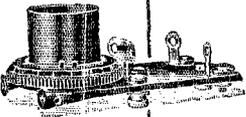
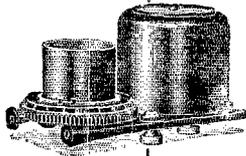
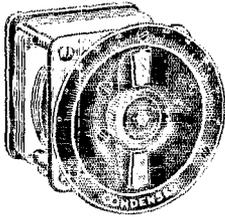
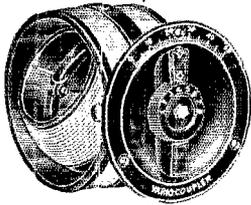
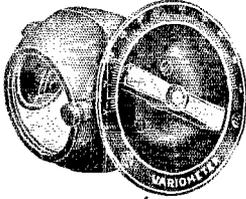
Instrument only.....\$5.00

With dry battery.....5.50

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Build your own Radio Set

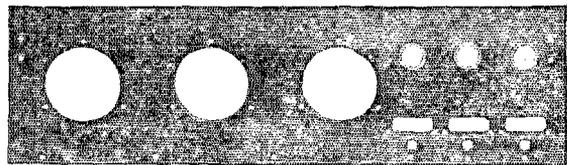
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The panels are completely drilled, and the parts are simply fastened with screws and nuts.

Any circuit desired may be employed. We have eight different types of panels.

The crystal black panel finish, together with the concave dials, lend a pleasing effect—the absence of knobs giving a clean, flush appearance.

You can build, or buy, a cabinet to suit your individual taste.



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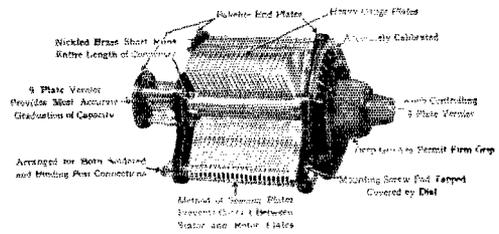
William N. Shaw, President

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Produces results not possible with ordinary type condensers. The 9 plate **VERNIER** feature is far more selective than the single or any multiplication of larger plates. The **RADIOSCOPE** is made in 45 and 23 plate type. It is extremely accurate and tunes sharply.

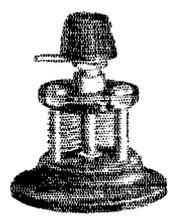


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Carefully designed for high oscillating **RADIO FREQUENCY** Circuits. We have developed a **Special High Resistance Insulation** which is used between the rotor and stator plates to prevent leakage of **Radio Frequency Currents**. This **Special Insulation** shows lower losses than any of the **Phenol Insulating materials** now on the market. Made in 45 and 23 plate types with and without Vernier.

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NEW PLUG

140 No. **2-FONE** 60c

The biggest value in a high grade 2-Fone Plug on the market. Takes two pair of **FROST-FONES**. Holds cord tips tight—never lets go. Secure several today at your dealers.

HERBERT H. FROST, Inc.
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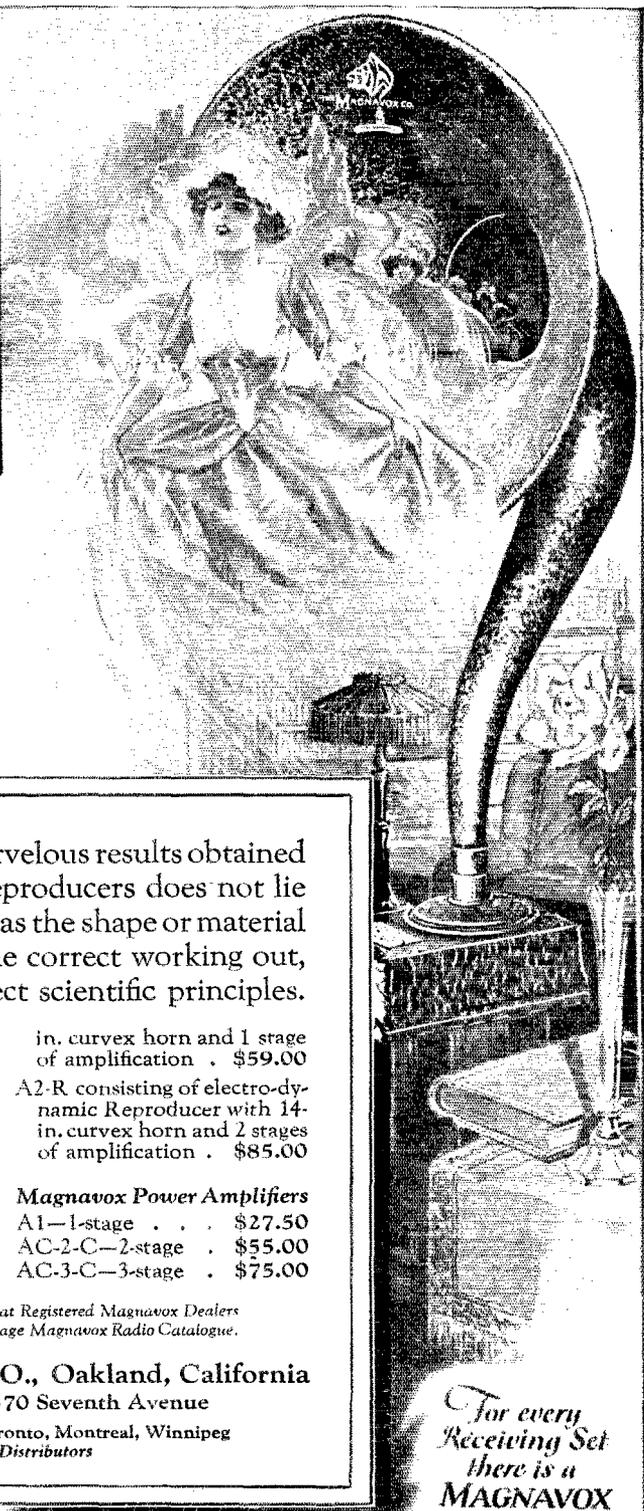
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THE secret of the marvelous results obtained with Magnavox Reproducers does not lie in any one feature (such as the shape or material of the horn) but in the correct working out, in all features, of correct scientific principles.

Magnavox Reproducer
R2 with 18-inch curvex horn . . . \$60.00
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1R

*For every
Receiving Set
there is a
MAGNAVOX*

To Our Readers Who Are Not A.R.R.L. Members

Wouldn't you like to become a member of the American Radio Relay League? We need you in this big organization of radio amateurs, the only national amateur association that does things. From your reading of *QST* you have gained a knowledge of the nature of the League and what it does, and you have read of its purposes as set forth on page 6 of every issue. We would like to have you become a full-fledged member and add your strength to ours in the things we are undertaking for Amateur Radio, and incidentally you will have *QST* delivered at your door each month. A convenient application form is printed below—clip it out and mail it today.

.....1923

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.

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Station call, if any.....

Grade operator's license, if any.....

Radio Clubs of which a member.....

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.

FANSTEEL

Balkite

PATENTS
APPLIED FOR

Battery Charger

A new battery charger for Radio "A" batteries, entirely noiseless, and indestructible. Has no moving parts, requires no attention, and cannot get out of order. Can be used while the radio set is in operation. A simple, positive, economical battery charger for home use. Write for folder giving full description.

Dept. Q4 - Fansteel Products Co., Inc.
North Chicago, Illinois

MARLE TRANSFORMERS

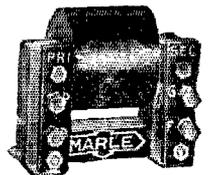
Audio and Radio
Frequency
Give Best Results.

Superior Quality
Reasonably Priced

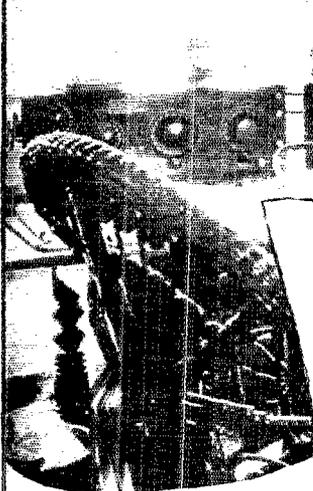
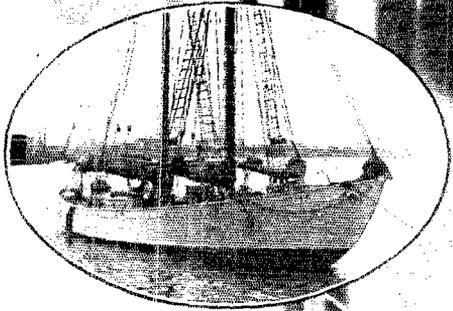
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Orange N. J.



TYPE A4
RATIO 3 3/4 to 1
Price \$3.75



Experimental Radio Station 9BP
Prince Rupert, B.C., Canada

September 26th, 1925.

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

Dear Sirs:-

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 Wiscasset, Maine on June 23rd, on board the radio equipped Schooner "Bowdoin" planned to keep in touch with the outside world by amateur radio. This they were able to do until they got North of Disco Island, Greenland. After going North of that point nothing was heard of the expedition. And all interested became worried at the ship's apparent silence. The Chicago Radio Laboratory on this account offered a duplicate of the receiving apparatus aboard the "Bowdoin" as a prize to the first amateur to get into communication with the Arctic 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" expedition (who are in winter quarters frozen in at Refuge Harbour, which is ten miles North of Greenland Latitude 78.50 North, Longitude 72.30 West) on September 7th. I have had a working schedule with the operator and have copied one 600 word and one 381 word press message from them addressed to the New York World, together with dozens of private messages from the expedition and a complete list of amateur calls heard (a total of 546 calls) by the "Bowdoin" from July 28th to September 20th. 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, I consider this quite a record for "PARAGON APPARATUS" and am glad to be able to advise you how proud I am of my receiving apparatus.

Yours very truly

Jack Barnsley

MacMillan's
Link with
Civilization

A Paragon Radio Receiver is the most dependable link between MacMillan's courageous explorers and a civilization eager to hear of their doings.

Read this letter from Jack Barnsley whose Paragon Receiver has been picking up these vitally important messages, picking up every one, and getting every word clearly.

A Radio Receiver could have no higher recommendation.

Illustrated Bulletins on Paragon Radio Products are yours for the asking.

ADAMS-MORGAN CO.,
 4 Alvin Avenue,
 Upper Montclair, N. J.



RECTIFIERS

POCKET METERS

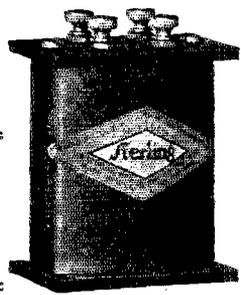
FILAMENT METERS

\$4.00
List Price

Sterling

The Best Radio Set Available Is Weak Without Proper Audio and Radio Amplification

No matter how well constructed and assembled the set that you are using, you are not getting volume and range unless you have selected a high grade set of transformers for both radio and audio amplification. With Sterling Transformers you are assured of louder signal amplification with the best tone qualities and wide range of reception.



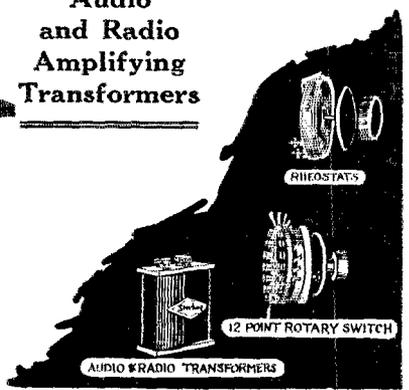
Audio and Radio Amplifying Transformers

Audio Transformers
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 6 to 1.

Both these transformers are midgets (1 1/2" by 2" by 2 3/8" high) but mighty powerful in effect.

The Sterling Mfg. Co., 2855 Prospect Ave., Cleveland, O.

Radio Transformers
These transformers are of the resonant type and are inherently limited to the range of wave lengths over which they will operate satisfactorily. They respond to a range of 200 up to 600 meters and give sharp tuning and high selectivity of resonance when used with a .0005 variable condenser across the secondary winding.



RHEOSTATS

12 POINT ROTARY SWITCH

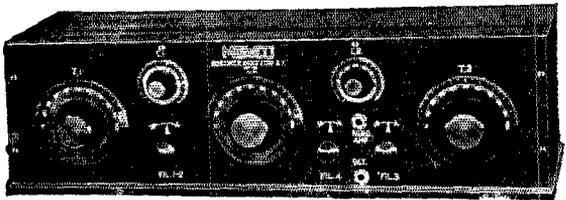
AUDIO & RADIO TRANSFORMERS

extreme selectivity—

A single tuning adjustment—assuring the greatest degree of program selectivity enabling one to tune in desired stations and enjoy their broadcasting without the slightest sign of interference by other stations, is one of the features of

MELCO-SUPREME

The Tuned Radio
Frequency Amplifying
Receiver that also



1. Operates with merely a 10 FT. WIRE—not even a ground necessary.
2. Offers exceptional CLARITY without the slightest loss of tone quality.
3. Affords real LONG DISTANCE by covering all Broadcasting ranges from 180 to 610 Meters.

We also manufacture a complete line of standard parts under the Amsco Brand. Write for our complete descriptive literature.

PRICE ONLY **\$140**

Complete knock-down parts for Melco-Supreme including drilled engraved Bakelite panel and solid mahogany cabinet. Price \$90

AMSCO PRODUCTS, INC.

Broome & Lafayette Streets,

Dept. Q

New York

A LONG AND SKINNY INSULATOR 18 INCHES BETWEEN WIRE HOLES



Highly vitrified high tension white glazed porcelain, strength 1500 lbs.

In Lots of Six or More

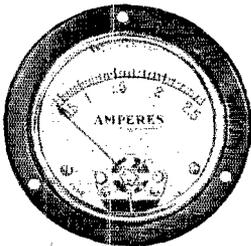
ONE DOLLAR EACH

Express C.O.D.

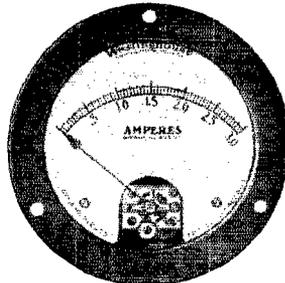
9DNH SURE FIRE RADIO LABORATORY

MACOMB, ILL.

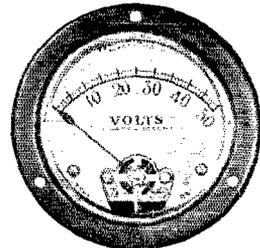
To operate Radio Receiving or Transmission Apparatus successfully, requires the use of accurate electrical measuring instruments.



Radio Frequency Ammeter
2-in. Dials, 2-in. Scales



Direct-Current Ammeter,
3-in. Dials, 2 1/4-in. Scales.
For Radio Application.



Direct-Current Voltmeter,
2-in. Dials, 2-in. Scales.
For Radio Application.

Westinghouse Radio Instruments

are small, yet accurate, sturdy and reliable. They are exact miniature replica of the larger high-grade Westinghouse instruments.

Direct-current Ammeters and Voltmeters should be used to regulate the current passing through the filament circuit of the detector or amplifier tubes, used in receiving or transmission sets.

Radio Frequency Ammeters should be used in connection with the transmitter apparatus. The effectiveness and character of transmission depends upon the current flowing through the antenna circuit.

Folder 4471-B gives full particulars

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

Newark Works,

Newark, N. J.

Atlanta, Ga., 426 Marietta St.
Boston, Mass., 10 High St.
Chicago, Ills., 111 W. Washington St.
Cincinnati, O., Third & Elm Sts.
Denver, Colo., 910 Fifteenth St.
Detroit, Mich., 1535 Sixth St.

Los Angeles, Calif., Seventh & Spring Sts.
New York, N. Y., 1105 Broadway
Philadelphia, Pa., 1325-29 Chestnut St.
Pittsburgh, Pa., 306 Wood St.
St. Louis, Mo., 717 South 12th St.
San Francisco, Calif., Montgomery St.

Seattle, Wash., Second & Cherry Sts.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

ARE YOU A 1923 MAN?

IF YOU ARE—GET OUT OF THE RUT.

Radio has improved with leaps and bounds since last year—to be a 1923 man is to be satisfied with last year's results—Broadcasting and CW will accomplish wonderful results this Fall and Winter and for you to share in these coming successes—both receiving and transmitting—you need a good set, made from the latest and most improved parts.

ROSE RADIO HAS IT !!

(and I don't mean maybe)

ROSE RADIO AND ELECTRICAL SUPPLIES

129 CAMP STREET,

NEW ORLEANS, LA.



How Many
Amperes
Are You
Radiating ?

A Roller-Smith type TAW Thermal Ammeter will tell you accurately and it will continue doing so. These little $3\frac{1}{2}$ " instruments have demonstrated their reliability in the Government service. You can't make a mistake when you use them. Bulletin No. AG-10 is yours for the asking. Send for it. This Bulletin also describes a most complete line of ammeters and voltmeters for all radio work.

ROLLER-SMITH COMPANY
16 PARK PLACE, NEW YORK

Offices in principal cities in U.S. and Canada



ALL-AMERICAN

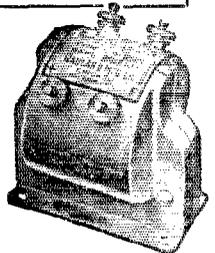
Amplifying Transformers

The best known, most widely used transformers on the market. Standard on the better sets. Types—Audio Frequency, Radio Frequency, Power Amplifying (Input and Output). All the better dealers sell "All-American."

RAULAND MFG. COMPANY,
200 N. Jefferson St., Chicago
Pioneers in the Industry

Special Offer

Book of tested hook-ups for getting new thrills out of your present outfit. Also, circuit diagrams and bulletin featuring Power Amplification. Send 2¢ stamp for postage. All-American Audio Frequency Transformers come in three ratios.



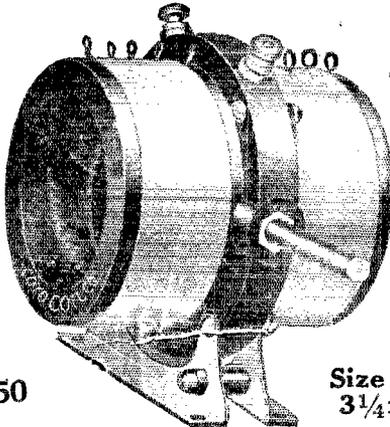
Coto

"Built First to Last"

Build Your Own Set and Build it Compact

Your radio dealer will recommend a good dependable and selective circuit. He will advise you, work with you, and make your success easy. A set assembled from Coto Compact Radio Parts, will be worth double its cost, especially next summer when you will carry it along on radio outings.

Insist on Coto Quality Compactness



\$5.50

Size is only
 $3\frac{1}{4} \times 3 \times 3\frac{3}{4}$

New Coto Compact Moulded Variocoupler

In polished brown bakelite. Range is 200 to 600 meters. Has eight taps for use with primary condenser. Pigtail connection to rotor. Base or panel mount. Type 9,000.

Dealers! Jobbers!

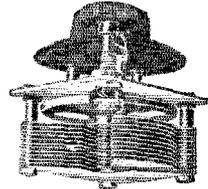
You can jump right into volume on the Coto Compact line because quality is right and demand established by national advertising.

COTO-COIL CO.

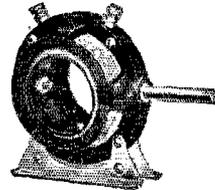
37 WILLARD AVENUE, PROVIDENCE, R. I.

BRANCH OFFICES:

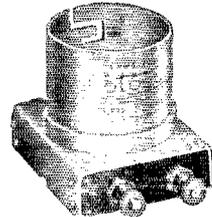
Los Angeles, 329 Union League Bldg.
Minneapolis, Geo. F. Darling, 705 Plymouth Bldg.
Atlanta, C. P. Atkinson, Atlanta Trust Co. Bldg.
Canadian Distributors, Perkins Electric Co., Ltd., Montreal, Toronto, Winnipeg.



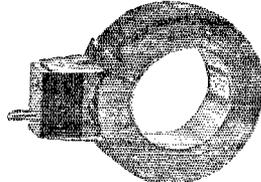
Coto Compact Air Condenser with Vernier
Only $2\frac{1}{2}$ inches square. Rotor plates soldered to shaft. Stator plates soldered at three points. .0005 Mfd. \$5. .001 Mfd. \$6.



Coto Compact Variometer
Especially designed for new wave lengths, 200 to 600 meters. Size $3\frac{1}{4} \times 1\frac{1}{4} \times 3\frac{3}{4}$ in. In brown polished bakelite with honeycomb wound stator. Pigtail connections to rotor. Base or panel mount. Type 8000. \$5.00

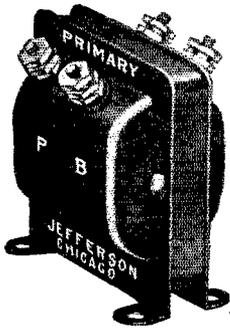


Cotogrip Tube Socket
Has the unique double positive grip of tube terminal posts. Best hard rubber insulation. Type 7000. \$5.00



The Original Honeycomb Wound Coils
Popular low priced favorites of the amateur and experimenter.

The Final Authority in Radio Frequency



THE NEW JEFFERSON RADIO Frequency Amplifiers need very little introduction. The name JEFFERSON is known wherever transformers are used. Both professional and amateur radioists are familiar with JEFFERSON Audio Frequency Transformers. They know from actual tests how superior they are to others and they have been waiting for a JEFFERSON Radio Frequency Transformer.

After many months of research and almost endless tests and experiments JEFFERSON Radio Frequency amplifiers have been pronounced by leading radio engineers to represent the very last word in this type of amplifier.

These new transformers cover the entire new wave length band (200 to 650 meters) and function with equal efficiency in standard Radio Frequency, Reflex, Inverse, Duplex or Neutrodyne circuits. Their scientific and careful construction sets a new standard for radio frequency amplification—the reasonable price appeals to all.

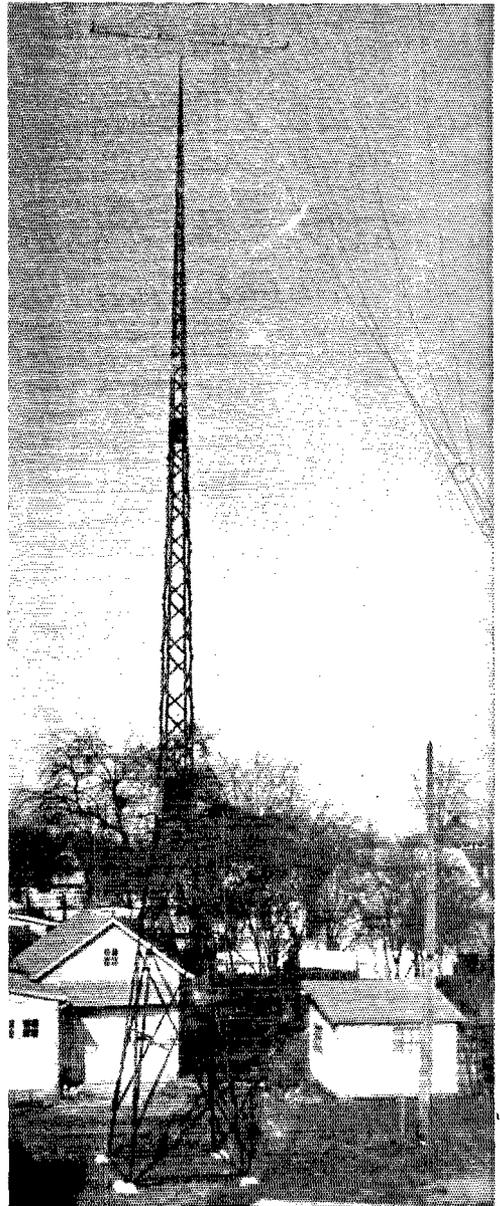
No. 80 Jefferson Radio Frequency Transformer (1st stage) . . \$2.50

No. 85 Jefferson Radio Frequency Transformer (2nd stage) . . 2.50

Descriptive bulletins, circuits and the recommendations of our Radio Engineering Department are at your disposal.

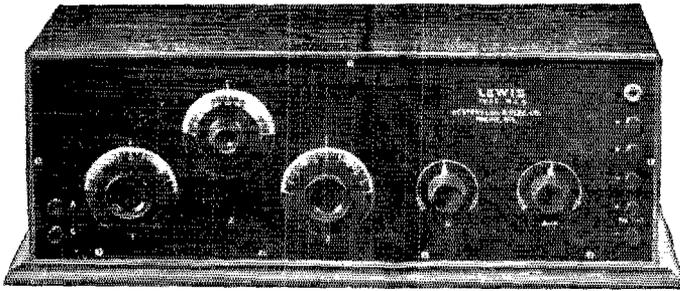
Jefferson Electric Mfg. Co.

425 South Green St., Chicago, Ills.



We build only self-supporting masts. There are no ladders, platforms, unnecessary wind-pressure surfaces, guy ropes or wires or other unsightly features. These masts are graceful and stately—will dignify the most palatial surroundings. Built in three weights, AMATEURS, STANDARDS and BROADCASTERS carrying a strain at the top of 300, 1500 and 3000 pounds. The Mast-Head Pulley is "fool proof" eliminating the necessity of climbing up. The Cables twice the masts' length, will break before the Mast will. Our Wind-up Reels bring the antenna up to proper position. Patents pending.

Whittlesey Engineering Co.
Cleveland, Ohio



A Special Low Wave Set for Transmitting Amateurs

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

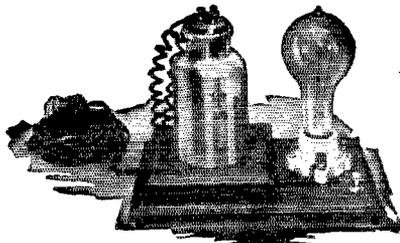
The WC-5-SW is a 4 tube set. One stage of tuned Radio Frequency amplification is employed ahead of the detector to make it supersensitive. Two stages of audio frequency are used to bring up the signal strength. Uses any type of tubes. Gives perfect control of audibility. Detector rectifies only. Uses antenna compensating condenser. Only two control adjustments. Pure negative biasing on all tubes, thus marked saving on B Battery current. Tuned Radio Frequency sharpest known and most selective principle ever adopted. Plate potential non-critical. Mono-block tube socket. No grid plate leads on audio amplifiers. Audio amplification absolutely necessary when using low efficiency receiving antenna, i.e., underground or indoor. Mahogany cabinet, piano rub finish. Rabbited-in panel. Split lid cover. The price is \$85.00.

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

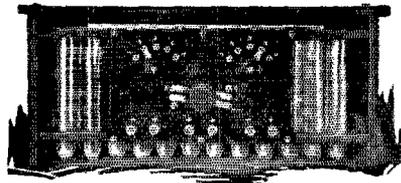
OTT RADIO, Inc.

224 Main Street

La Crosse, Wis.



Mounted Charger



100 Volt Panel Type

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 3 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.

Unmounted Rectifier.....\$1.00

Mounted Rectifier..... 2.50

KIMLEY ELECTRIC COMPANY, Inc.

2666 Main Street,

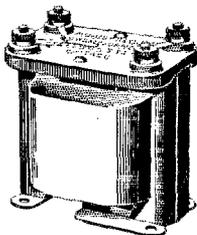
Buffalo, N. Y.

K I C - O

Storage "B" Batteries—
long service, low cost

Cells	Volts	Price, Plain	With Panels
16	22	\$5.50	
24	32	7.50	\$11.75
36	48	9.50	14.00
50	68	12.50	17.00
78	100	17.50	22.50
108	145	23.50	28.50

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.

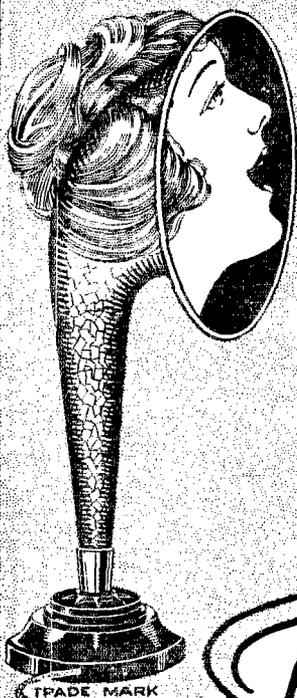
No. 501—Ratio 4½ to 1—\$4.50 each
No. 502—Ratio 3 to 1—\$4.50 each

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

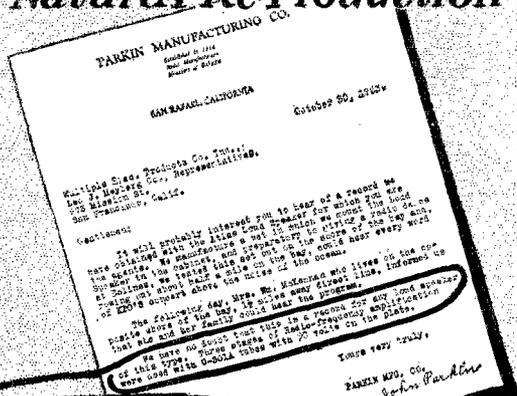
Here are a few of the items we are selling off at greatly reduced prices. Send for complete list of bargains.

Type	Regular Price	Sale Price
AcmePhone Receiver with detector two-step amplifier and loudspeaker. Can be made regenerative at small cost....	\$ 30.00	\$30.00
HZ Clapp-Eastham Amplifier	35.00	15.00
JM-3 5-tube Radio Frequency Detector-Amplifier.....	95.00	30.00
JM-6 6-tube Radio Frequency Detector-Amplifier	130.00	40.00
RF DX Tuner for above radio frequency sets...	35.00	10.00
No. 8 Federal Detector-Amplifier	52.00	20.00
No. 9 Federal Two-step Amplifier	58.00	25.00
20-A Firco Detector	27.00	8.00
No. 521 Kennedy Two-step Amplifier	55.00	40.00
No. 220 Kennedy Intermediate Receiver	125.00	75.00
No. 525 Kennedy Two-step Amplifier	85.00	65.00
No. 330 Remler Detector Panel	8.50	6.50
No. 331 Remler Amplifying Panel (without transformer)	6.00	5.00
No. 502 Remler Variometer Panel	10.50	8.00
No. 505 Remler Variocoupler Panel	12.00	10.00
CR-7 Grebe Long Wave Receiver (Slightly used)	210.00	140.00

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



Atlas LOUD SPEAKER Natural Re-Production



A Record!

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 Amplitone? Tell us about it.

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

Ask Your Dealer
for a
Demonstration

List Price
Complete

\$25

Multiple Electric Products Co. Inc.
ORANGE ST. RADIO DIVISION NEWARK, N. J.

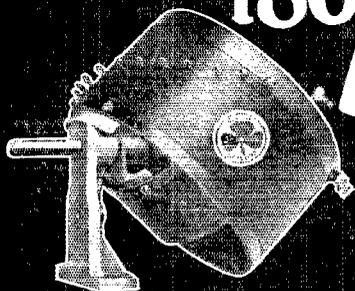
An Absolute Guarantee
with every instrument
made them famous!

SHAMROCK
FOR SELECTIVE TUNING

Vario-Coupler

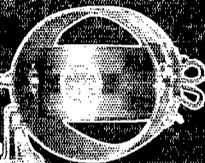
List price,

\$3⁵⁰/_{each}



180°

**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

Made for the United States Army Air Service. Equipped with a Dubilier Filter System. Using 2 1/4 MF. 1800 volts Mica Condensers. Ball Bearings Equipped. All new, in original cases. Price \$29.75. Half Cash With Order—Remit by Money Order to Facilitate Immediate Shipment 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.



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.

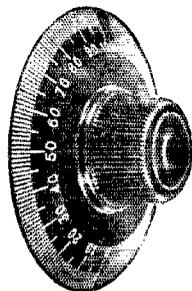


DE LUXE DIALS

When phonographs were first made they were square boxes without ornamentation. Likewise the first dials, turned out in a laboratory,—had hard straight lines for shape. Beauty is a later development. Na-aid dials have soft, graceful lines which makes them very pleasing to the eye. They lead in both beauty and quality. They have the right grip for delicate, exact tuning.

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

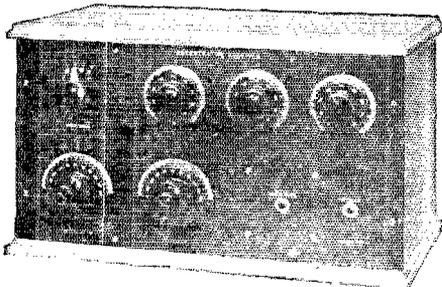
Dept. M 52 Willow St.



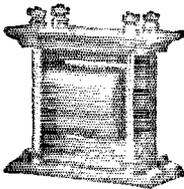
3 inch
No. 3003—4
35c, 3 for \$1.00

C
NATIONAL
CHELSEA
LEADERSHIP IN QUALITY COMPLETE LINE

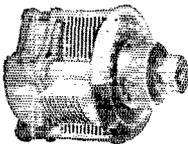
Performance! — Read this Letter



Receiver No. 102 Price **\$95.00**
(Licensed under Armstrong Patent 1113149)



Audio Frequency Transformer, No. 50
Gives maximum amplification without distortion
Ratio 3% to 1. Moisture proof
PRICE, \$4.50



Vernier Condenser, No. 10
Twenty-three plates, capacity .0005 M. F.
Built-in vernier—low resistance and losses.
PRICE, \$4.50

Melrose, Mass., November 10, 1923.
National Chelsea Radio Corp., Boston, Mass.

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 without any 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	WJZ	New York City
WOAI	San Antonio	WOS	Jefferson, Mo.
KLK	Denver	WCAU	Phila, Pa.
WHN	New York City	WFI	Phila, Pa.
KHJ	Los Angeles	WNAC	Boston
WFAA	Dallas	WGI	Medford
WDAR	Phila., Pa.	WDAP	Chicago, Ill.
KDKA	Pittsburgh, Pa.	WTAM	Cleveland, O.
WRC	Washington, D.C.	WLAG	Minneapolis.
WEAF	New York City	WHW	Cincinnati
WOR	Newark	KGW	Pittsburgh
CFCE	Montreal	WIP	Phila, Pa.
WGY	Schenectady	WCAE	Pittsburgh
WBZ	Springfield	WWJ	Detroit
WHAZ	Troy, N. Y.	KYW	Chicago
WCRD	Zion, Ill.	WDAP	Chicago
WAAM	Newark, N.J.	WSB	Atlanta
WGR	Buffalo	KSD	Kansas City
	WHAS		Louisville

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

NATIONAL CHELSEA RADIO CORP
739 Boylston St., Boston, Mass.

The New SIGNAL

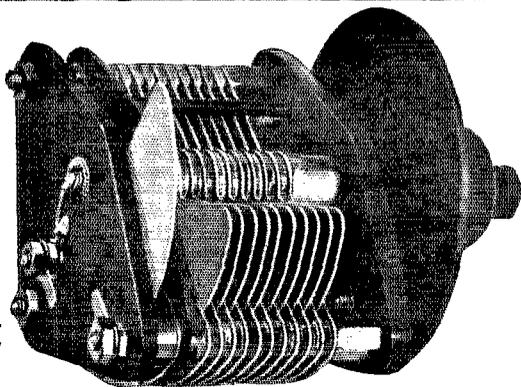
Vernier

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 con-



tact 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.

Boston,

Chicago,

Cleveland,

Minneapolis,

Montreal,

New York,

Pittsburgh,

St. Louis,

San Francisco,

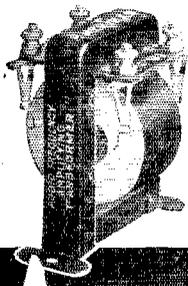
Toronto,

Philadelphia,

Los Angeles

You'll find our local address in your Telephone Directory

Factory and General Offices
1915 BROADWAY,
MENOMINEE, MICHIGAN



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

AMERTRAN

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 1005.

Type AF-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 22 years.

176 Emmet Street, Newark, N. J.

FERBEND

Wave Trap

TRADE MARK
PATENT APPLIED FOR

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.

850 Ferbend Electric Co.
CHARGES PREPAID
23 E. SOUTH WATER ST.
CHICAGO
Circular on Request

Why do you do it?



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.

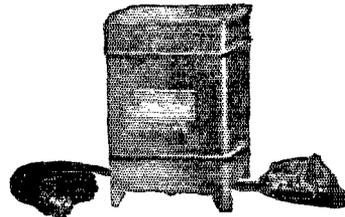
You don't have to move the battery. Just connect Tungar, and leave it—any time, day or night.

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 "B" Storage Battery—\$3.00—fits either size Tungar.



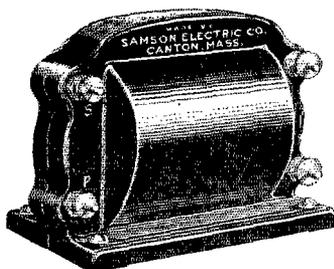
Charge 'em at Home, with

Tungar

BATTERY CHARGER

A GENERAL ELECTRIC PRODUCT

35A-96C



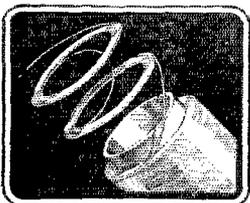
TESTS PROVE IT BEST!

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 a distortion. Helical Winding exclusive with the SAMSON.

Made by
SAMSON ELECTRIC CO.

Factory: Canton, Mass.

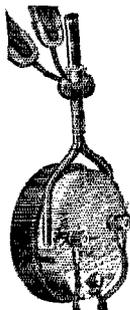
Sales Office:

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'll mean 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 The new 1924 "Red-Head" Jr.

\$6.50 PER PAIR Complete
\$5.00 PER PAIR Complete

This is the standard 3,000 ohm "Red-Head." The 1924 Model F has eleven improved features. Sensitive and fine-tuned; aluminum case; famous brown-red ear caps; military headband; high-grade cord.

The Junior Model has most of the quality features of the standard Model F here described. The resistance is 2,000 ohms per set instead of 3,000 ohms. A remarkable value.

"Red-Heads" sent prepaid on receipt of price if you are unable to get them at your dealer's.

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

CATALOG E19-112
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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.

Impartial Experts Testify!

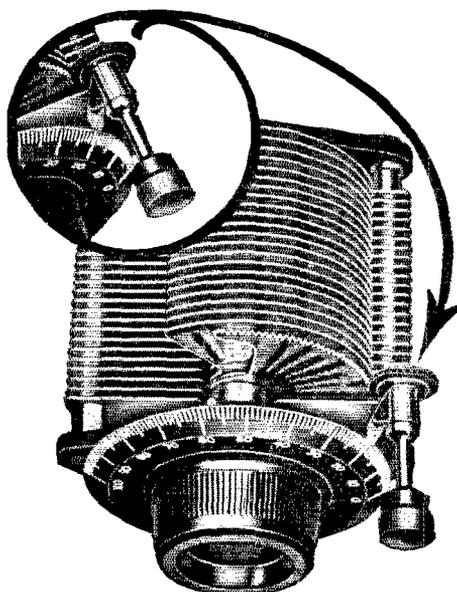
For a long time, set builders have wanted some definite, authoritative guide to condenser quality. Complying with this demand, HEATH RADIANT CONDENSERS were submitted to two of the greatest radio testing laboratories. Below are salient phrases from their reports. Copies of the complete reports free to 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 $2\frac{7}{8}$ " dial and knob)

13 Plate \$5.00

25 Plate \$5.50

45 Plate \$6.50

HEATH RADIO & ELEC. MFG. CO.

207 First Street

NEWARK, N. J.

**WEIGHS
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**

**Order TODAY
by Postcard**

**THE
PHONE
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TOOK
A SOLID YEAR
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\$2.95

**POST-
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**LOUD
SPEAKER
UNIT \$1.95**

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

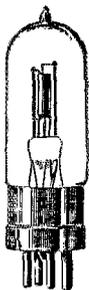
98 Brookline Ave.

DEPT. G

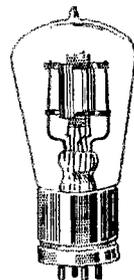
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WE REPAIR THE FOLLOWING

**RADIO TUBES
and Guarantee Them**



WD-11	\$3.50	UV-199	\$3.50
WD-12	3.50	C-299	3.50
UV-200	2.75	UV-201A	3.50
UV-201	3.00	C-301A	3.50
C-300	2.75	UV-202	4.00
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DV-6	3.00	DV-6A	3.50



Mail Orders solicited and promptly attended to.
Dealers and Agents write for Special Discount

H. & H. RADIO CO.

P. O. BOX 22-W

CLINTON HILL STA.,

NEWARK, N. J.

HYGRADE SPECIALS

- Skinderviken Transmitter Buttons..... \$.95
- No. 763 Eveready 22½ V. Variable B. Bat. 1.25
- No. 766 Eveready 22½ V. Variable B. Bat. 1.98
- No. 767 Eveready 45 V. Variable B. Bat. 3.98
- 2000 Ohm Murdock No. 56 Head Sets..... 3.50
- 3000 Ohm Murdock No. 56 Head Sets..... 4.25
- Federal or Brandes Head Sets Complete... 5.50
- Dictograph 3000 Ohm Head Sets..... 5.98
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- 6 Volt Marko Storage Batteries..... 8.95
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- Federal Amplifying Transformers..... 4.75
- 23 Plate Var. Cond. Bakelite Ends..... 1.49
- 43 Plate Var. Cond. Bakelite Ends..... 1.95
- No. 164A Fada Neutrodon Condenser..... .98
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All orders must include Parcel Post charges

Hygrade Electrical Novelty Co.

41 West 125th Street

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**RADIO "B" BATTERIES
At Factory Prices**

Greatest radio "B" battery on market. Full number voltage taps; **QUALITY GUARANTEED; LOWEST PRICES;** brings in concerts **LOUDER AND STRONGER;** will work on any tube or loud speaker. Order by number **TODAY** with check, money order or pay postman C. O. D.

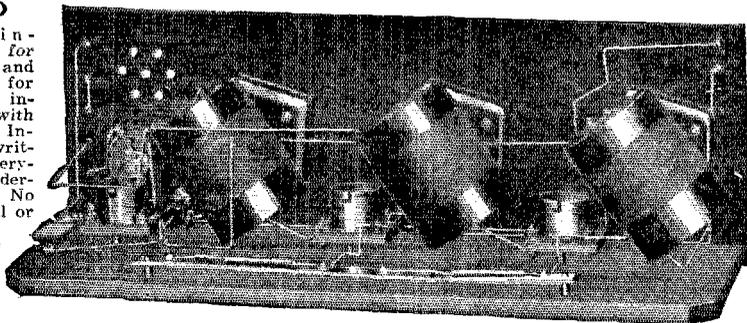
- No. 222B 22½ volt variable, regularly \$2.25.. \$1.52
- No. 222A 22½ volt variable, regularly 3.00.. 1.85
- No. 245A 45 volt, 8 taps, regularly 5.50.. 3.25

AYRES BATTERY CORPORATION, Cincinnati, Ohio

Build a receiver where the numbers on the dials have a real meaning—

EASY TO BUILD

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



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

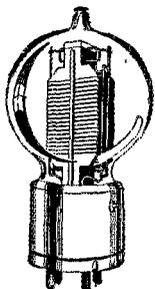
(With Fada or Freed-Eisemann licensed parts)

- | | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> 1 7 x 21 x 3-16 drilled Formica panel. 1 Howard rheostat. 3 4-inch Radion Dials. 3 John Firth bakelite sockets. 8 Binding posts. 3 23 plate variable condensers. 1 Wave control neutroformer. 2 Radio frequency amplifying | <ul style="list-style-type: none"> neutroformers. 2 Grid neutralizing condensers. 1 .00025 micron grid condenser. 1 Marco variable grid leak. 1 Baseboard for mounting. 25 feet tinned copper bus bar wire and complete instructions for assembling and wiring. |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

3 TUBE
\$28.60

4 TUBE
\$44.65

5 TUBE
\$46.25



\$10.00
Value

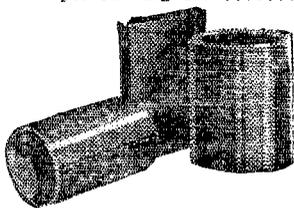
Western Electric VT-2 TUBES

One of the big features of these brand new genuine Western Electric VT-2 Tubes that we bought from the U. S. Signal Corps is that they have a higher amplification factor than any other 5-watt tube made! May be used for both RF and AF Amplification and for CW and phone transmitting. Not Navy defects; they have been sold only as a surplus. **\$7.45**

FORMICA

Made from Anhydrous Redmanol Resins
SHEETS TUBES RODS

We are prepared to furnish promptly and saw Formica panels of any dimensions. Cutting charge is included in the following price:
3-16-inch Formica, sq. in...2¢
1/2-inch Formica, sq. in...1 1/2¢
Tubing (all diameter), per running inch.....10¢



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—to "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-handed merchandise. Every item we sell is guaranteed brand new—in fact 95% of our merchandise is in the manufacturers' 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 of No. 40 enamel coated copper wire. DC resistance 1600 ohms. Impedance, at average music and voice frequency (800 cycles) 21,000 ohms. (Effective impedance rather than DC resistance is the big factor in a good headset.) **\$3.65**

Genuine Western Electric MICROPHONE

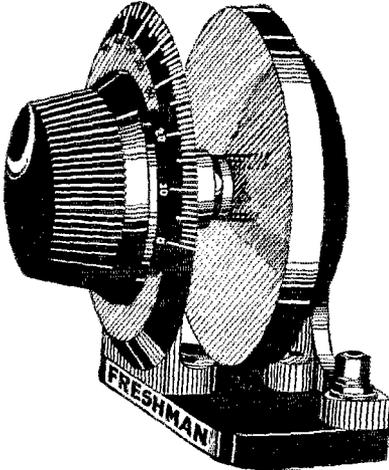
Including:
6 ft. of cord
Attachment Plug
Breast Plate
Shoulder Straps
Transmitter
Special at **\$1.95**



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 Dielectric.

As Near 100% Efficient as a Variable Condenser Can be Made

Do not confuse the "FRESHMAN SELECTIVE Mercury Variable Condenser with any other heretofore 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.

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Radio Condenser Products

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KLAUS RADIO

GET OUR BULLETIN

KLAUS is authorized distributor for largest radio manufacturers. Complete stock and prompt shipment of the best lines of apparatus. The "KLAUS RADIO BULLETIN" contains information of vital interest to every radio dealer. If you are not on the mailing list send us your name at once.

Complete Stock of Amateur Equipment

KLAUS is carrying the latest type of amateur transmitting and receiving equipment as well as broadcast receivers. Write us for prices today.

Klaus Radio & Electric Company
Authorized Distributors
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Eureka, Illinois



**GOLD SEAL
HOMCHARGER**

Charges Radio and Auto Batteries at Home Over Night for a Nickel

No stopping—no sticking—no muss—no fuss—no trouble. Self-polarizing—high-charging rate—finished in mahogany and gold—approved by Underwriters. Price \$18.50 complete with ammeter (\$25.00 in Canada)—no extras to buy—at all good dealers.

FREE Ask your dealer or send direct for free HOMCHARGER list of broadcasting stations and GOLD SEAL bulletin.

Insist on the GOLD SEAL

It's your guarantee against substitution and appears on name-plate and package. No other charger is just as good.

Automatic Electrical Devices Co. 127 West Third St. Cincinnati, O.
Largest Manufacturers of Vibrating Rectifiers in the World

The Supreme Insulation

RADION

Panels

are easiest to
drill, saw, or
engrave with
simple tools
at home



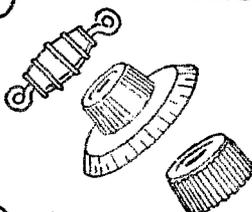
18 Stock Sizes
Radion Panels

Mahoganite and Black

6 x 10½	6 x 14	6 x 21
7 x 9	7 x 10	7 x 12
7 x 14	7 x 18	7 x 21
7 x 24	7 x 26	7 x 48
9 x 14	10 x 12	12 x 14
12 x 21	14 x 18	20 x 24



Look for this
stamp on every
genuine RADL
ON Panel. Be-
ware of substi-
tutes and imi-
tations.



AMERICAN HARD RUBBER CO., 11 Mercer Street, N. Y.

Clear as a Silver Bell

O-T SILVERTONE TUBES

(Registered)

in your radio set assure—

sharp, clear, mellow tones—
music with its delightful and thrilling modulations—
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

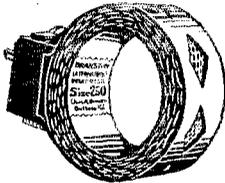
High class representatives wanted.



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

BRANSTON RADIO

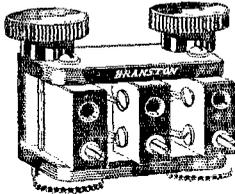
D.L. Honeycomb Coils—



Interchangeable with all coil mountings. Wave lengths 150 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 DeForest Patents (Front or Back Panel) Neat, sturdy, permanent—capable of extremely fine adjustment. Genuine Bakelite throughout. Substantial gears give vernier adjustment.



Send 2¢ Stamp for New Honeycomb Coil Hookups Compiled by experts and includes five good Honeycomb Coil "Hookups" and complete catalog of famous Branston Radio Apparatus. Write today. Give us name of Chas. A. Branston, Inc. 823 Main St., Buffalo, N. Y.

In Canada—Chas. A. Branston, Ltd., Toronto
Manufacturers of Branston Violet Ray High Frequency Generators

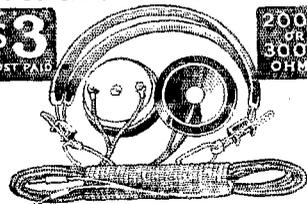


Look for this trademark card in your dealer's window or sales-room.

EDSON

Tone Tested
Radio Headsets

\$3
POST PAID



2000
to
3000
OHMS

THE lowest-priced first quality headset on the market today.

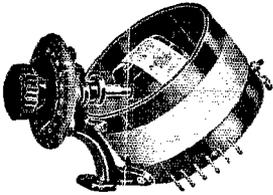
Compare with headsets costing twice our price. Return ours if not satisfied. Our written guarantee protects you. Send \$3 by registered mail or money order. Buy direct of us and save the difference. We ship, postage prepaid, same day order is received. Ask for our

Free Catalog of Radio Parts

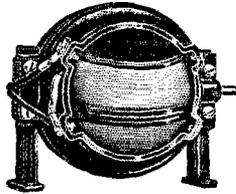
EDSON RADIO SALES CO.
5 Elmwood, Providence, R. I.

Use These Kennedy Parts

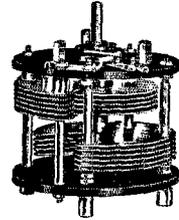
For the real satisfaction that comes with continuous superior performance, use these genuine Kennedy parts. They are of the same high-grade workmanship and efficiency as those used in Kennedy receivers. Each part has been designed by the Kennedy Engineering Staff so that every detail is electrically correct—every manufacturing operation is performed under strict supervision and inspection.



Variocoupler—Black Bakelite shells. 180° variation. Primary taps connected through inside of tube. Pigtailed connections. Without knob or dial\$7.50



Variometer—Black moulded Bakelite shell and rotor. Minute clearance. Pigtail connections. Table or panel mounting. Without knob or dial.\$8.00



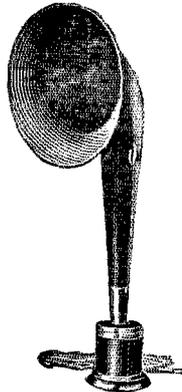
Balanced Condenser—0.0006 mfd. Rugged construction. Perfect balance. Adjustable tension on end thrust ball bearing. Pigtailed connection. Without knob or dial.\$8.00



Head Phones—Extremely sensitive on weak signals. No rattle or blare on loud signals. Light, comfortable. 3000 ohms...\$9.00



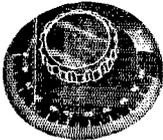
Vernier Condenser—Two plates. Pigtailed connection. Has sub-panel and small Kennedy Bakelite knob with engraved arrow\$1.50



Loud Speaker—Faithful reproduction. Adjustable damping of diaphragm. Polished nickel base and trimmings. 10-inch bell on horn.....\$30.00



Non-Microphonic Socket—Cushioned type. Moulded Bakelite base. Shell and cup nickel plated. Positive side-contact connector springs.....\$1.50



Dial—100 division. 3 inch. Black oxidized metal finish with silver etched figures. Kennedy type fluted Bakelite knob\$0.75



Rheostat—Suitable for all new type tubes—either dry cell or storage battery. Bakelite shell. Positive contact. Kennedy Bakelite knob, engraved arrow.\$1.10

Insist on genuine Kennedy parts! Buy them from your dealer— if he does not stock them, write us, giving his name and address.

THE COLIN B. KENNEDY COMPANY

SAINT LOUIS

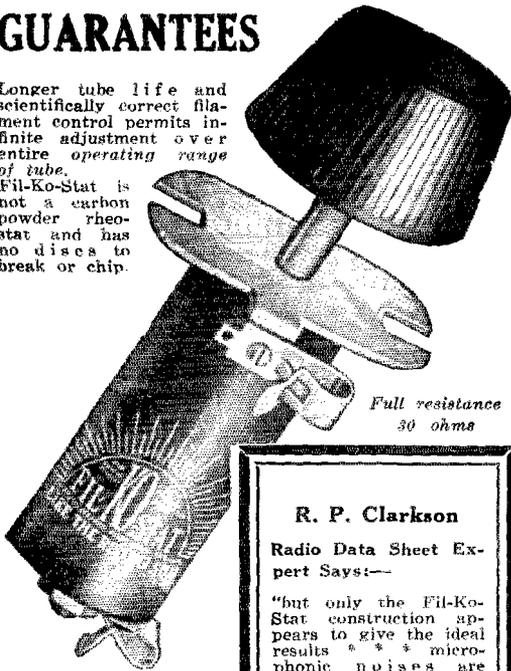
SAN FRANCISCO

K E N N E D Y

The Royalty  of Radio

GUARANTEES

Longer tube life and scientifically correct filament control permits infinite adjustment over entire operating range of tube. Fil-Ko-Stat is not a carbon powder rheostat and has no discs to break or chip.



Full resistance
30 ohms

At Dealers
Everywhere

2.00

(in Canada \$2.75)
And Worth it!

Adjusted at Laboratory to ideal "off" position for all tubes including 5 watt transmitting tubes.

Suitable for panel mounting without re-drilling. Equipped with Fahnestock clips. Heavy, nickel plated, drilled and tapped mountings for rigidly setting up FIL-KO-STAT on table or board—15 cents.

R. P. Clarkson

Radio Data Sheet Expert Says:—

"but only the Fil-Ko-Stat construction appears to give the ideal results * * * microphonic noises are eliminated * * * makes possible sudden inrush of current and then its gradual adjustment."

Kenneth Harkness

In His Volume on Radio Frequency Amplification says:

"Fil-Ko-Stats * * * provide fine regulation, essential if maximum efficiency is to be obtained — particularly useful tuning in weak stations. Fil-Ko-Stat gives such fine control of filament temperature that it has become * * * almost indispensable * * *"

The filament control of infinite adjustment

FIL-KO-STAT

UNCONDITIONALLY
GUARANTEED
BY THE MAKER

DX Instrument Co.

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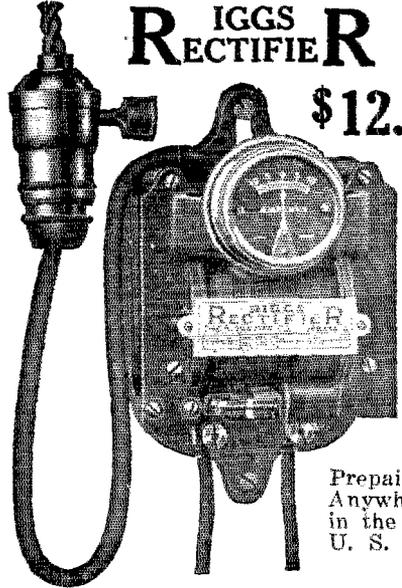
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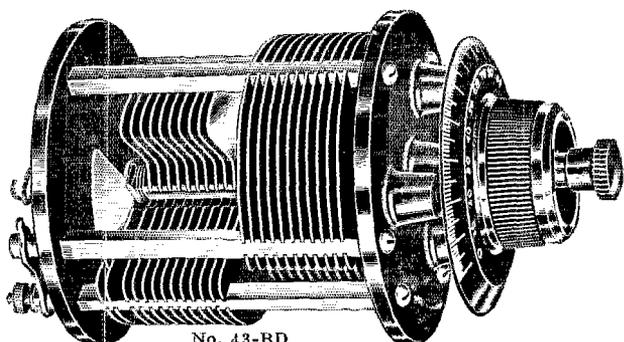
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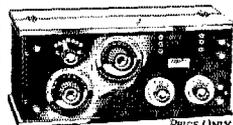
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Saw \$10.00, 1 Dubilier Condenser .01 M.F. 10,000 Volts \$8.00, 1 Dubilier Condenser .01 M.F. 25,000 Volts \$12.00, 12 U.C. 490 1 M.F. Filter Condensers \$2.00, 12 U.P. 1627 1/2 M.F. Filter Condensers \$1.50, 1 R.O.C. Transmitting Inductance \$7.50, 1 10-Henry Choke 1 Amp. Capacity \$15.00, 1 4-Henry Choke 1 Amp. Capacity \$8.00, 1 2-Henry Choke 1 Amp. Capacity \$4.00, 1 1/4 H.P. Motor Generator 100-A.C. to 90-volts D.C. \$35.00, 1 1/2 H.P. 110-volts G.E. Motor \$35.00, 1 150 Ohms Bunnell Relay \$2.00, 1 Thordarson Oil Transmitting Condenser .01 M.F. \$5.00. Terms: C.O.D. One-fourth Cash with Order. G. L. Hight, Rome, Georgia.

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BARGAIN: Omegaigraph, fifteen dial \$15.00. Grebe 8, \$50.00, Rork, \$30.00. Also tubes. All good condition. J. Hudlow, Gold Hotel, Salt Lake City, Utah.

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HAVE AN ENLARGEMENT made of that favorite negative of your radio station and mounted at a reasonable price. T. Johnson, 15 Rosemont Rd., Worcester, Mass.

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MAGNAVOX R3 OR M1. Latest nationally advertised reproducers. List \$35. Introductory \$25. The factory sealed carton is your guarantee. Radio Central, Dept. Q, Abilene, Kansas.

OHIO AND WAGNER 60 cycle 110 V. synchronous motors \$18.00. Attachments to make synchronous rectifiers for C.W. transmission \$12.00. Acme plate transformers, King chargers, "A" and "B" batteries and other supplies on hand. Prices reasonable. Write Kimley Electric Company, Inc., 2665 Main St., Buffalo, New York.

ONE QUARTER TO TWO KW 500 cycle generators. With and without motors. Transformers, battery dynamotors, Bakelite inductances, Western Electric 50 watters \$25. Henry KiENZLE, 501 East 84 Street, New York.

FIFTY ASSORTED FLAT HEAD solid brass machine screws, nuts, washers, copper lugs, 50¢. Eight initial binding posts, set 60¢. Twelve nickle plated binding posts 50¢. All three items \$1.50. **RADIO LIST** for stamp. All prepaid. Stamps accepted. Kladag Radio Laboratories, Kent, Ohio.

CALLS HEARD POSTAL CARDS (for DX reports). Send \$1.00 with your name, address and call letters for 100 printed report postal cards with large red call letters. Complete form for description of your station, etc. State if member of A.R.R.L. Samples on request. "Used Everywhere—Go Everywhere." The Radio Print Shop, Box 582, Kokomo, Indiana.

FOR SALE: Good regenerative receiver, det. and 2 step, with tubes, \$57. W. G. Klein, 20 Fairfield St., Springfield, Mass.

10" PORCELAIN INSULATORS (QST No. 6) only 90¢. Why pay more? Equal to No. 5 in tests. Aluminum rectifier plates 1x6 @ 7¢. \$8.00 per hundred. Any special size cut to order. Lorain Radio Supply Co., Lorain, Ohio.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

SELL new Grebe CR-5 Receiver for \$45.00. Cost \$80.00. First money order or certified check takes same. H. R. Lord, Cambridge Springs, Pa.

BARGAIN: 1 KW spark transmitter complete \$30. Write 5QZ.

FOR SALE: 2 Variometers and variocoupler Penn. C. Set with 2 step amplifier in separate highly polished oak cabinets. New \$80. Clayton LeGallez, Slingerlands, N. Y.

FOR SALE: 400 volt 250 watt motor-generator, runs on ball bearings off of a six volt storage battery. One fine buy, \$60.00 takes it. Box 605, San Luis Obispo, California.

SELL: 1/2 kilowatt spark \$25.00. 9DVK.

FOR SALE: 9CLZ's C.W. transmitter complete. DX 38 states worked. \$110. Send for photograph.

FOR SALE: Corona typewriter in excellent condition. \$25. D. Cason Mast, Nacogdoches, Texas.

WANTED: A 750 to 1000 Volt D.C. Generator. Radio 9EFE.

SELL, 9AVP: UP1016 Power transformer \$23.00; 3 UV203's New \$20.00 Each; Sockets for same \$1.50 Each; 2 Murdock Antenna switches \$2.00 Each; Jewell 0-15 voltmeter \$5.00; Benwood Sink motor 1/2 H.P. \$20.00, 1/2 H.P. Globe Heavy Duty Motor \$20.00; 1 KW Acme non-sink spark transmitter complete \$25.00; R.C. Inductance \$7.00; Jewell \$25, 0-10 amps \$10.00; Chemical Rectifier 72 jar \$8.00; 1 KW Marconi Coffin 30,000 volt secondary \$20.00; Coupling condenser \$1.00; Navy Key \$3.00; Vibroplex \$4.00; 200 watt filament transformer carry 4 fifty's \$8.00; Reinartz tuner (no cabinet), \$8.00; Three circuit, a beauty, \$20.00; Both with tube controls. Ship anything C.O.D. Willard McCulla, Waukegan, Illinois.

SELL: VT elevens, genuine audiotron, Myers and receptacle, \$5 each. 5 Amp. charger \$18. C. McDermott, Bellevue, Iowa.

SELL: Connecticut 500 Volt D.C. Generator, 375 watts, 2000 Revolutions \$15.00. Y-415 Reactance \$4.00. Two Dubilier 1000 Volt .002 Condensers \$4.00 each. 5 Amp. and 3 Amp. G.E. Radio Ammeters \$4.00 each. Connecticut Variable Condenser \$3.00 C. H. McKnight, 45 Lowell Road, Schenectady, N. Y.

FRENCH FIFTY WATTERS. 6 Volts 1,000. Bell-like clang. \$15. Brand new. Canadian 2BN.

98% PURE ALUMINUM for rectifiers \$1.50 per square foot. 9CSA, Box 15, Oak Park, Ill.

SINKS—New Stahl Sink Rectifiers \$50.00. Prepaid. Electrical Specialty Company, Valparaiso, Indiana 9DVK.

FOR SALE: Large stock of Radio apparatus. Write immediately for reduced price list. Box 565, Fort Dodge, Ia. Carlton Tennant.

HAMS WHO DESIRE SPEED—a moment's attention. Brother Ham whose limit was 15 words doubled his speed in One Evening. Send your Call and ask for the facts as told by himself. Dodge Radio Shortkut, Dept SC, Mamaroneck, N. Y.

RADIO GENERATORS—500 Volt 100 Watt \$28.50 each. Battery Chargers \$12.50. High Speed Motors, Motor-Generator Sets, all sizes. Motor Specialties Co., Crafton, Penna.

LET ME PRINT your QSL cards. Large call letters in colors. Printed to order at reasonable prices. Write for samples and price list. 5BP.

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FOR SALE: 100 Watt Broadcast Transmitter complete with microphone, tubes and Esco Generator motor driven. DX 2000 miles, can also be used below 200 meters. The Maus Piano Company, Lima, Ohio.

MURAD six tube set, MA thirteen, with finely finished loop for ninety-eight dollars. Cost \$176. In perfect condition. Bristol power amplifier for fifteen dollars. Three tube "All-Wave" set, with All-American transformers, Paragon sockets, Cutler-Hammer rheostats, "All-Wave" tuner, Posaco 43-plate vernier condenser

in fine mahogany cabinet. All for twenty-five dollars. One F.R.S. set, completely wired, for twenty-five dollars. Box 352, Palestine, Illinois.

MICARITE CONDENSER—Can be adjusted from .00225 to .006 M.F.D. Formica base & cover, copper plates, mica dielectric. Tested at 2000 volts. For transmitting or receiving. 75¢ postpaid. Radio frequency transformers—type S range 150 to 450 meters, —type L range 300 to 700 meters. \$2.50 either type postpaid. Nelson Radio Laboratories, 1773 Carlyon Road, Cleveland, Ohio.

WESTINGHOUSE NAVY DYNAMOTORS @ \$15.00 Each. Spring rack \$3.00 extra. CN240 Long wave Navy receiver. \$85.00. 5 dial Omnigraph. \$12.00. Amrad Wavemeter, \$8.00. Acme 300 Watt Filament Lighting Transformer. \$14.00. Acme Two Stage, \$15.00. Rotary converter, \$10.00. W.E. Microphone \$2.00. 2 W.E. Amplifying Transformers, \$5.00 Each. 1/2 KW Navy Transmitting Key, \$6.00. Navy change-over switch, \$9.00. General Radio Modulation Transformer, \$3.00. 2 Large A.C. Voltmeters, 0-120 & 0-180 \$3.00 Each. General Radio Portable radiation Meter, \$8.00. Best offer takes the following meters: Weston 0-40 Amp., 0-3 Amp., Small 0-25 Amp. Jewell 0-300 Milliamp., 0-1 1/2 Amp. Thermo couple, 0-15 Voltmeter, D.C., Pyrometer, \$40.00. Tubes, 3 W.E. 50 Watt @ \$28.00 Each, 3 J Tubes @ \$6.50, 6 N Tubes @ \$5.75, 4 E Tubes @ \$7.00, 3 UV 202's @ \$5.50, 2 WD11's @ \$3.75, 3 Austrian Tubes @ \$4.00. All the above material is absolutely new. 2BYK, Philip Orein, 54 Cook St., Brooklyn, N. Y. Phone Stagg 9585.

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Sell what the public wants—long distance radio receiving sets. Two sales weekly pays \$120 profit. No big investment, no canvassing. Sharpe of Colorado made \$955 in one month. Representatives wanted at once. This plan is sweeping the country. Write today giving name of your county. Ozarka, 853 Washington Blvd., Chicago.

FOR SALE: 1/2 KW 500 cycle alternators \$80; 1 KW Crocker-Wheeler 500 cycle motor-generator \$110; 2 KW \$145; 250 watt tubes \$70 and \$90; General Radio wavemeter \$40; 1/2 KW 500 cycle alternator \$40; watt meters \$10; 1 KW 5000 volt 500 cycle transformers \$45; 1 KW 220 volt 60 cycle transformers \$40; 12,000 volt .002 mfd. condensers \$5.50; Advance sink rectifier \$35; Navy receivers and other high power transmitting apparatus. Edward Page, Baldwinville, N. Y. 8AQO-8XAV.

SELL NEW Radio Corporation No. 1368 transformer. Perfect condition, \$15. Lyle Palmer, Boonville, N. Y.

FOR SALE: 350 Volt Generator \$15.00. French Army Variable Condenser .0022 Mfd. semi mounted with calibration curve \$10.00. RCA C.W. Transformer UP-1368 \$20.00. Lots of Five Watt Stuff. Write for list. No. C.O.D. F. W. Paul, 472-98th Street, Woodhaven, L. I., N. Y.

1000 VOLT, 500 Watt, Direct Current Generator Price \$50.00, one 500 Volt, 200 Watt machine, Price \$30.00. Complete with field rheostats and pulleys. Also several motor generator sets 500 to 1500 Volts, like new, bargains. We have a few 250 Watt filament transformers, price each \$9.00. 500 Watt, Price each \$12.00. Queen City Electric Co., 1734 W. Grand Ave., Chicago, Ill.

GREBE CR-7 500 to 25,000 meter receiver. A-1 condition. Cost \$210.00. First money order for \$75.00 gets it. H. B. Wooten, Coldwater, Miss.

PURE SHEET ALUMINUM and lead 1/8", 75¢ square foot. Electrical Specialty Company, Valparaiso, Indiana. 9DVK.

FOR SALE: Valley Battery Chargers, Type AB Ten Dollars; 4 inch Radion Dials 39 cents; Standard tube sockets composition 41 cents; 50 Watt tubes slightly used, twenty dollars; Omnigraph 5 record size ten dollars. Radio Supply Co., Sedan, Kansas.

AMATEUR RADIO STATION-ERY. 100 letterheads and 100 envelopes printed on good bond paper, special radio size, \$1.65. Send copy for name and address and station call. Printed by 9AVO (member A.R.R.L.), Samples on request. Radio Print Shop, Box 582, Kokomo, Indiana.

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, OT's, pig-tails, lead-ins, etc. Twenty sizes. No. 16 for wiring receivers, fifteen feet for 50c. 9CZP.

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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-Heising with speech amplifier, built-in, panel type, complete minus D.C. \$125. Also complete portable cabinet receiver 200-500 meters and amplifier, DX coast to coast, used, but in new condition minus accessories \$30, worth \$70.. Also cabinet receiver 1 stage tuned R.F. detector and 1 stage audio, minus accessories, solid mahogany piano finish, bargain \$35. Other cabinet receivers and parts less than wholesale. D.C. motors and lighting generators 56 watt to 5000 watt. Tesla Coil five feet long in 2 sectional drums delivers 3 foot spark largest 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 \$20 each or trade, 1 Kenotron UV217 used 6 hours \$15. or trade. All apparatus guaranteed as represented. Send 25% deposit, balance C.O.D. REAL Florida coconuts, in natural outer husk, good eating, fresh, and will grow in Northern hothouse, 25¢ each, plus parcel post on 2 lbs. Quantities by freight. Write for prices. Kenneth Richardson, Associate I.R.E., Box 1013, Fort Lauderdale, Florida.

RADIO CALL CARDS printed TO ORDER. Red call, black printing. 100, \$1.75; 200, \$2.75, prepaid. Color changes 35¢ extra. Government postals 1¢ extra each card. LETTERHEADS 8 1/2 x 5 1/2 AND ENVELOPES, 100 EACH, \$2.25; 200 EACH \$3.50. A.R.R.L. emblem used on cards or stationery if requested by members. Send TODAY. Department 11-C, Radio Printers, Mendota, Illinois.

FOR SALE: 3 pr. head phones, Books on wireless, one large and one small Westinghouse Rectigon Battery Charger, Magnavox. (Set of Marconi Wireless telegraphy double face records—six in set.) Omnigraph, lot Radio Magazines, Radio wet battery, also lot of parts and supplies. Lock Box 708, Calumet, Iowa.

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. 10% discount on all goods. All apparatus shipped prepaid. Edward Gieseke, Radio 9EBH, 312 So. Liberty St., Elgin, Ill.

DEFORST RECTIFIER tubes handle 1000 volts, 20 watts, used slightly, \$3.00; Electrode 4 in. dials, new \$0.50. Everything prepaid. Rubidge, Mountain Lakes, N. J.

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

FOR SALE: Omnigraph No. 2, ten dials, practice key and buzzer, eighteen 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.

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\$110.00 EDISON CHROME NICKEL 6 volt 150 ampere hour storage A battery at \$22.95. A wonderful battery at an equally wonderful price. 6 volt 330 ampere at \$37.90. Edison Type A (large size) B battery plates at 4¢ per pair, Type G's at 3¢ per pair. Parts for making rechargeable B storage battery from Edison plates (Type A) for 100 volts at \$8.95, 150 volts at \$12.95. Consists of plates, glass vials, special wire, perforated separators, chemical electrolyte and simple instructions for assembling and making charger. B. Q. Smith, 31 Washington Ave., Danbury, Conn.

SPECIAL MID SEASON SALE: UV 199's, UV 201-A's, WD11's, WD12's, \$5.75 each; UV 200's and 201's \$3.75; 100 A.H. Cooper Storage "A" Batteries \$13.50;

Crosley 80 A.H. Storage Batteries \$12.00; R-3 Magnavox \$24.50; Magnavox Power 2 step \$30.00; Telephone loud speakers \$4.50; RCA Potentiometers (200 ohm) \$1.00; UV 1714's transformers \$3.50; UV 712's \$4.00; Standard (Packard) transformers \$3.00; Stromberg-Carlson, Brandes Superior, Federal and Roller Smith head sets, \$5.00 each; Marshall-Gerken variometers (moulded) and variocouplers, \$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; Homchargers, \$13.00; Riggs Rectifiers, \$9.00; 2 Amp. Tungars, \$13.50; Aeriola Sr. Complete with aerial equipment, \$35.00; Aeriola Jr. Complete, \$12.00; Federal Jacks, any type, 30 cents; Federal Plugs, 50 cents; Pacnet Multijacks, 80 cents; No. 14 copper aerial wire, 200 ft. coil, 50 cents; porcelain insulators, 10 cents; Westinghouse aerial equipment, \$3.00; Marshall-Gerken Detector unit, \$3.00; Amplifier units with All-American transformer, \$4.00 each; Formica panels $\frac{1}{8}$ in. thick, 6x12, 6x18, 6x19, 6x21, 8x12, 9x12 and 12x14 inches, $1\frac{1}{2}$ cents per sq. inch; Micadon condensers, any value 20 cents. We ship C.O.D. if you desire. Leon F. Shell Co., New Washington, Ohio.

NEW VT2 \$8. Omnigraph \$15. Two Kenotrons \$5 each. Never used. Old Telefunken direct reading wavemeter 300 to 3200 meters \$20. Navy transfer switch 2 KW \$5. Radio 3BEM.

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TRADE—COMPLETE $\frac{1}{2}$ KW spark. Cost \$85. For receiving apparatus. Geo. H. Smith, Charleroi, Pa. Ex-8QG.

FONE TRANSMITTER, 8KG HOOK-UP, 10 watt oscillator, 10 modulator, 10 speech amplifier, or 20 watts straight C.W., 150 watt Esco motor-generator, cost \$250.00, sell \$150.00. Motor-generator separate \$50.00. SELL OR SWAP for synchronous rectifier, new Remington Portable Typewriter, cost \$95.00. Harold Scheerer, 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 Phones, \$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. 2DD. 8 Swan St., Schenectady, N. Y.

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

FOR SALE: 1/6 H.P., 220 volt, 25 cycle, Champion Motor. Used but in good condition, \$12.00. Will trade for good 200 watt C.W. transformer. Carlton Tennant, Box 565, Fort Dodge, Iowa.

MOTOR GENERATOR for sale. Esco 200 watt 400, 600, 1000 volts. Four bearing, double commutator. Operates on 110 volts, 60 cycle. Purchased new August, \$90. Elison Thompson, 1301 Findley Ave., New York, N. Y.

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

HERE'S A REAL BARGAIN: New Paragon RA-10, receiver, DA-2 detector and two-step amplifier. \$65. Good reason for selling this at this price. U. of I. Supply Store, Champaign, Illinois.

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

30 WATT CW-FONE transmitter on bakelite, complete with Motor Generator, tubes, etc. \$250. 500 volt 150 watt Motor Generator almost new, \$40.00. $\frac{1}{4}$ H.P. 1750 32 volt motor, new \$12.00. Want 1,000-

1,500 Motor Generator. "The Radio Parson," Greentown, Indiana.

FOR SALE: Regenerative set, 2 step amp. phones, bulbs, Bodine 24-volt Generator and other apparatus, cheap. Write for details and prices. F. A. Wimmer, 3916 N. Irving Ave., Chicago, Ill.

BIG BARGAIN: UV 199, UV 201A, WD11, WD12, \$5.65; Loud Speaker with Baldwin Unit, \$11.00; Freshman Variable Grid Leak with Condenser, \$0.80; \$10.00 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.

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HERE THEY ARE FELLOWS. Edison element storage batteries. Complete in attractive dust and acid proof cabinet, electrolyte and handles. $4\frac{1}{2}$ " surface between cells. The last word in storage "B" battery design. 22 volt battery \$3.25 48 volt \$6.50. 72 volt \$9.50. 100 volt \$12.25. Prepaid anywhere in the U.S.A. Shipped from stock. Send for circular. For this month I am offering Type A elements wired with heavy nickel plated iron wire at 6¢ per pair. $\frac{3}{4}$ x6 containers 3 $\frac{1}{2}$ ¢. 1x6" containers 4 $\frac{1}{2}$ ¢. Separators $\frac{3}{4}$ ¢. 5 lb. can electrolyte \$1.50. Everything for that storage "B." J. Zied, 530 Callowhill St., Phila. Pa.

EDGEWISE WOUND Copper Ribbon $\frac{1}{8}$ inch wide 6 inch diameter 15¢ turn, $\frac{1}{8}$ inch wide, 5 inch diameter 12 cents turn, any number turns one piece. Remler Giblin Coils mounted 25-75-100-150-200-250-300-400-500-600-750-1000-1500 turns, half price. Genuine Silicon Transformer steel, cut to order, 25 cents pound, 10 lb. and over, 4 cubic inches to lb. Postage extra. Geo. Schulz, Calumet, Mich.

QRA SECTION

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

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

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

1UO—Amateur Radio Club, at Wesleyan Univ., Middletown, Conn.

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

2AG—C. R. Runyon, Jr., 544 North Broadway, Yonkers, N. Y.

2CZD—J. H. O'Connor, 25 Cortland Ave., New Rochelle, 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.

4FZ—Thos. H. Hall, 117 Oak Haven Ave., Macon, Ga.

4IU—W. Justice Lee, Ortega, Fla.

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

50T—A. B. Tinsley, 1317 Allen Ave., Ft. Worth, Texas.

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

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

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

6ZAT—Lyndon Farwell, 55 Broadway, Los Gatos, Calif.

6SN—M. Kingdon Weller, 618 West 4th Street, Los Angeles, California.

7PK—Henry Bauer, Uniontown, Washington.

8ANL—W. K. Fischer, 7711 Guthrie Ave. N.W., Cleveland, Ohio.

QRA-8ANM—H. J. Crisick, W. Washington St., Medina, Ohio. QRK? All cards answered immediately.

QRA of 8AOT is 15 South McNab Ave., Gloversville, N. Y., not 2515 Braddock Ave., Swissdale, Pa., as published in Citizens Radio Call Book. All crds. ans.

8APE—Norman W Smith, 8058 Chamberlain Ave., Detroit, Mich.

8AZT—Reassigned to B. Buckingham, 195 West Eleventh Avenue, Columbus, Ohio.

8BBI—W. Guy Watson, 457 Florence Ave., Royal Oak, Mich.

8BCB—Ed. J. Kensler, 415 W. Chicago St., Sturgis, Mich.

8BHF—R. B. Greenman, 26½ Lincoln Ave., Cortland, N. Y.

8BJY—Ralph M. Cook, 588 Norton Way, Bucyrus, Ohio.

8BWC—Alto Hoover, 141 W. Main St., Norwalk, Ohio.

CUBAN 8GT—Juan E. Chibas, G. Portuendo baja 12, Santiago de Cuba, CUBA.

8GX-8ZE—Everett W. Thatcher, Oberlin, Ohio.

9ATT—Claude B. Vail, 607 N. Diamond St., Jackson, Illinois.

9DRY—Clyde A. Dolson, P.O. Box 167, Trinidad, Colorado.

9ELV—Justin W. Blauert, 498 13th Ave., Milwaukee, Wisc.

9UB is H. Harrison, Angola, Ind. Correct Ur. Citizens Call Book.

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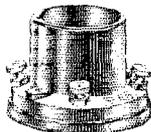
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DeLuxe Contact



Na-ald DeLuxe No. 400

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Ohio Brass Co. porcelain antenna insulators 5" 75¢, 10" \$1.50, Corona bushings if requested, Corona shields \$1.00. No. 12 solid copper enameled aerial wire. Lowest hifrequency, and no corrosion losses. 1¢ a foot prepaid. Grebe CR-13. A real receiver for relay men. \$95 prepaid. 250 watt Western Electric transmitting tubes \$75. Radio 8ML, 4837 Rockwood Road, Cleveland, Ohio.

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Federal Tel. & Tel. Co.....	78	Stromberg-Carlson Telephone Mfg. Co.....	70
Ferbend Electric Co.....	100	Sure Fire Radio Laboratory.....	90
Fischer Co., G. H.....	74	Thordarson Elec. Mfg. Co.....	88
France Mfg. Co., The.....	78	U. S. Tool Co.....	74
Freshman Co., Inc., Charles.....	78, 106	Valley Elec. Co.....	76
Frost, Hebert H.....	86	Washington Radio Lab.....	118
General Elec. Co.....	101	Western Coil & Electrical Co.....	82
General Radio Co.....	81	Westinghouse Elec. & Mfg. Co.....	91
Grebe & Co., A. H.....	4	Westinghouse Union Battery Co.....	71
HAM ADS.....	118 to 118	Weston Electrical Instrument Co.....	70
H & H Radio Co.....	104	Whitall Elec. Co.....	118
Hartford Instrument Co., The.....	111	Whittlesey Eng. Corp.....	94
Heath Radio & Elec. Mfg. Co.....	108	Zenith Radio Corp.....	69
Hommel Co., Ludwig.....	74		
Hygrade Elec. Novelty Co.....	104		
Jefferson Elec. Mfg. Co.....	94		
Kellogg Switchboard & Supply Co.....	96		
Kennedy Co., Colin B., The.....	109		
Kimley Electric Co.....	96		
Klaus Radio & Elec. Co.....	106		

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!

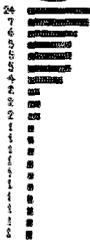


\$1.85

IN CANADA
\$2.50

PARCEL POST
10¢ EXTRA

Bradleystat Leads by Big Margin



Analysis of Returns

Each line represents a different type of rheostat used in the contest. The numbers indicate how many of each were used. Note the overwhelming popularity of the Bradleystat, first on the list.

Allen-Bradley Co.
Electric Controlling Apparatus

277 Greenfield
Avenue



MILWAUKEE,
Wisconsin

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

A NEW ERA IN RADIO



The Golden Rule Tube

The discovery of the principle upon which the Sodian 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



CONNECTICUT
MERIDEN

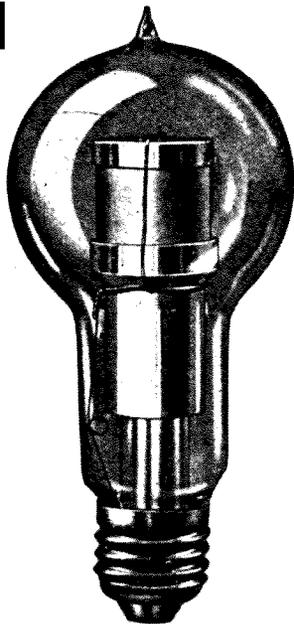
TELEPHONE
& ELECTRIC
Radio Division

COMPANY
CONNECTICUT



AMRAD

OWNERS DELIGHTED WITH "S" TUBE



Improved AMRAD "S" TUBE No. 4000
Price \$10.00

No Filament to Burn Out SPECIFICATIONS IMPROVED "S" TUBE

Rating per tube—

Current: 100 Milliamps.
Voltage: Up to 1000 volts
DC
Life: 3000 Hrs. (Very
conservative)

Operates CW Transmitters, utiliz-
ing either 5 or 50 watt power tube.

May be used to charge storage
"B" batteries.

Fits standard base.

A 100% rectifier.

*Write for new Bulletin J-2
describing the "S" Tube
and containing diagram
showing methods of con-
necting tubes for obtain-
ing various voltage and
current.*

"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.

Go to your dealer and demand "S" TUBES, but if he does not stock or you are not near one, send your order with remittance direct to us, and we will ship promptly.

The "S" Tube is fully guaranteed or money back.

Write for Descriptive Bulletin J-2

AMERICAN RADIO AND RESEARCH CORPORATION

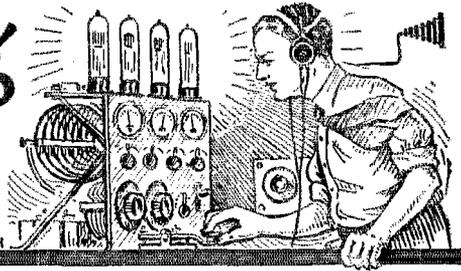
205 College Ave., Medford Hillside, Mass.

AMRAD Dealers in Principal Cities and Towns

The Operating Department

F. H. SCHNELL, Traffic Manager
1045 Main St., Hartford, Conn.

QISH



Some new abbreviations which will be of great help to us amateurs have been suggested by Boyd Laizure, 9RR, of Kansas City, Mo. To start the gang off with a few to see how they fall into use is the purpose of giving just seven new abbreviations. There are many more available, but before we try to overload you with something new, we feel it would be best 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 unnecessary 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)

- QRDD—(Question) In what direction are your messages going? (Answer) My messages are going _____ (North, East, South, West.)
- QRFF—(Question) From what station did you receive message Nr.—? (Answer) Message Nr.— was received from _____.
- QSL—Please acknowledge my signals by card; I will return the favor.
- QSRM—(Question) Will you forward message Nr.—by mail if you cannot relay by radio at once? (Answer) I will forward your message Nr.—by mail if I fail to relay by radio within 12 hours.
- QSUF—Please call me by wire telephone at once.
- QSYI—I shall shift my transmitting wave to _____ meters.
- QSYU—Please shift your transmitting wave to _____ meters.

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 9RR a card and tell him what you think of his ideas. His street address is 8020 Mercier St., R.F.D. 1, Kansas City, Mo.

The last month has seen 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 every month? It would be FB if we could as the greater number of amateurs we can get into the A.R.R.L., the greater will be our prestige—and we need it.

Reid, manager of the East Gulf, has been a ball of fire both in getting new members and in lining up his division. The East Gulf Division is in very fine shape. West, manager of the North-western Division, is keeping his division going and just as soon as the personnel is received, 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 efforts of such good men as Wise, Garrett, Coles and McCreery. Mr. Babcock is always on deck with the right kind of advice when called upon.

Mr. G. L. Bidwell, 1245 Evaris St., N.E., Washington, D. C. has been appointed chairman of the Emergency Railroad Committee and with the assistance of A. L. Budlong is whipping an organization into shape for the railroads. Those interested or having railroad communication experience are requested to get in touch with Mr. Bidwell for appointments. The A.R.R.L. will be prepared to handle communications for railroads this winter when severe storms cut off other communication.

Dist. No. 3:—C.M. PHILADELPHIA—Russell Mester, 5624 Arch St. Dist. No. 5: D.S.—John A. Roehm, 666 Union St., Lancaster. Dist. No. 7: D.S.—A. L. Crossley, Penna. State College, State College, Pa. Dist. No. 10: D.S.—W. M. Shoup, 160 1/2 Jefferson Ave., Vandergrift; C.M. JOHNSTOWN—N. L. Straub, 1045 Sunday St.; C.M. ALTOONA—K. W. Aughenbaugh, 1432 12th St. Dist. No. 12: D.S.—K. B. Lloyd, 231 w. 8th St., Erie.

SOUTHERN INDIANA—Dist. No. 1: O.R.S.—9BGW, 9BCT; Dist. No. 4: 2YJ.

NORTHERN INDIANA—Dist. No. 2: O.R.S.—9BLC.

WISCONSIN—Dist. No. 1: C.M. MILWAUKEE—Irving Strassman, 1064 38th St.

NORTH DAKOTA—Dist. No. 2: D.S.—Harold Demmer, Ellendale.

TENNESSEE—Dist. No. 2: C.M. KNOXVILLE—S. E. Adcock, 200 Washington Ave.

MISSOURI—Dist. No. 2: O.R.S.—9BKK.

CALIFORNIA—Dist. No. 2: D.S.—H. A. Duvall, 4965 Wadsworth St., Los Angeles. Dist. No. 3: C.M. FRESNO—M. P. Ports, 3305 Belmont Ave. D.S.—R. H. Potts, Riverbank.

COLORADO—A.D.M.—J. L. Turre, Fitzsimmons Hospital, Denver.

Corrections—State of Iowa

A.D.M.—D. E. Watts, 116 Highland Ave., Clear Lake

R.M.—J. P. Gillett, R.R. No. 2, Rippey

Dist. No. 1—Counties: Worth, Cerrogrado, Franklin, Hardin, Lyon, Osceola, Dickinson, Emmet, Kossuth, Clay, Winnebago, Sioux, O'Brien, Palo, Alto, Hancock, Plymouth, Cherokee, Buena Vista, Pocahontas, Humboldt, Wright, Woodbury, Ida, Sac, Calhoun, Webster, Hamilton, Monona, Crawford, Carroll, Greene, Boone, Story, Harrison, Shelby, Audubon, Guthrie, Dallas, Polk, Pottawattamie, Cass, Adair, Madison, Warren, Mills, Montgomery, Adams and Decatur.

D.S.—M. H. Decker, 310 N. Georgia Ave., Mason City, 9DKY

C.M.—R. H. Williamson, 715 S. Iowa Ave., EAGLE GROVE, 9AHH

C.M.—J. E. Decker, 119 Second St. S.E., MASON CITY, 9AMI

C.M.—C. S. Tunwall, 11th & 1st Ave., FT. DODGE, 9UL

C.M.—E. F. Havens, 1307 Des Moines St., DES MOINES, 9BIF

O.R.S.—9ATN, 9ZAA, 9RIF, 9RRS, 9BSZ, 9UL, 9DAH, 9BCF, 9CLQ, 9BSG, 9AHH, 9AOU, 9BGI, 9DXC, 9BVL, 9AEQ, 9EDB, 9ARZ, 9AMI, 9DKY, 9BFG.

Dist. No. 2—Counties: Mitchell, Howard, Winneshiek, Allamakee, Floyd, Chickasaw, Fayette, Clayton, Butler, Bremer, Grundy, Black Hawk, Buchanan, Delaware, Dubuque, Marshall, Lema, Benton, Linn, Jones, Jackson, Jasper, Poweshiek, Iowa, Johnson, Cedar, Clinton, Scott, Muscatine, Marion, Mohaska, Keokuk, Washington, Louisa, Lucas, Monroe, Wapello, Jefferson, Henry, Des Moines, Wayne, Appanose, Davis, Van Buren, Lee.

D.S.—D. J. Bailey, 525 Kenilworth St., Clinton, 9CS

C.M.—Paul Lovet, R. I. Jersey Ridge Rd., DAVENPORT, 9BGT

O.R.S.—9FK, 9CS, 9YA, 9DOF, 9CXP, 9BIK, 9AMU, 9BZI, 9BGI, 9CHN.

Additions

DISTRICT OF COLUMBIA—O.R.S.—3OK
PENNSYLVANIA—Dist. No. 3: C.M. PHILADELPHIA—Orien G. Albert, 867 N. Preston St.; O.R.S.—3DS. Dist. No. 4: O.R.S.—3CHG. Dist. No. 5: O.R.S.—3AAO, 3BGG, 3BWW, 3BKL;

CANCELLATIONS, CORRECTIONS IN AND ADDITIONS TO OCTOBER DIRECTORY

Cancellations

PENNSYLVANIA—Dist. No. 1: O.R.S.—3AWF.

D.S.—R. S. Williamson, 328 College Ave., Lancaster, Dist. No. 7: D.S.—W. C. Resides, 583 W. College Ave., State College.; O.R.S.—8BOY, Dist. No. 8: D.S.—W. K. Augenbaugh, 1482 12th St., Altoona.; O.R.S.—8AOK, Dist. No. 9: O.R.S.—8JW, 8VN, 8CDC, Dist. No. 10: D.S.—N. L. Straub, 1045 Sunday St., Johnstown, Dist. No. 14: O.R.S.—8BBP, 8BGG, 8BRM, 8BDU, 8DBL, 8ABS, 8RKY, OHIO—Dist. No. 1: O.R.S.—8BCF, 8CMY, 8CCL, 8ER, 8GD, 8AVN, Dist. No. 3: C. M. AKRON—W. E. Slabaugh, Jr., 142 S. Union St.; O. R.S.—8RKM, Dist. No. 5: C. M. LANCASTER—R. E. Stuckey, 810 N. Broad St.
 MICHIGAN—Dist. No. 1: O.R.S.—8CWX, Dist. No. 2: O.R.S.—8CFQ, Dist. No. 3: O.R.S.—8CZZ, 8CPD.
 ILLINOIS—Dist. No. 1: O.R.S.—8DAP, 8BWO, Dist. No. 2: O.R.S.—8BRX, Dist. No. 6: O.R.S.—8AOD, 8KD.
 WISCONSIN—Dist. No. 1: C. M. MILWAUKEE—Marion Szukalski, 1027 Windlake Ave.
 SOUTHERN INDIANA—Dist. No. 5: D.S.—Ralph Schwartz, 616 Montgomery St., Shelbyville, Ind.
 NORTHERN INDIANA—Dist. No. 2: C. M. LAFAYETTE—Prof. R. V. Achatz, Purdue University, Lafayette, Ind. O.R.S.—9DHJ, 9YB.
 MINNESOTA—Dist. No. 3: O.R.S.—9BPN.
 NORTH DAKOTA—Dist. No. 2: D.S.—L. H. Weeks, c/o Radio Equipment Corp., Minot.
 TENNESSEE—Dist. No. 3: D.S.—S. E. Adcock, 200 Washington Ave., Knoxville.
 KANSAS—Dist. No. 2: C. M. EMPORIA—L. C. Stroh, O.R.S.—9BOA, 9JW, 9AYP.
 MISSOURI—Dist. No. 1: O.R.S.—9DMJ, Dist. No. 2: C. M. KANSAS CITY—E. B. McDowell, 3145 Karnes Blvd., O.R.S.—9SS.
 NEBRASKA—Dist. No. 2: O.R.S.—9BDU.
 RHODE ISLAND—Dist. No. 1: O.R.S.—8AKR.
 MASSACHUSETTS—Dist. No. 2: C. M. BOSTON—H. W. Goucher, 469-A Columbus Ave.
 CONNECTICUT—Dist. No. 3: O.R.S.—1MO.
 CALIFORNIA—Dist. No. 4: D.S.—A. A. Hunt, 122 Market St., Los Gatos, Dist. No. 7: D.S.—E. Staats, 2318 Eye St., Sacramento.
 WEST VIRGINIA—Dist. No. 6: O.R.S.—8TH.
 NORTH CAROLINA—Dist. No. 2: O.R.S.—4KC, 4ML, 4CW.
 COLORADO—A.D.M.—Paul M. Segal, Equitable Bldg., Denver, Dist. No. 1: C. M. DENVER—J. L. Hathaway, 4026 E. 19th St., O.R.S.—8AMB, 8APE, Dist. No. 2: O.R.S.—8GLD, 8DFH.
 WESTERN ONTARIO—C. M. ST. THOMAS—W. E. Eldert, 60 5th Ave.
 SASKATCHEWAN—C. M. MOOSE JAW—David Stewart, 829 4th Ave., N.W.

EAST GULF DIVISION PERSONNEL

Florida, South Carolina, Alabama, Georgia
 D.M.—H. L. Reid, 69 E. Park Lane, Atlanta, Ga.
 Alabama (Dists. No. 1 to No. 4.)
 A.D.M.—V. C. McIlvaine, 106 W. 3rd St., Sheffield, Ala.
 Dist. No. 1—Counties: Lauderdale, Limestone, Madison, Jackson, DeKalb, Marshal, Macon, Lawrence, Colbert, Franklin, Marion, Winston, Cullman, Blount, Etowah, Cherokee, Cleburne, Calhoun, St. Claire, Jefferson, Walker, Fayette, Lamar, Pickens, Bibb, Tuscaloosa, Shelby, Talladega, Clay, Randolph.
 D.S.—H. S. Brownell, Edgewood, Birmingham
 C.M.—D. J. Connelly, 1025 N. 17th St., BIRMINGHAM, 5WB
 C.M.—J. McGuire, 1629 Quintard St., ANNISTON
 C.M.—J. K. Moore, 410 Reynolds St., GADSDEN
 O.R.S.—5ACM, 5ZAS, 5AGJ, 5AMH, 5UP, 5WB
 Dist. No. 2—Counties: Perry, Chilton, Coosa, Tallapoosa, Macon, Elmore, Montgomery, Autauga, Lowndes, Dallas, Butler, Crenshaw, Pike, Bullock, Babbour, Henry, Dale, Coffee, Geneva, Houston
 D.S.—F. P. Brooks, 400 S. McDonough St., Montgomery
 O.R.S.—5AJP, 5ABT
 Dist. No. 3—Counties: Sumter, Greene, Hale, Marengo, Choctaw, Clarke, Wilcox, Monroe, Conecuh, Covington, Escambia, Mobile and Washington
 D.S.—G. L. Barnett, 313 Chatham St., Mobile, 5JN
 C.M.—Chas. Rush, 855 S. Broad St., MOBILE, 5QF
 O.R.S.—5AFS, 5QF, 5AC, 5JR
 Dist. No. 4—Counties: Lee, Chambers, Russell

D.S.—A. M. Dunstan, Ala. Polytechnic Inst., Auburn, Ala. 5XA
 O.R.S.—5XA

Florida (Dists. No. 1 to No. 4.)

A.D.M.—C. F. Clark, c/o Western Union Tel. Co., Jacksonville, 4BP
 Dist. No. 1—Counties: Escambia, Santa Rosa, Franklin, Okaloosa, Walton, Holmes, Washington, Bay, Jackson, Calhoun, Liberty, Gadsden, Leon, Wakulla, Jefferson, Madison, Taylor, Hamilton, Suwanee, Lafayette, Alachua, Columbia, Baker, Bradford, Nassau, Duval, Clay, Putnam, Flagler, St. Johns
 D.S.—M. D. Clark, 1924 Swift St., Jacksonville, 4BP
 C.M.—E. Collins, 1311 N. 15th St., PENSACOLA, 4MS
 C.M.—F. W. Wienbarg, 819 W. State St., JACKSONVILLE—8G, JACKSONVILLE
 C.M.—Clement Paffee, 51 St. George St., ST. AUGUSTINE, 4PI
 O.R.S.—4SB, 4PL, 4SD, 4FS
 Dist. No. 2—Counties: Levy, Marion, Volusia, Citrus, Sumner, Lake, Seminole, Orange, Brevard, Hernando, Pasco, Hillsborough, Polk, Osceola, Manatee, northwestern half of De Soto
 D.S.—E. R. Hall, Box 1188, St. Petersburg
 C.M.—A. R. Clark, 314 W. Concord Ave., ORLANDO, 4RO
 C.M.—W. P. Moore, 339 Plant Ave., TAMPA, 4IZ
 C.M.—T. Litschauer, Box 1350, WINTER PARK, 4JI
 O.R.S.—4JY, 4JI, 4JZ, 4IZ
 Dist. No. 3—Counties: St. Lucien, Okeechobee, Palmbeach, southwestern half of De Soto, northern half of Lee
 D.S.—R. C. Bender, Box 538, West Palm Beach, 4DL
 O.R.S.—4DI
 Dist. No. 4—Counties: Broward, Dade, Monroe, southern half of Lee
 D.S.—W. E. Wood, 1711 N.E. First Ave., Miami, 4BS
 C.M.—J. Napier, 292 S.W. 10th St., MIAMI, 4DP

Georgia (Dists. No. 1 and No. 2.)

A.D.M.—G. L. Hight, 200 E. 9th St., Rome, 4BQ
 Dist. No. 1—Counties: Hart, Dade, Walker, Catoosa, Whitfield, Murray, Chattoga, Gordon, Fanning, Gilmer, Pickens, Dawson, Union, Lumpkin, Towns, Rabun, White, Habersham, Stephens, Franklin, Madison, Banks, Hall, Forsythe, Cherokee, Barstow, Floyd, Polk, Haralson, Paulding, Cobb, Milton, Gwinnett, Barrow, Jackson, Elbert, Lincoln, Wilkes, Columbia, McDuffie, Warren, Oglethorpe, Hancock, Taliaferro, Greene, Clarke, Oconee, Walton, Morgan, Putnam, Baldwin, Jones, Bibb, Rockdale, Newton, Jasper, Fulton, DeKalb, Douglas, Carroll, Heard, Campbell, Clayton, Henry, Bulks, Monroe, Crawford, Taylor, Fayette, Coweta, Group, Meriwether, Spalding, Pike, Lamar, Harris, Talbot, Ocon, Muscogee
 D. S.—M. Nicholson, Jr., 208 E. Hall St., Athens 4FG
 C.M.—L. Womelsdorf, Jr., 23 Howard Hights, CARTERSVILLE, 4DB
 C.M.—V. B. Bayliss, 337 Juniper St., ATLANTA, 4HS
 O.R.S.—4BW, 4BL, 4CG, 4CP, 4EH, 4ZF, 4JV, 4AG, 4FG, 4KF, 4HS, 4FB, 4DB, 4DH, 4AP, 4ZA, 4DN, 4EQ, 4QF, 4DO, 4BQ, 4XC, 4KU, 4IO
 Dist. No. 2—Counties: Chattahoochee, Marion, Schelly, Macon, Houston, Twiggs, Wilkerson, Washington, Glascock, Jefferson, Richmond, Burke, Screven, Jenkins, Emanuel, Johnson, Ffilingham, Bulloch, Candler, Chatham, Bryan, Liberty, McIntosh, Glynn, Camden, Charlton, Brantley, Pierce, Wayne, Long, Evans, Tattnall, Toombs, Appling, Bacon, Ware, Echols, Clinch, Atkinson, Coffee, Jeff Davis, Montgomery, Treutlen, Wheeler, Telfair, Laurens, Beckley, Dodge, Ben Hill, Irwin, Berrien, Lanier, Lowndes, Pulaski, Wilcox, Dooley, Stewart, Webster, Sumter, Quitman, Randolph, Terrell, Lee, Crisp, Turner, Clay, Calhoun, Dougherty, Worth, Tift, Cook, Brookes, Colquitt, Thomas, Grady, Early, Baker, Mitchell, Miller, Seminole, Decatur
 C.M.—L. J. Habne, 8 W. 43rd St., SAVANNAH
 O.R.S.—4EL, 4GN, 4GL, 4BY, 4FD

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. Waynesboro; 8DY, 8AWL and on spark and has installed a C.W. set. Luck has turned against 8AWL, who has been blowing all of his tubes lately. Altoona; 8AKI has been very active this month. The message traffic report has been increased.

Dist. No. 9: Washington; 8LJ's C.W. is still doing its little trick. 8DDK is having considerable trouble with the plate supply. East Pittsburgh; 8SE worked 6XAD. (FB, OM) This station has a consistent range of about 1000 miles all directions at dusk and at dark. New Brighton; 8BW is the only one in this town and shows lots of A.R.E.L. pep. Freeport; 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 6AWT. Scottsdale; 8QD has been reported at 6ALV. The antenna is being remodeled. New Kensington; 8CKM has his 20-watt and 100-watt set all set for the T.A. Tests. Oakmont; 8AAG—a 20-watt set will soon be on the air here shortly. The generator at 8CFQ burned out one A.M. during the T.P. Tests. He was heard in California the night before though. The 2nd op. has left Oakmont and will live at Scranton with the call of 8BJI and using two 50s. Here are some of the mottos of this station:

"No messages die here."

"Routing considered."

"Glad to deliver 'em."

This is what the A.R.E.L. has been fighting for for a long time. (Why can't we have more of it, fellows?) Pittsburgh; 8BT reports good receiving conditions, also a B.C.L. spark set on 200 meters. 8AIG has worked 6XAD. 8BRL is just getting under way for first time since last spring. Using 7 5-watters. 8CEI is still working the coast in odd moments. 8CFB has no antenna up and is using indoor antenna for both transmission and reception. 8CTF reports 30 messages. Glad to have the North Side represented again. 8DGE claims that the "DX" craze has spoiled real "Ham" work. (This "DX" stuff is bad business—C.M.) work. His C.W. is reaching out well. 8AGO is using a master oscillator. Good results on 5 5-watters. 8VE-8ZD is Pittsburgh's representatives on the new "WNP" traffic route. A super-heterodyne and a CR 13 will be used for reception.

Dist. No. 10: This district has just been taken over by the new D.S. who is 8BYI on the air. Johnstown; 8ADS has been working practically every night and is doing very good with his 15 watts A.C.C.W. 8AOP has not been on the air due to repairs on the transmitter. 8ECH is out of commission on account of burnt out tubes. 8BYI is working regular schedule every Sunday with 8DBL and is handling a fairly good amount of traffic. Erie; 8AHE is starting in FB with his "old reliable" spark and is working all the sparks east of the Mississippi. 8CWW is a new promising 5 watt station. 8GU is the new QRA for the old 8AGE that did fine work last winter with 10 watts. 8GU is now using 50 watts and is on every A.M. handling messages.

Dist. No. 14: Connellsville; 8BJV handled the usual traffic and was able to get better results with the new conical cage. This station is now using both 50 and 100 watts C.W. and is getting into the west and east as well as south in great shape. 8ABS is doing very consistent work. He has a wonderful location and can be relied upon for handling traffic east and west. 8BDY is getting unusual results with a 5 watt bottle, and has been reported frequently from the west coast. 8BBP is a new station but our old operator from 8BSJ. 8WR is trying hard to get back on the air but owing to business conditions is not able to work more than once a week at present. 8BGG is back on the air after an absence of nearly eight months. Uniontown; 8BDU is back on the air with a 1/2 K.W. Jug and is handling traffic in a very consistent manner. 8DKS has been off the air for a month and has just erected a new pole for his antenna which blew down some time ago. South Brownsville; 8AAF is putting up a

new conical cage antenna and a real counterpoise. Berlin; 8DBL is doing much better having rebuilt his antenna and put up a larger counterpoise.

DISTRICT OF COLUMBIA—3SU and 3AB seem to be doing excellent work. 3ABT reports his six operators having trouble keeping watch on account of the Y.L.s but they are doing excellent schedule work. Our YL station, 3CDQ, is getting out well on a 5-watter and is keeping early morning schedules with 3BCK one of our YL stations in Baltimore. 3BSB is doing excellent work and is doing a great deal in keeping Washington on the map.

DELAWARE—8AUN has installed 3 steps of radio frequency. Several sixes have been copied in one night with antenna on the ground. 3AIS has not been able to do much DX as yet. 3AIS has been doing very good work since changing the transmitter to Hartley circuit. We are glad to hear 3HG on the job again as it has been exceedingly hard to get traffic into Baltimore from the north.

MARYLAND—8TE is back from France with a flock of French 50's and is making them percolate to the tune of 8 amps. 3WF and 3FK have installed 100 watts and are reaching out in fine shape. 8AJD has put in two 50's also, and is reported from the Pacific coast. 3LG is doing fine work on 10 watts and reports the highest total of msgs. for Baltimore. 3BUC and 3FQ are doing the usual fine DX. 3APT has moved, but is again on the air doing good DX. He is very much elated over having been heard in Greenland. 3BU and 3PH are getting out in good shape. 3MF is heard on the air occasionally, and is heard working good DX. 3EM has been reported in England. (FB, OM.) 3SF is the only DX spk. in town, but does good wk in spite of this. 3FB, the combined station of 3BTP and 3IF clears much traffic, but fails to report it. 3BMO is doing the usual good work. 3BUR is keeping things moving in Annapolis when NSS shuts down. 3HG is on the air again.

EASTERN PENNA.—Dist. No. 1: Reports are not up to the standard this month, many are missing. 3HH is clinging to a lonely 50-watter and pushing it hard. 3BTL increased to 50 watts and hopes for a better report. 3AEN is working on his transmitter tuning for effective results. There are no reports from Chester.

Dist. No. 2: 3YO is back on the air again and looking forward to big traffic totals. The sigs from 3BNU have been heard in Alaska, Hawaii, California, and England. (FB, OM.) The call of 3ALU has been changed to 8DHV. Same QRA.

Dist. No. 4: 3ZO is having trouble with messages for the west coast. He says: "A fellow will get you OK and will QSR any message you have until you try and give him one for the Pacific coast—he will then answer with QRM or never come back." 3CHG is out one 50-watter but got busy with a few fives. Between college work, 3AUV manages to handle his share. Philadelphia; 3CDG topped them all with 35 msgs, just got the 50 to percolate. 3ADV worked 1300 miles with 5 watts.

CENTRAL DIVISION R. H. G. Mathews, 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: 9CCD leads this time in traffic handling, with 9ELV and 9CVI a close second and third, respectively. We still have two spark stations handling traffic in this district, 9AMA and 9BKR. 9BYB might develop if operators could be found to set up the apparatus and keep it in operating condition. 9ALR, is reaching out well. 9BAC has sold his transmitter. 9DXT will not be on this winter. 9AFK is studying medicine, hence has no time for radio. 9LN is wrestling with the difficulties of getting a 50-watt tube working. 9BZT is on with a M.G. 9CTV is erecting another mast and will then open up with 1 K.W. spark.

Dist. No. 3: 9BMU now has a DX record of 5500 miles and 38 states and hands in one of the best reports. 9AEU is installing a 40' steel tower. 9BVA's new transformer gives more kick to his sigs. 9BQG is giving school work part of his time. 9CJI has a motor-generator and will have new sticks. 9BYJ is on with C.W. 9BYE has been reported off the coast of England.

SOUTHERN INDIANA—Dist. No. 3: 9BRK hands in a big total. He reports working all districts in less than six hours this month. 9CIC

on spark is the only other active station in this district, and is discarding the stone mill for a 20-watt C.W. This will make Southern Indiana 100% C.W. WSP is on again with 20 watts after an absence of 18 months.

Dist. No. 1: D.S. Hood Bros., 9BVZ, (newly appointed, succeeding C. J. Kieley.) Indianapolis; Several of the old stations are back on the air including 9ARK, 9PF and 9DHR. 9EAD, 9EJA, 9FB, 9GJA, 9CYQ, and 9AWG are on regularly. 9BVZ is still having trouble getting a satisfactory plate supply. 9UR found that he was over 200 meters and since changing to a lower wave can't get out of the state.

Dist. No. 5: Ralph Schwartz, 9BBL, 616 Montgomery St., Shelbyville, Ind., has just been appointed Supt. of this Dist.

NORTHERN INDIANA—Dist. No. 1: H. G. Tudor, 9AZX, of Marion, Ind., is in line for appointment as D.S. since E. F. Pippenger is away at college and cannot therefore handle the work. 9AZX has 150 watts C.W., I.C.W. and fone and has been doing wonderful work.

Dist. No. 2: 9MM is using ten watts and has worked seven districts on fone. 9DYT is using 5 watts, and has worked seven districts and twenty-two states. 9DHJ is a new one working with a quarter K.W. spark. 9DVK has a 50-watter going with a new sine rectifier and has worked into Washington and Idaho. 9CP blew his 50-watter and has been off the air. South Bend; 9FP is on the air a good part of the time. 9CTE is going good with his 250-watter, having worked all but six states since he put it in a short time ago. He has been reported regularly in Calif. and by WNP. 9AXY burned out two 5-watters, but he has come back with others. 9AKD has two masts to put up and will be on the air. 9CNO has no masts to report. 9DJL, has opened up with a 5-watter. 9YB has been doing good work in spots and in other spots not so well.

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 enjoyed. The new 100-watt D.C. set at 8YN and the receiver at 8BRW proved the main attractions.

Dist. No. 4: 9CGF hands in a good total and is still using spark.

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

Dist. No. 1: 9CHE now has two ops and an all night schedule. 9DAY has worked all districts but the 7th with 10 watts. 9VM is back on the job. 9BZQ with spark coil fone worked 300 miles. 9BIZ has erected an 80 ft. stick—reports FB. 9DBU has a new antenna and hopes to work England. 9ARB is moving to California where he expects to work on a 6 license soon. 9CFK worked two sixes in twenty minutes and has been heard by WNP. 9DC has a 100-wtt set and worked 1BBO using 50-watt phone.

Dist. No. 2: D.S. Bergman reports holding down day and night jobs—18 hours a day—also radios after work—says "Sorry to report" "The Sleepless Wonder" in the east has a worthy rival in 9CA.

Dist. No. 3: 9MC using 500 watts blows a sink rectifier but falls back on M.G. set. 9BYX has been sick but is now back on the job. 9BHH with 10 watts has worked all districts but six and seven. 9CMN is quarantined and his message total is picking up. (FB) 9TW sends in his first report. 9CMC uses 5 watts. 9CXT 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. 9BHX is constructing a 100-watt set. 9BIT says glass towel racks make fine C.P. insulators, but too weak for the aerial. 9HXD is waiting for the power house to QSO. 9CLZ continues to be high traffic man and is putting up a 70 ft. mast. 9DCE is getting out fine with pure D.C. EXTRA! 9DHZ, the spark hound, has a 50-watt Western Electric and O.R.C.A.—says C.W. is the hope. 9DQU has worked 6 west coast stations and has been heard by WNP. 9CLJ is doing fine work on 10 watts and has an O.R.S. ticket. 9DKH is going FB. 9CPA, 9CFH, 9BPW, 9KX are coming to the front slowly but surely.

Dist. No. 5: 9BDA is using 5 watts with 10 watts available for emergency. 9CED will have

two ops and is increasing power to 50 watts. 9AYX worked 23 states on 5 watts. 9DLR is increasing power and wants the gang to know it. (Hope you break into the big League next month. OM—D.S.)

Dist. No. 7: 9AAW leads as usual with both spark and C.W. but 9BWS, 9BEF, 9AOY, 9BIL, 9AZP, 9FLB, and 9RC are all giving him a close run. For the first time in some months a real total is turned in from Chicago, with thirteen C.W. and seven spark stations reporting. (FB fellows, let's have a 100% report from all Chicago stations next time D.M.)

OHIO—Dist. No. 1: Lima has six active stations. 9ER, 9AA, 9AVN, 9GD, 9RCF, also 9CCI who has only been on two weeks with 100 watts and the rest 10 watts. 9FU was only on for two weeks account bad power but worked several sixes. 9CMU is doing fine work on 5 watts and heard by 6CGW. Van Wert is QRV for traffic with 8BX, 8MQ, 8CQS, 9CIE, 8AZA and 8BZQ who has a new 70-ft. pole and 10 watts D.C. 9CXU is doing fine work and sent in a good report.

Dist. No. 2: 9AAJ takes the lead and was also heard by WNP. 9BFH worked all districts in 24 hours with 50 watts.

Dist. No. 3: 9BNH leads this month with 8BKN second.

Dist. No. 4: 9EB sends in a good spark total, but has a 250-watter coming up. 9CWR heads the Dayton up with 50 watts. 9ZC worked eight sixes in October.

Dist. No. 5: 9GZ runs 4GL a close race for speed. He has been heard eight times in England, the Rockies east. 9PL has installed a sine rectifier with 100 watts and has worked 3 west coast stations.

Dist. No. 6: 9CRC and 9AL turn in good totals. 9CRC worked 7ABB and Canadian 4HH. 9AL claim that 8FS tried to get away with a whole chicken at a big chicken dinner by the DX Radio Club of Canton, but the rest of the gang saved some by sending an SOS to the waiters.

KENTUCKY—Dist. No. 1: 9WU is on the air with a pair of fifties in self-rectifying circuit. The owner, Mr. Hill is a prominent attorney. One of the ops at 9ARU is pounding brass on KDXQ. 9DWG will be on the air shortly. 9OX leads the district with 9EP second. Good totals were also turned in by 9BTT, 9ARU, 9BDE and 9ELL.

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.) 9UZ is second in 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 Mix during the past few weeks. Reports have come from 9EBT, 9AVZ, 9ZT, 9ETT, 9DKB. Apparently 9EBT was the first U.S. station to work WNP after the Bowdoin reached its present location.

MINNESOTA—Dist. No. 1: 9BAV is high this month with 108 messages. 9CO is too wobbly to handle traffic with Duluth direct, so he relays thru 9CE. 9DOE has been heard by WNP. 9ZC reports being very QRW.

Dist. No. 3: Minneapolis traffic is picking up in fine shape. 9BPN is getting out in fine shape. 9APE with his 5-watters is still knocking the phones in properly with the long-awaited for M.G. 9DEV is learning how to sign his call properly and DX stations are calling him. 9DPX has a new pole and has re-designed his 50-watt transmitter. 9BMX with a five watter is getting out well to the Fifth district. 9BFI leads the district with 361 messages D.C. Wallace, A.D.M., reports that on several mornings during the latter part of November, 9ZT was the only link between the east and west coasts in the inauguration of WNP-Hartford Express Relay. On one morning the route reached Alaska, the route being 1CKP, 9ZT, 7ABB, 7AAB (Alaska) and return. On November 25, 9ZT worked WNP direct for 28 minutes.

NORTH DAKOTA—Dist. No. 1: 9ADZ reports the erection of a 50 ft. mast. 9DLI has not yet started owing to the delayed arrival of a motor-generator. WNP has reported most of the stations in the district, showing that we are getting out. 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 9ACK 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 Wisconsin. 9DKB has the honor in this district of working WNP.

SOUTH DAKOTA—Dist. No. 1: 9BOF has ditched his rock-crusher and installed a 50-watt tube. 9DXR and 9BG are doing good work as are 9DKQ and 9AQE. 9BNH has been having some rectifier trouble. 9CKT and 9CKA are among the leaders in handling traffic.

Dist. No. 2: 9CGA is on the air consistently and leads the district in traffic handled. 9DKL is doing good work. 9CJS has been doing excellent work. 9RA of 9AGL is H. M. Crosby, Brookings, S. D. He reports good DX on 10 watts. 9AYI works only on week-ends. 9AVZ lost his 250-watt tube and is now on with a 50. 9BRI has moved his station off the back porch and has a more comfortable location. 9NM is working a distance of 200 miles with a coil and amplifier tube.

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. Msgs. were reported.

LOUISIANA—Dist. No. 1: We are very glad to announce that 5WY will remain in the game with us. He will raise his power to 20 watts shortly. 5WG, using 15 watts on motor generator, was reported by WNP. (FB, OM—D.M.)

Dist. No. 2: In three hours, 5KC worked all districts with the exception of the first and fourth, using 20 watts. 5YW, the new station of the Louisiana State University, is on the air with 100 watts and a fine cage antenna. Ex-5SF of Fort Worth is the brass-pounder there. 5ABA is learning how to pull teeth at Tulane University, where he hopes to erect a transmitter. 5ABC wants more time to devote to radio. 5CQ was a visitor at 5KC's shack recently. 5ZK works DX every Sunday. (How about those Sunday closing laws, ZK?—D.M.) 5RH is getting his 100-watt outfit ready for work. 5OO has a 50-watt unit with motor generator and will help out the traffic jupplers in his section. 5AA doesn't operate very often, but makes time count when he is on. 5ABH has his sink working, so we look forward to some traffic from him. 5UA caused the flat top and does better with a cage. 5NJ, an O.R.S., announces he is thru; sold his junk and has quit. (Better keep it, OM—it will cost money when you start again—D.M.)

TENNESSEE—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, McNairy, Hardin, Houston, Humphreys, Lauderdale, Haywood, Hardeman, Chester, Henry, Wayne, Dyer, Weakley, Crockett, Henderson, Benton, Perry, Obion, Gibson, Madison, Carroll, Decatur, Stewart and Lake. Those in the Second are: Lawrence, Montgomery, Cheatham, Wilson, Trousdale, Marshall, DeKalb, Hamilton, Putnam, Bledsoe, Lewis, Giles, Davidson, Rutherford, Franklin, Moore, Warren, Maury, Sequatchie, Jackson, Hickman, Robertson, Bedford, Coffee, Macon, Grundy, VanBuren, Clay, Dickson, Williamson, Sumner, Lincoln, Cannon, Smith, Marion, White, and Overton. Those in the Third are: Pickett, Morgan, McMinn, Knox, Blount, Grainger, Hawkins, Johnson, Fentress, Roane, Bradley, Loudon, Sevier, Claiborne, Greene, Carter, Cumberland, Rhea, Campbell, Monroe, Jefferson, Hancock, Cocke, Washington, Scott, Meigs, Anderson, Polk, Union, Hamblen, Sullivan and Union. Look up your location and see in what district you are now located to the proper District Superintendent.

Dist. N. 1: A. L. Cowles, 5NZ, D.S.—5BW is on with both C.W. and spark. 5AHJ and 5ALV are troubled with falling masts. 5EK is on with both C.W. and phone, does good work on both 'em. 5MO would do better if he would stick around the shack a little more. 5FP is back with 15 watts and stepping some! 5PY, has a swell shack, with reception room and everything. (Sure is nice—D.M.) 5PY will use at least 100 watts if he can get all his fifties together at one time. 5ZB is getting out well with the traffic and broadcasts. 5NT is getting started with a fifty.

Dist. No. 2: B. F. Painter, 5MB, D.S.—5MB is not on the air as he is putting up a 1300-foot Beverage antenna and a super-heterodyne receiver for the Trans-Atlantics. (Here's wishing

you luck, OM—D.M.) 5ANT uses a lone fiver with "S" tubes and is budding into a real ham station. 5LU, back from a trip around the world, will be on with 50 watts soon. (We welcome you, OM—A.D.M.) 5AJM is still striving to attain that elusive DX. 5AMF shows 196 messages handled. 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, and has accepted the position. This leaves Knoxville without a C.M., but one will be appointed shortly. 5WO is recovering from an auto wreck, which ruined his chances of getting that 250-watt. Several BCL's are planning on installing transmitters. (Give 'em a boost, you guys.—D.M.) 5AKW is away at school. 5UV worked everybody in one night and blew his bottles. 5IF-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 fade 4GL's list.

ARKANSAS—Dist. No. 2: 5MA is on with C.W., doing good work. 5WE 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 ever reached by this state and 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 658 handled by 5 stations, an average of 132 messages per station. Individual reports from separate districts show that everyone is on the job and will push the state's total up each month. In district No. 1 things are booming. 5AMH worked Can. 5CO and 7SF. 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: A very much concerted new interest is being shown around Mobile. A real live "Ham" club is going in that city and is doing much to help things along. Operating schedules have been adopted and are being exercised.

Dist. No. 4: Practically nothing doing at 5XA this year.

FLORIDA—Dist. No.1: Jacksonville stations have come to the short jump relay system of traffic handling and are maintaining schedules with St. Augustine and other nearby stations. Reception is good. 6th district stations, particularly 6XAD and 6ZZ are heard nightly. 4FS has been out of commission almost the entire month, rebuilding his rectifier. 4PI lived up to his promise and forked over his first report. 4PI and 4SB are still doing well. 4SD has come across with a traffic report. 4ZC is capable of excellent work but the operators are deprived of its use because of the exorbitant fee required of them by the University heads—D.M. 4QS has popped up with a flivver coil and works 5UP.

Dist. No. 2: 4IZ, the old standby, is out of operation completely this month. 4JZ is doing good work as usual. 4JI handled 12 msgs with 5 watts. 4RO is a new station and will soon be ready with 10 watts. D.S. Hall, 4JY, has resigned because of business pressure.

Dist. No. 3: 4DL is working and we want to thank him for forking over with a report.

Dist. No. 4: 4DP is having hard luck. He gets 5 good amps 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 msgs, respectively.

GEORGIA—A.D.M. Hight at Rome, is about to have to give up amateur radio for about five years due to a new business project he will undertake. Atlanta stations seem to be carrying the load for the entire state. 4EQ is leading with the most consistent work, while 4MB runs away with the message banner. Quite a few new stations are booming up and promise to be real A.R.K.L. stations soon. Macon: A live bunch have taken hold at this city and promise to put Macon on the map again. 4AY and 4FZ do the most consistent work.

PORTO RICO—No news from Rexach yet. We sincerely hope to get the cooperation of the Islanders in the near future.

MIDWEST DIVISION
G. S. Turner, Mgr.

Dear Gang: By the time you read this report, the holidays will be at hand. Therefore, I desire to thank you one and all for your splendid cooperation and support during the past year. It has been a pleasure to me to have the privilege of working with such a loyal gang as we have down here in this, the best division of the A.R.R.L. "The OLE MIDWEST." May the accomplishments 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 you all.

IOWA—THE NEW R.M. GETS ON THE JOB.
MISSOURI—A SPECIAL STUDY ON MESSAGE DELIVERY.

KANSAS—9CCV AND HIS INDUCTIVELY COUPLED TRANSMITTER.

NEBRASKA—A NEW TYPE RADIO CLUB OR 100% A.R.R.L.

IOWA—9DJJA 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**, **9DUS**, **9DMV**, **9DPW** and **9LT** going full blast. **9BZI** is doing his DX work before daylight hours. **9DSL** doesn't seem to be able to hit his old stride since he has discontinued using rubber stamp messages. We have a new Route Manager, gang, Mr. J. P. Gillett of Rippey, Iowa. The C.M. of Des Moines reports the gang are again hitting the ball in great shape. **9BRS** took the cake, handling 175 and **9CLQ** got a smell by being a close second. Other stations in Des Moines doing good work are **9AYE**, **9ACH**, **9LA**, **9DAL**, **9DIP**, **9BIF** and **9CSY**. **9RIF** has his 20 watt set going full blast. **9CHC** was quite active during the past month. **9RIK** handled a job of traffic and then sold out to **9AMU**. **9ATN** is doing good work on 20 watts. The R.M. has been active during the month despite a spell of sickness. He has drawn up a map listing thereon all the active stations in his state. Before the winter is over he expects to have Iowa criss-crossed with relay routes. In order to insure your station being included, write the R.M. at once. A total of 1171 messages were reported handled by Iowa stations during the past month.

To the new members of the A.R.R.L. at Wamego, Iowa—Welcome!

MISSOURI—The oft' repeated statement that the 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 why messages are not being delivered. A series of messages numbering 127 during the month of November were logged, properly checked, dated and timed. A card was mailed to the fellow to whom we QSRd the message, requesting information as to time and date received and to whom QSRd, including date and time. A card was also mailed to the fellow from whom we received a message stating that we received it, also the time and date and to whom we gave it. A card was then sent to the last fellow requesting information as to whom he gave it, etc. When these cards were returned properly filled in we again mailed a card to the fellows mentioned on his return card, and so on until the fellow to whom the message was addressed was found. Out of the 127 messages handled during the period of October 21 to November 20, only 14 messages were actually delivered. Out of the entire bunch of cards mailed out, 70 were returned with the desired information promptly, 10 were slow and 14 had to be reminded that a card was mailed 'em. 6 of these replied while 8 are still missing. Two fellows received four notices but so far have not replied. On the whole however, the cooperation was splendid. The above is a very good story to determine the status of message delivery. It proves that conditions were worse than we imagined. However, we are expecting a decided improvement as soon as the new O.R.S. certificates are sent out. Conditions in Missouri are fair, however, not up to the standard of last year. Many of the old timers are missing and some of the new stations are not working regularly. The old gang in St. Louis, St. Joseph and Kansas City, who are heard regularly are: **9AYL**, **9DMJ**, **9DJB**, **9BKO**, **9AVN**, **9DXK**, **9CTG**, **9DLT**, **9DZY**, **9DXN**, **9EKF**, **9EKY**, **9AAU**, **9NU**, **9PW**, **9CEE**, **9BLG**, **9DCW**, **9CJC**, and **9AON-9ZV**. Among the above mentioned stations the most active are, **9CTG**, **9AYL**, **9CJC**, **9BSH** and **9EKY**.

The new C.M. of K.C. is conducting "hammy" parties at his residence in order to discuss amateur conditions. MacDowell is one of the older fellows with a mature mind and therefore knows just what to do in fairness to both the amateur and the B.C.L. A complete log of the amateurs in K.C. was received from Mac and we find calls listed we never heard of. Hi. Let's get busy K.C. and work with your C.M. who has your interest at heart. The C.M.s of St. Louis, St. Joseph and Joplin report progress. Particularly the latter who states Joplin has revived interest in its club by inviting the OWs to join. The C.M. reports wonderful interest in radio (?) now. Cox of St. Joseph reports the old gang lining up and handling oodles of traffic. (Do they deliver, OM?) Schoening reports the St. Louis gang working FB. A recent conference of transmitters resulted in the formation of a traffic squad representative of all factions who are going to see to it that the U.S. Radio laws are enforced to the letter. **9BDS** and **9DVK** are on the job. **9DVK** was elected president of the S.E. Missouri Radio Club and we know this will boom with Ueleke as its president. **9DZY** of the eastern half seems to have his section pretty well lined up. The A.D.M. wants to thank you all for your consideration and hearty cooperation for this, the closing year and wishes you all a most joyous Christmas and a Very Happy New Year.

A total of 2584 messages were handled during the past month by Missouri stations.

KANSAS—The A.D.M., Simms of 9CWC rep, has resigned. All the information received to date is that he is moving west. (We are surely sorry to lose you, OM. You were a real A.D.M. and did good work for your station and the League. Best wishes to you.) The D.S.s have stepped in and reported direct this month. That's cooperation. **9CCS** and **9CCV**, Dist. No. 1; The C.M. of K. C.K., **9DLM**, is on the job and reports the following stations active, **9BVN**, **9NA**, **9RJB**, **9BXQ**, and **9DLM**. **9BVN** and **9DLM** were the most active. **9CKM** is coming back in the game with 50 watts soon, also **9CFI** contemplates 100 watts. **9RJB** has taken an OW for life. Congrats to you both. **9CCV** insists that a loose coupled inductive transmitter is the thing. No report as to DX obtained is at hand but you all know the quality of his sigs. In this connection, see August issue of *QST* for a similar circuit which is being used by **6JD**. What further recommendation is necessary? As **9CCV** says, "They are FB, gang." **9BHN** is the proud daddy of an eight pound brass-pounder. (Somemore congrats!) Dist. No. 2: **9AIM** is tearing up the air in all directions with his 150 watts. **9EFA** on spark is active. **9CJE** handled about a weeks supply of messages; total 68. (FB) He will have 15 watts next month. **9AVG** is reaching both coasts on 5 watt. **9AYP** is going good. **9BOA** has been appointed O.R.S. and C.M. of Emporia. (come on now, OM, pep 'er up.) **9CCS** is using 50 watts and working both coasts. **9DHB** is active. Total for Kansas this month—1372.

NEBRASKA—Hurray, gang! Nebraska is pepping up! **9EB** and **9DEW** are valuable assets to the **9ATC** has sworn to go after that nifty transmitter they are offering the winner. He added that he had a few hundred cards printed to acknowledge receipt of the lime-juicer's twisters. Mysterious actions on the part of Smith of 9JK and Stenback of old **AD7** are causing considerable comment around here of late and it is suspicioned that a certain 250-watt tube will soon explain the peculiar actions of these otherwise normal personages. **9AEC** on 5 watts, has been heard in Hawaii and also by **WNP**. (Another station putting it over on Iowa.) (Boys, our hats off to **9AEC**! He is a real worker and deserves the honor that is due him.) **9AFR** is doing good work despite the fact that he possesses a very infinite system. He only has 10 watts, too. **9YY** is the most consistent Lincoln station in operation. They are on with 250 watts. Many of the out-state hams are congregated at **9YY** at **9YY**. **9EAK** is attending school at Lincoln and goes home each week-end returning Sunday evenings with a wad of messages to push thru **9YY**. Dear old Quinby—another cracker-jack report from him. Omaha is booming. He has been elected president of an all A.R.R.L. radio club, the Citizens Radio Club of Omaha. Here is how the twenty-five men who are members of this club belong to the A.R.R.L. Two dollars is required for admission to this club and this two dollars in turn pays for a years subscription to *QST* and the A.R.R.L. Then the dues are levied monthly. The beauty of this scheme lies in its

simplicity. Best of all it is for the good of the old A.R.R.L. This club has just been recommended for affiliation and will of course be accepted. Schnell told me to go out and get him a dozen more such clubs. I am passing the request along to all who may read this report. (Go out and get a hundred such clubs.) Who will be the first to become 100% A.R.R.L.? 9DXY is putting out six amps on one 50-watt. But as Quinby says, there never was a rose without watch out! 9GY on 20 watts is our most consistent ditite station. 9DEW handled 121 messages. Fellows doing good work and deserving special mention are 9AQK, 9AQO, 9CIM, and 9HG. 9CMK knocks'em dead with his 100 watts. 9DSM is paralyzing the whole Missouri Valley with his big European tube. Let's make Nebraska a 100% C.W. state. Nebraska accounted for 1056 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. 1A1L reports hard luck with his tubes but likes his sink rectifier. 1BRQ was reported twice by WNP and has been using 50 watts on a single 40-foot counterpoise. 1CDO has just received a 250-watt tube. 1CKQ is on with 100 watts. 1CRU will be on with a 20-watt transmitter. 1CTP is dropping out of radio for a while. 1FM and 1KX are still in competition for traffic honors. 1KX is having trouble raising his antenna from 75 to 110 feet. 1APF hopes to be on with D.C. soon. 1BGN is changing from 20 to 50 watts. 1CNP has just started with 50 watts.

VERMONT—1ARY seems to a king up here. They are heard in England very consistently and their walls are peppered with cards from the 6th and 7th districts. They report hearing over twenty 6's and 7's. 1ARY handled 109 messages. 1AIQ handled all of nine.

NEW HAMPSHIRE—B. H. Stevens, who has been appointed A.D.M. in place of Mr. H. R. McLane, is doing wonderfully well. 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. 1YB has been doing some very fine work. They handled 455 messages and have been heard by 6XAD and three other Califor-handled 104. 1GL handled 215. 1BT handled 84. 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. 1BDU, Boardman Chase has been appointed A.D.M. for Eastern Mass. The vacancy caused by Mr. Robinson's resignation as C.M., which place he also held, has been filled by H. W. Croucher, who is an active officer of the Commonwealth Radio Association of Boston. Lee Bates, who resigned his position as D.S. of Worcester County, because of some fireworks, niggers in the woodpile, dynamite, 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 sevens. 1BT handled 107 messages on 5 watts. 1CIT is working 9's and 4's very easily. 1CPI is overhauling his station. 1CRJ has increased his power to 10 watts. 1CUK is operating at 1AF part of the time. 1COC handled 100 messages. 1BNT reports 12. 1SK handled 131 messages and 1LT put over 227. 1DY is putting out 7½ amperes. He has been heard in Los Angeles. 1DY is putting in C.W. and will probably junk the spark. A. S. McLean sends in a nice fat report, totalling 1058 messages. We feel proud of the way Western Mass. is coming through. Among the headliners is 1ADN with 119 and 1BOM with 103. 1AWW and 1YK 98 and 90 respectively. 1IL and 1CJT have taken the lead on the new O.R.S. certificates and are practicing delivery of all messages immediately. One station has been caught delivering a message to the waste basket and his O.R.S. has been cancelled. The E.A. to Mr. McLean, Miss Daniels, accompanied by 1BSZ visited 1BWY and found a very sociable crowd. President Curney served coffee and 1BSJ passed the cake. 1ADN has worked 7LN, 2100 miles, on three 5 watters. 1CPN is carrying on tests with English stations. 1BKQ 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 county. 1RR handled 132 messages this month. 1CKN handled one message from WNP and delivered by phone. He is rightly proud of this report. He is another station who delivered all messages in 12 hours. 1CPN has tube troubles. 1AQY handled 12. 1BBM handled 31 and reports his I.C.W. getting out fine for a small set. 1AR handled 6.

RHODE ISLAND—Fancher still continues to keep Rhode Island going in extra fine shape. He reports 1224 messages. 1II is doing good work and is on consistently. He handled 171. 1ANX has 100 watts going. 1BVH handled 286. 1GV reports 12. 1CMP reports 168. 1BES another old time traffic-chaser, reports 14. 1ANX puts over 154. 1BQD handled 103, but expects to move soon.

CONNECTICUT—J. L. Reinartz has resigned from the berth of A.D.M. of this state due to other duties, such as experimenting, tuners, etc., and Mr. Comstock, 1MY, has been appointed in his place. Mr. Comstock by the way, was formerly a B.C.L., and was converted by the coming in contact with several red hot amateurs and our chief H. P. Maxim. Now, he is converted and never thinks of a broadcasting station. Let this be a fair warning to other B.C.L.s and what the League does to 'em once they get their wires crossed with 5 or 6 A.R.R.L. men. The D.M. believes it is in order to drop a line of thanks and congratulations to 1MY. 1CPV handled 137 this month. 1FD,91;1APJ, 10; 1BOQ, 204. 1BOQ has been entirely rebuilt and is now 100 watts sink rectified 200 volts radiating 7 amps. They have worked 6BCL and received cards from 6TU and 6BGY. The station is being operated by 1CDM, 1OF, 9DPV, and 1BOR.

NORTHWESTERN DIVISION Glenn E. West, Mgr.

WHOOPEE!! Northwestern gang is back to old time form again. The spirit of honest co-operation and friendly rivalry seems to have taken hold of every man in the division. Fine work, men!

WASHINGTON—Dist. No. 2: Stations operating are 7ABB and 7PF, with one in Port Angeles just getting started. 7PF seems to be going good with three ops. while 7ABB is batting good along the IX line, and putting traffic into every district, Canada and Alaska and the North Pole. Kick is as regular as a clock. Consistency is his middle name. When the special "WNP Express Relay Route" was tested, 7ABB grabbed the message from 9ZT and shot it to 7AAB, Alaska. (FB, OM, keep it up!)

Dist. No. 3: Things have been running fine in this district. 7AIF and 7DC are combining stations. 7ACA has been off during the month, while 7AAO has just started up.

Dist. No. 4: This is the Gray Harbor district. Their powers range from 5 watts to 500 and any station can QSR with ease. The most active are: 7ADR, 7SF, 7LH, 7NO, 7SH, 7SC, 7NN, ex-7RI, whose new call is unknown, and 7ADF.

Dist. No. 6: This happy family is growing. Happy except for the frequent 5-watt funerals. 7VN and 7AJY are the latest additions along with 7AZ.

Dist. No. 7: 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 SOL 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 he can find time to be on.

OREGON—Dist. No. 1: A new D.S., 7EZ has been appointed. Traffic is moved through 7LR, 7IW, 7SY, and 7EZ. The first three are QSO east. In Junction City, traffic is moved by 7AIZ.

Dist. No. 2: 7HA is still working out FB, as is the new station, 7AKH.

Dist. No. 3: 7TT, 7QJ, 7LW, and 7TP are handling the traffic. Ninnes and eights are being worked nightly by these stations. QRM is fierce in the city, but the man that stays up earliest in the morning is working FB. 7AEA is working sixes with his 5-watt fone.

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. 78N and 7ABU are holding down the air in Seaside.

Dist. No. 7: 7QD and 7EM are handling the bulk of the traffic. 7FR has his 20 watts perking again. 7TQ is too busy building a DX sup set to copy British hams.

Dist. No. 10: In Milton all the traffic goes through 7ABY. 7KR is on the air again with a 20-watt fone set, and is doing consistent work. 7AJQ is away until after Xmas. 7JE is handling most of the traffic in Pendleton.

IDAHO—Dist. No. 1: 7JF is building a 100-station.

Dist. No. 2: 7OT is on with 50 watts again, after several months absence. 7OB has been doing exceptional work on a single 5-watt tube. 7PJ tears through in great style. 7PX has been heard several times. A new station has opened up with 10 watts under the call of 7OL. 7GW is a promising relay station if the wind storms, which Pocatello is noted for, will permit his masts to stand. 7IO has been doing the work of fifty and roars in the eastern bird's cans like dynamite. 7LN has been getting out also. 7OT, 7OB, 7AGR, and 7LN have been having a lot of fun experimenting with fone. They can all sit in the old shack and talk as if they were all together. 7OT and 7LN have worked up to a thousand miles using loop modulation.

MONTANA—Dist. No. 1: 7AJX has resigned as D.S. and his place has been taken by Martin Andah. At this time the only active stations are 7WP and 7AGF. Both did some good relay-ing, but 7AGF still has trouble of getting east.

Dist. No. 2: 7ZF was not heard very often. 7ZL, 7XBC, and 7JD, the station of the A.D.M. at Bozeman, handled 145 messages. The best work was done when our Lieutenant Governor had an auto 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 Mr. Story's brother-in-law was at the injured man's bedside two trains ahead of the rest of the relatives. 7ZL will be on with pure C.W. on 220 and 186 meters. 7JD with I.C.W. and fone on 186 and 7XBC has a license covering 50-200 meters and plans on doing some experimenting with the Tuzzer circuit.

Dist. No. 4: L. E. Crouter of Billings, address Y.M.C.A., is now the D.S. and tho this is his first real report, he has shown all indications of becoming a real supt. The only active station is 7ZU who is doing his best with relief ops. to keep the ether agitated in that vicinity. 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 on the fellows who pound the keys and burn the mid-night oil. With three very capable assistant division managers, California is all decorated with the desire to show the rest of the country that she means business.

SOUTHERN CALIF: Message reports were turned in by 6CME, 6BWE, 6ALC, 6LJ, and 6BRK. That is the most we have seen in many moons and the sum total was about 200 messages. 6ALG is installing 2.5 watters. 6BVG has blossomed forth with a 250 watter. 6KA, using 2-250 watters pushes 21 amps into his antenna. 6LJ is increasing his power to 290 watts, using all the methods of plate supply available. Three ops will be on the job for traffic and schedules will be established. 6LJ has 6UP's old spark ready for emergency work. 6OD will be away at school this year. Poor Lester Picker—had the misfortune to break an arm in an auto accident, but with his grit he can be expected back in harness by the time this reaches you.

Due to reorganization, some few reports got scrambled up in the mail along the route and didn't reach their proper place in time to appear in this issue.

CENTRAL CALIF: Dist. No. 3: 6BIH is the outstanding star this month. 456 messages passed thru his station and he is QSO 6CEU in Hawaii quite regularly. Dame rumor has it that 6AVV is tuning up a 250 watter. 6ABX and 6ARF are stringing up a Beverage Wire for Transpacific work.

Dist. No. 4: Five new special licenses were issued this month. 6ZAG is the same QRA as

6AMK; 6ZAH same as 6TU; 6ZAR same as 6TV; 6ZAU same as 6ATC; 6ZAT same as 6UW. There are some mighty good stations in. 6AGJ—250 watts; 6NX—50 watts; and 6ZAJ, 6HC with 10 watts. 6ACM was left out of the September report when he handled 242 messages. 6BM has been reported from 25 states and 8 districts in five weeks of operation.

Dist. No. 5: 6AWT says you can take your choice of routes from his place as he gets out PB on his 250 watter. 6CHL, with 100 watts handled 25 messages.

Dist. No. 6: 6ZI has joined the ranks of the benedicts. 6TI is on the job again with 50 watts. A total of about 600 messages was handled by 6ZX, 6AUY, 6ARB, 6CKC, 6BFU, 6HP, 6BQI, 6CLZ, and 6ACT.

Dist. No. 8: 6BUIA is doing best traffic work for this district. 6APE and 6BNC will break forth with C.W. soon. 6LU is back on the air again. All north-bound messages should go thru 6BUIA and 6LU who are farthest north stations in California.

A new list of men who have been appointed in each of the California sections and districts will appear as soon as same is received. There are many changes being made and the new list will help you to know where your reports must go to get into QST.

ROANOKE DIVISION W. T. Gravelly, Mgr.

Mr. A. A. Hebert, from A.R.R.L. Headquarters visited several cities in Virginia and North Carolina and gave talks on the situation at A.R.R.L. Headquarters.

The old chestnut about not receiving reports still continues to come in and it seems there is a general lack of interest in the game in certain sections. It appears to us that if you fellows would think over the question of who looks after your interests, when someone knifes you in the back and wants you closed up, because you are entitled to the air on an equality with others, that you would get fully organized and not have to have your D.S. continually dig after you. Some of the D.S.s are in this class and it appears to us that this is not the right A.R.R.L. spirit and we certainly want you to wake up and get your reports in ON TIME and show some life, otherwise give reasons for not doing the work which requires a very little time and we will make an effort to relieve you of the duties. We must have COOPERATION and REPORTS and ON TIME at that.

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. 8AUE handled his traffic in daylight with a 10-watter. 8AFD, 8BPU and 8ZW are getting on a little.

Dist. No. 5: D.S. Rhoads is not active in the radio game on account of other business preventing and the others suffer. 8CYM handles a few; only station accounted for this month.

Dist. No. 6: 8BDA seems to have carried off the honors this month. 8TH knocked off a few with his spark. (Try C.W., OM and kill 'em all.)

NORTH CAROLINA—Dist. No. 1: Traffic seems to have fallen off, but some of the stations are getting on the air and reporting. 4LJ is on the air every night. 4QW has a 20-watt fone going. (Get on the key, OM and let's handle a few messages.) 4EN, 4FP, 4NV and 4FA are all fone, hence the lack of traffic handled.

Dist. No. 2: 4KC does fine work and always QRV. He has been reported in France. 4GW reaches the west coast frequently. 4CM is back with 15 watts. 4OU has just opened up. 4MI will be back on the air soon.

Dist. No. 3: 4JR is 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 traffic report. 4BX is back on the air and going good.

FLASH—4MV has started ½K.W. rock crusher at Winston-Salem. (Boy, page the Flint gang with the wouf-hou!)

VIRGINIA—Dist. No. 1: 3UU gets out in fine shape and knocks off some traffic, as does 3BHT. 3UV showed over a few messages this month. 3CJX and 3CKA will be with us next report.

Dist. No. 2: 3ATB was heard on west coast the first week of operation. He has a 100-watter—worked into North Dakota. 3AUU is still winding M.G.s for the gang. The supply of "hams" will run out some day and then we will

get a traffic report. 3RCH just finished a new antenna and uses 20 watts. 5AOT by consent moves from the cellar to the attic. 3AHE, after getting down to 120 meters had to come up to get the gang to work with him. 3SG can't work when the tubes won't burn! 3ABS just finished regu-ling and will add more power. 3GKN will be going good next report. 3RMN has a M.G. hooked up and is doing good work, also rebuilding the shack too.

Dist. No. 5: 3IW is doing all the work. Seems that the others have quit or at any rate they make no reports.

Dist. No. 8: 3BZ, however, is back on the air and we are glad to hear him again after an absence due to overwork. 3AEV is not heard any more.

Dist. No. 9: 3ZA still shows some pep and is on the air often. 3BHS and 3RXX are getting out. 3CKL, a new station is hammering all around the lot which is sure FB, OM, and it shows pep all right. 3XN is getting on the air and we expect to see a report from there soon.

(The above was prepared by J. E. Wohlford, 3CA.)

ROCKY MOUNTAIN DIVISION N. R. Hood, Mgr.

9AMB—328 Msgs.
Hathaways
C.W. Denver

COLORADO—The Denver district piles up 1518 this month. 9BJL, 9CAA, 9CVY, and 9APF each put thru considerably more than 150 messages. Due to traffic schedules and schedules with those who a station interferes with, Denver is one of the best regulated "ham" towns in the country. 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: 9BVO 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. 9DFH leads in this district with 114 msgs. 9APF is a new O.R.S. in Colorado.

UTAH—The only reports received this month were from Salt Lake stations. 6CBU leads with 74 messages to his credit. 6RM comes next and 6BUH 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.)

WYOMING—With 7ZY off the air temporarily, this state now boasts of only two O.R.S. A new station has been put in operation at Laramie, Wyoming, and will be handling traffic when this reaches the readers. 7ZD put thru 45 msgs, and 7ZO put thru 30. Both of these stations have been camping continuously on WNP's wave, and traffic has suffered terribly.

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. Mapee, Guanajuato, Mexico, it being the farthest station south. On November 11, BX sent a message of greeting to the A.R.R.L. station farthest north. WNP, reading:

"Fm Mex BX to Mr. D. H. Mix,
Wireless North Pole, via Can. 9BP
Official ARRL stn farthest south sends
greetings to the ARRL stn farthest north
(signed) H. T. Mapee, Mex BX"

This passed from BX to 5LR, Can. 9BP, WNP. On November 18, the following message dated November 18 and received the same date by BX, passed via WNP, 7ABB, 5ZA, BX.

"Mr. I. Fm WNP to Mexican BX
Many tnx this acknowledges and returns
best 75's"

(Signed) Mix—WNP"

5LR takes first honors in number of messages handled his total being 394 for the month. 5YK comes second with 324. 5AMA takes third place with 217 and 5ZAV runs him a close race with 212.

Northern Texas Section—Dist. No. 1: 5ACQ, D.S. finds it necessary to resign his position due to school work. He also surrenders his O.R.S. appointment for the same reason. (Sure sorry to lose you OM—D.M.) Greenville; 5DW

leads "Greentown" with 111, altho he lost part of his 80' mast. 5GN comes second with 45; 5ACQ, as a parting shot reports 34; 5AI, working third trick for the "Katy" on top of the quiet hours has a hard time sitting in, but brings up rear with 8. Marshall; Now has two A.R.R.L. stations. 5ALJ and 5AMG, Texarkana; 5AER still out of commission on account of local QRM from power lines. Grapevine; 5AMJ has it all to himself now, experienced some receiver trouble. 5TP has moved to Richardson. 5ANQ has moved to Burlison. 5AMJ is on every night from 7 to 8 and from 10:30 to 11 P.M. Denton; 5NW has a 4 5-watt tube set coming up. He passed 80 along the way. Grand Saline; 5ALI—48. Terrell; 5UD has put his spark set in a curiosity shop. He moved 6. Denison; 5AHC slipped 22 along the relay path and 5AMB helped with a "baker's dozen," 13.

Dist. No. 2: 5ADQ is a new O.R.S. ready for traffic on Sundays, Mondays, Tuesdays, Thursdays and Fridays. Waco; 5GV leads the four relay stations with 127 and 5QW ran him a close second with 121. 5SD has been off the air about two weeks. He moved 70. 5ZF has been inactive during the month. Waxahachie; 5AJT is getting QRM from school, but moved 80. West; Everything is moving smoothly. 5FA handled 94. Tyler; 5QY with only one operator on duty moved 131, all in daytime too. 5PH has been reported in Whitehorse Yukon, Canada. He is using 4 5-watt tubes, 4 amps, and moved 101 of those A.R.R.L. messages. 5ADH did not keep a complete month's record, but counted 45. 5ADH is a new O.R.S. 5QY is also a new O.R.S. Cleburne; 5AGH reports 28. 5AFH moved 10. Holland; 5AMW, working C.W. and fone handled 68. Nacogdoches; 5ADV worked at 5ADV and the sun never sets on a message here. 23 states and 6 districts. There are two operators. They handled 55.

Dist. No. 3: Wichita Falls; 5UO and 5UN are holding down the game. 5HQ is about over the Y.L. craze and the gang are after him with an application so this place will be 100% A.R.R.L. Eastland; 5AKT is a new A.R.R.L. station.

Dist. No. 5: Amarillo; 5ZH moved 18. 5VD is another A.R.R.L. relay station for this point. Lubbock; 5AJJ seems to have it all to himself, he moved 40, but has trouble clearing to El Paso and New Mexico. 5AGE moved to Paris, Texas. 5AMI and 5ABJ are at A & M, Dallas; 5LR is the star traffic handler. 394 is his total. He has the "star" masts too with some overhead attached thereto which caused him considerable worry as to how to get it down to 200, a deck rigging on one of the masts place the set on and a cloud for a "ground" was one of the suggestions. 5HY had another 5 watt bottle to pass away, handles traffic all directions. He takes second place with 129. 5AKN handled 70. 5AIC—68. 5AJJ, our handsome and talented C.M., 53. 5G representing Trinity Heights—33. 5VP—32. 5JG is a new A.R.R.L. member, and has discarded his spark for a C.W. and likes it beter. He moved 25. 5JY broken back into the game with a 5-watt bottle and reports 10 messages. 5CT has arranged a schedule with 9BOF. 5BX is another new A.R.R.L.er. Fort Worth; 5BE heads the list with 125 messages. He has heard WNP sending press to Can. 4CL, and works all districts using a 50-watt bottle. 5QI has been all piled up with foot-ball.

Southern Texas Section—Dist. No. 6: Houston; 5AE handled 22. 5ZX reports 4, and this just about tells the story for Houston. 5NK has re-joined the A.R.R.L. 5OV is a new mem-ber but figuring on getting well. 5APJ is a new O.R.S. Orange; 5AMA is being operated by Gray and Doane. They advise that the Rev. E. T. Drake still owns it. They handled 217. 5XAD is still out of commission waiting for the owner to get enough jack together to start it up. Galveston; 5AHM is a new station on the island to become an A.R.R.L. relay. 5VY-5ZG shoved 103 of those free-gratis-friendly messages along their way.

Dist. No. 7: Austin; 5RN is out of commission. 5FT is on Friday, Saturday and Sundays, and leads the Capitol City with 36 messages. 5ALR reports 2. 5PD is a new O.R.S.. Rockdale; 5NH reports 31. New Braunsfels; The A.D.M. pushed 324 messages on their way. (Atta boy!!! that's the stuff, like to see these traffic officers on the air! That's my idea of a traffic officer anyway. Think I'll hook this "Corona," its about worn out on this stuff anyway, get me a real "HE" C.W. and win back my reputation as a "brass pounder."—D.M.) Beeville; 5GR surrenders his O.R.S. certificate.

Dist. No. 8: Mr. L. D. Wall, D.S. finds it necessary to leave San Antonio on account of ill

health and resigns as D.S. Mr. Chrono, 5AEW is acting as D.S. San Antonio; 5MN has moved to the city from Ft. Worth. 5ZAE has gone to sea, and 5ZAK is going. 5KG is the star station of the "Almo" City—handled 133. 5AEW—2, 5AJZ is now on and ready for traffic. 5VO "nil" still saving for a 50-watter. San Angelo; 5JC has been spending all his time blowing 5 watt bottles, and reports 13. 5GE is attending A. & M. His O.R.S. appointment has been cancelled until he returns. San Benito; 5ADI reports 37. 5AEY is a new A.R.R.L. station, as is 5PS.

Dist. No. 3: El Paso; 5ZAD has moved to California. 5ADB has been making some SOS (speed of service) records, moving every message within five minutes after it lights at his station. This of course takes good fast operators at both ends and the "fast circuits" are with 5AMA, 5OV, 6EC, 5AID, 6BTS, 9DTE and 9AMB. 5DE reports 2, as he is only on Saturday, Sunday and Monday nights. 5NB is a new A.R.R.L. station. 5GC is under construction.

Oklahoma—Dist. No. 1: Enid; 5ANC handled 145 and was out of commission 9 days on account of blown tubes. 5JE had a tube "go west" too, but reports 25. 5SR is starting to rebuild his station. 5ZM passes 55 of 'em along. Oklahoma City; 5ZAV "Am going good, blew 3 more 50-watt tubes, have a regular schedule with 9AAU and 6CMR twice a week for traffic, also a schedule with Mexican BX. 5XG is a new O.R.S.

Dist. No. 2: Muskogee; 5BM is out of commission since Halloween night—pole down. Tulsa; 5QQ leads with 55. 5GA handled 17. 5SG will have 5FS helping out as second operator. Sand Springs; 5GJ has a new tower up, and is on consistently. His operating hours are 6:30 to 8 P.M. and 4 to 7 A.M. 5XBF reports 2. Sapulpa; 5AAW is ready for traffic. Fort Sill; 5TA every message accepted is relayed or delivered within 24 hours Ringling; 5AGZ wishes the bunch would have pity on a new "ham" and QSL sigs and shoot him some traffic. Altus; 5AHD moved 94. Norman; 5VM is out of commission at present. Norman stations are working on a plan to consolidate all stations in one efficient relay station under the supervision of a professional radio fraternity of the U. of Oklahoma, the Alpha Sigma Delta. Chichasha; 5IB is a new A.R.R.L. station.

New Mexico—Roswell; 5ZA is back on the air and moving traffic. Cloudcroft; 5IG reports 70.

Mexico—BX reports 43 for the month. "The gang up in the states must think BX has a long reach, received 4 for Panama, 1 for Peru, 1 for Argentine, 1 for Columbia and 2 for Chile, they were all passed along too; via mail."

HAWAIIAN DIVISION

K. A. Cantin, Mgr.

Dist. "A" Honolulu—GCCR has increased his transmitter to 30 watts and has received favorable reports from mainland stations on his signals. 6ASR with his new 50-watt D.C. transmitter expects to be QSO with the coast. 6TQ still continues to be unsuccessful in working the mainland.

Dist. "B" Hawaii—6CEU handles all coast traffic and is doing excellent work with his 15-watter. To date his signals have been logged by WNP, 4AA New Zealand and Alaska. Also by many 6th and 7th districts.

MARITIME DIVISION

W. C. Borrett, Mgr.

Amateur radio in the Maritime Division has certainly taken a big jump in the last thirty days. The Amateurs have answered the call of the Division Manager in a way far beyond his fondest hopes.

The Maritime Division covers a tremendous amount of territory, taking in the Canadian Provinces of New Brunswick, Nova Scotia and Prince Edward Island, also the Dominion of Newfoundland and the Laboratory Territory. The only place left for the Division to take in is the North Pole with that very efficient station WNP but owing to it being hard to make connections up there, the Division Manager would just as soon leave that part of the world to Mix to rule for the present.

Halifax is the center of activity of the Division and we now have the following A.R.R.L. stations located there: 1AI, 1AU, 1BQ, 1BV, 1DF, 1DT, 1EB, and 1EF. In Dartmouth just a mile away we have 1AR, 1DD, and 1DQ. The province of New Brunswick, of which Mr. Tom Lacey is A.D.M., is coming along in good shape. In St.

John we have 1EI; in Hampton, 1DN; and in Jacquet River, 1AF who is located in a splendid position for an all Canadian route for trans-Canada messages.

In Prince Edward Island 9AK is the only station that we know of in working order, but it is hoped that with the help of Keith Rogers, who is well known in radio circles on the Island, that many more will spring up in the near future.

In Newfoundland and Labrador we have not as yet any stations working but steps are being taken to try and establish at least one station in the Ancient Colony.

There is hardly a Maritime station of any DX ability that is not in the League and whereas two months ago we had only five A.R.R.L. stations in the Division we now have 16. 1AR has handled considerable traffic, having received 12 messages and sent 18. 1DD sent 25 and received 7 making a total of 62 messages handled by the two stations for the Division for the month. 1AR is still receiving cards from England. He says that he is giving up the 500-watt bottle and is returning to his old love the four 5-watters as reports he has received do not satisfy him in regard to the big tube. 1DD broke his previous record by working USA 9DSW out in Falmont, Minn., with 20 watts and with all his chokes in at that. 1BQ has returned to the air. (Hurrah) He has 20 watts going as before but is awaiting the arrival of two 203-A tubes. The size of two telephone poles in his yard is worrying the B.C.L.s considerably, as they seem to think that he ought to wipe up all concerts whenever he starts up, but very strange to them he does not. Greig is one of the best ops and although his signals reach the West Coast he probably causes less QRM to B.C.L.s than any other Maritime station. 1EB and 1DT have their aeriels up and should be on for traffic by now. 1EF and 1DF are still in the building. 1AL, who formerly operated a 3/4 K.W. spark, still casts longing eyes at it, but from kind remarks he has heard has decided to put in a C.W. set. 1BV has 10 watts and expects to break all records by the time this is printed. 1DQ has 20 watts and has worked the USA Eighth Dist. 1EI is going now and has worked 1DD thereby connecting up NS and NB by Amateur Radio for the first time. He is on every night and would appreciate a call or report from USA or Upper Canadian stations. 1DN has 10 watts ready to perk and 1AF should be on soon. Mr. Massie of St. John is getting his 200-watt set in order for 1EI to use in Trans-Atlantic contests. Special certificates have been offered by the Division Manager for the stations that handle first traffic after Nov. 23rd over the following routes: NS—NB, NS—PEI, NS—NFLD, NB—PEI, NB—NFLD, PEI—NFLD. Several transmitting contests and receiving contests will be held in the Division for which prizes have been offered by the Can. Gen. Electric and the Northern Electric, the full particulars will be mailed to all the Maritime Stations.

ONTARIO DIVISION

C. H. Langford, Mgr.

Ontario can boast of a station working WNP. It is none other than 3NI. 3DC will be on soon with 20 watts.

Windsor, Sandwich and Leamington are doing their best to get ahead of the others. (Go to it fellows, but make it interesting.) 9AR and 3MN have 100 watts on 100 meters. Everyone seems to be putting in tubes and 100-foot poles. Two B.C.L.s will soon be heard around Leamington on 10 watts, with M.G. sets. London gives news that 3TB worked Vancouver with 50 watts. (FB) Eldert, C.M. of St. Thomas, also reports working ancouver on 100 watts. Not to be outdone, 3SP says he does the same thing and throws in yorking 6XAD. Now with this running pretty, Kitchener makes a break by not turning in a report.

Central Ontario reports 3XX as top traffic man of the district. 3CO wants reports turned in on time and better ones. Hamilton reports blown tubes, overhauled sets and real traffic service.

Eastern Ontario reports 3MP going to Brockville, taking the only station out of Cornwall, Ottawa and Brockville are working a daylight schedule. 3AFP, 3NF, and 3KR are doing good work. Kingston is well represented by 3AEL, 3AFZ, 3HO, 3HE, and 3NF. 3HE has been reported in England on three occasions.

All in all everything is improving and a hum-dinger season can be expected. DO YOUR SHARE, OM, TO MAKE IT SO!

QUEBEC DIVISION
J. V. Argyle, Mgr.

Good progress has been made during the past month, all stations reaching out better and handling more traffic than ever before. The actual traffic total is somewhat lower due to the absence of 2BN, who is unable to work except on week-ends, due to college QRM. 2IC, 2BG, 2AM, and 2CG, the usual gang, are being assisted these days by 2FL, 2AZ, 2BY, 2CT, and 2EK, which is FB as we require good new stations in this section all the time. 2BN is to be congratulated on being the first man in this division to work a "6," he having worked 6XAD for half an hour. 2CG receives cards from the sixes but has yet to work one. A get-together party held at 2BG's station has convinced the D.M. that if some of the gang could handle DX traffic as well as they handle the grape-juice, we would sure have the best traffic totals of any district in the A.R.R.L. 2HV, our wide-awake publicity man has some fine stunts planned—watch us, Ontario and the west, we are

4s, 2s; and along comes 5GO right on his tail with only 50 watts. (FB, OM) Vancouver is keeping traffic moving (twenty-four hours a day with at least one station on all the time, 5EJ too busy—not on much, 5EB and 5AH both with 5 watts have worked east over 1200 miles. 5HG is on frequently, 5HB is going with 20 watts, 5AT at Chilliwack will be going soon with 15 watts.

Vancouver Island Dist.: W. F. Reeves of Duncan, B. C. is D.S. and reports very little traffic moving since the "Rubber Stamp" msgs have gone west, he is a lone station and reports it hard to raise any station.

Prince Rupert Dist.: J. Barnsley of Prince Rupert is D.S. hands in no traffic report, but we know that he is handling all messages for North American Newspaper Alliance with WNP and has been in constant communication with WNP since Sept. 7th.

Edmonton Dist.: P. A. Field, of 4CL is D.S. and handed in a basket full of msg. reports. He is QSO American 1s, 2s, 3s, and was heard



cleared for action! 2FB threatens to open up with 20 watts D.C. (Gosh! we could ask for nothing better. Come on, old timer!)

Communication with Nova Scotia, via 1DD, 1AR, and 1DE is really excellent as is communication west through Ontario stations. No direct communication with Canadian fours has yet 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 forgotten what sleep is, record biz with WNP. Division Message report has hit the mark of 607, and the Operating Department has got away to a very good start, all O.R.S. 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, so the whole division is ablaze, scrambling for traffic and DX. GANG, this D.M. work is no Golden Harp and Marble Chair job, but as long as you keep up your "PEPP" and help as you have done so far, I am willing to let you call it whatever you think. For more speed and spontaneous reports just address all matters to D.M. as A. P. Ober, Vulcan, Alberta, and no street number.

Vancouver Dist.: C. West, 3290 Granville St., is the new D.S. and as 5CN is a DX hound, is QSO Can. 3OM es 3TB also American 3s, 3s,

working WNP. (FB, OM—D.M.) He blew a 50-watter; its mate is longing for a pal. 4HF is on with 10 watts and is doing fine work using Meissner circuit. 4CL warns all Boiled Owls that his district will be hard to beat next month.

Alberta Dist.: 4CW is on with real C.W. and has sure done great DX, good traffic report and regular hours on duty. 4IO has sure set a stride for 5-watter QSO 7s and fine traffic report. 4DQ has set some DX for 10-watt reports from 1s, 2s, 3s and WNP and has logged WNP consistently on Reinartz and detector, is QSO Canadian 3NL, and has done FB handling traffic with WNP. Got three msgs from 4CN to WNP at 12:00. At 12:40 they were in Mix's care.

WINNIPEG DIVISION
J. L. Birckett, Mgr.

Saskatchewan—4DN broke his collar-bone playing rugger and is off the air for a while. 4HH is on with a 50-watter and is getting out in fine style. 4ER and 4AO are both on the air again handling a share of the traffic. 4BB and 4AL will have their stations going shortly. 4GH is off the air with a busted 5-watter but will be on again soon with a 40 "Mullard." 4FC and 4DG are working together for a while and getting out FB with 10 watts. 4HZ promises to be going with 5 or 10 watts. He is another converted B.C.L. (Stuff to give 'em HZ) 9BX is
(Concluded on page XVI)

Calls Heard



HEARD DURING NOVEMBER

Unless otherwise Specified

F. D. Bell, 4AA
Palmerston South, New Zealand

Sept. 24 to Oct. 24 using 2 h.f., det. and 2 Lf valves. All C.W. 200 to 240 meters: 1AS, 2CQZ, 5GJ, 5HT, 5LL, 5PB, 6FY, 6KA, 6PL, 6SU, 6ZK, 6ANR, 6ARB, 6AUP, 6BVG, 6BQC, 6CEU, 6CFI, 6CGW, 6CHL, 7SF, 7ADR, 8VQ, 9MC, 9EY, 9APS, Can. 5GO.

Heard after Transpacific Tests began: 1KC, 2CXL, 3ME, 3ALN, 3RE, 5EK, 5HL, 5IF, 5OV, 5AU, 5ADB, 5ZAV, 6CH, 6FF, 6FH, 6GX, 6MG, 6RM, 6RO, 6UP, 6ACM, 6ALV, 6AMS, 6AOV, 6AOL, 6ASJ, 6AUY, 6AWT, 6RBC, 6BIC, 6BII, 6BFS, 6BJQ, 6BPF, 6BPZ, 6BQL, 6RVE, 6RVS, 6BVG, 6CBB, 6CEJ, 6CFZ, 6CGA, 6CKP, 6CMI, 6CMU, 6CMR, 7DC, 7HG, 7KS, 7WX, 7AFE, 8AB, 8FU, 8RJ, 8PD, 8PW, 8VY, 8DA, 8XAN, 9AAS, 9AAU, 9AED, 9AOU, 9AUS, 9AUY, 9AVN, 9AWG, 9BK, 9BQ, 9BTL, 9BZI, 9CAH, 9CGU, 9CTM, 9DKY, 9DWK, 9EHL, 9EUV, 9VM, 9ZV.

Complete logs on file at A.R.R.L. Headquarters if time and date heard is desired for verification.

Leon Delov, FSAB

(Received via Radio IMO, Hartford, Conn.)
Nov. 11th to Dec. 3d: 1CMP, (1MO), (1XAM), (1XAQ), 2BY, (2CQZ).

J. L. Leistra,

Walenburgstreet 4, Rotterdam, Holland.
Oct. 7: 2BY, 2CA, 2LH, 2JF, 2XU, 2BQU, Oct. 13: 1RR, 2CXL, Nov. 10: 1BD, 1BK, 1ER, 1TR, 1YB, 1YK, 1ARY, 1CMP, 2BY, 2BQH, 2CQZ, 2CXL, 3AS, 3JJ, 3NL, 3VR, 4EL, 8TT, 8AMM, 9MC.

C. G. Williams, 2JF

22 Scholar St., Sefton Park, Liverpool, Eng.
1ER, 1ARY, 1YB, 2AS, 2BY, 2CY, 2TS, 2WR, 2AGB, 2AWF, 2AOL, 3AS, 3HD, 3ASW, 8XE, 8AMM, 8BLA, 8BDA.

W. R. Burne, 2KW

Springfield, Thoroid Grove, Sale, Cheshire, England
(Sept. 10 to Nov. 20)

1AQQ, 1ADN, 1AJX, 1AUA, 1AWW, 1BFL, 1BQT, 1BWJ, 1CMP, 1CPN, 1AW, 1ER, 1FD, 1PA, 1RR, 1SP, 1SN, 1XAM, 1YB, 1KG, 2BQH, 2BTT, 2CCX, 2CMK, 2CQL (on "Duncon"), 2AGB, 2CXL (on "Duncon"), 2ER, (on "Duncon"), 2OF, 2RE, 2BY (QSA), 2AGP, 2AFS, 3AVN, 3NI, 3CHN, 4FT, (on "Duncon"), 4HD, 5HT, 5ZAV, (QRA? rec'd one tube QSA), 7ZU, 8ACF, 8AWI, 8WZ, 9BRK, 9DHK. Are on watch till 12:00 midnight every night and till 6:00 A.M. Sunday G.M.T. Will shortly be on the air signing G2KW with 500 to 1000 watts on wavelength of 170 metres. Best o' luck! 73.

A. G. Davies, 2PC

Redcot, Park Road, Timperley, Cheshire England
Nov. 11th: 1AHL, 1ARY, 1BDI, 1ER, 1FD, 1YB, 1YBG, 2BQH, 2BY, 2CPA, 2CQL, 3AS, 3RV, 5HT, 5MP, 8AB, 8BDA, 8CAZ, 8DAA, 8DGO, 8GZ, 8VE, 8XE, 9AON, 9RP, 9MC, 9ZT, Can. 3OSE.
Nov. 18th: 1BDI*, 1RHW*, 1CMP*, 1RV*, 2BD*, 2BY, 2IS*, 2RK*, 8WX*.

*These stations heard between 2305 and 2345 G.M.T., probably transmitting in daylight.
Please QSL by card to 2PC if not already done so.

F. L. Hogg, 2SH

37 Bishop's Road, Highgate, London, N. 6, England
Nov. 10, 14, 17th only: 1AW, 1TS, 2BY, 2CXL, 2ER, 2RK, 2XQ, 4FT, 8UF, 8XE. Pse QSL by card. 1 K.W. C.W. here on 180 meters, Fridays, 8, 9 and 10:00 P.M. E.S.T.

H. Swift, 2WY

Kassala, 77, Upper Tulse Hill,
London, S.W.2, England
1ARY, 1CK, 1CMP, 1ER, 1YB, 1YK, 2AGB,

2BY, 2CKA, 2CQZ, 2CY, 2RK, 2WA, 2WB, 5BA, (5NZ)? 5SJ, 5AB, 5AFN, 8BL, 8GZ, 8NQ, 8WS, (9LY), (9NF). Would be pleased to receive cards from the stations I have heard and reported.

L. G. Rose
46 Trewince Road, Wembleton, S.W.20,
London, England

Sept. 2th: 1AUC, 2AH, 2AY, 2BIC, 2EL, 2RS, 3JY, 3MO, 8UF, Can. 1AR.
Sept. 24th: 2EL, 2CCX, 3CC, 3MS, 7IT.
Oct. 10th: 1BDI, 1BWJ, 2CXL, 2RS, 2LV, 9DIS.

B. L. Stephenson, 5IK

12 Sheringham Road, Withington, Manchester, Eng.
September 23rd: 1AW, 1BCF, 1BWJ, 1CDU, 1CMX, 1PL, 2BMR, 2AH, 2WA, 2AGB, 2BQH, 2CXL, 2BSC, 3AAO, 3FOF, 3XN, 3CO, 3MO, 8AIB, 8TT, 8GZ, 8HV, 8CTP, 9BRK.

Juan E. Chibas, Cuban 8GT

Box 142, Santiago, Cuba
180Q, 1CKP, 1CKQ, 1CMP, 1ER, 1FD, 1PA, 1YE, 2AAY, 2ABG, 2AFP, 2BMQ, 2BQH, 2BZV, 2CFB, 2COH, 2CXD, 2CXL, 2GZ, 2RB, 2TS, 2WR, 2AIC, 2AS, 3AVA, 3BSS, 3JY, 3OB, 3PZ, 3ZO, 4AL, 4AQ, 4BY, 4DB, 4DL, 4EB, 4EL, 4EQ, 4IH, 4JZ, 4JH, 4JZ, 4KU, 4MB, 4ME, 4OA, 4PB, 4ZA, 5AAT, 5ABH, 5ADS, 5AFS, 5AGD, 5AUI, 5AIO, 5AKN, 5AMA, 5AMH, 5RE, 5DA, 5ER, 5GL, 5GN, 5HL, 5HT, 5HZ, 5IF, 5IN, 5JR, 5KG, 5KR, 5MI, 5MO, 5NN, 5OV, 5PB, 5QE, 5QW, 5RD, 5SU, 5TD, 5UA, 5UK, 5UP, 5VV, 5XA, 5YW, 5ZA, 5ZG, 6CGW, 6ADG, 6ADP, 6AIF, 6ANM, 6ATC, 6RDT, 6BF, 6BQ, 6BNH, 6BNY, 6BU, 6BZC, 6CSE, 6CTP, 6DIG, 6FU, 6GZ, 6HXT, 6WX, 8XE, 9AAU, 9AIM, 9AON, 9APS, 9AWG, 9BAK, 9RED, 9RLG, 9BRX, 9RSH, 9BSP, 9BTT, 9BWA, 9BWW, 9RZI, 9CCS, 9CCZ, 9CFH, 9CGH, 9GKP, 9CLQ, 9CMK, 9CTU, 9DCC, 9DQU, 9DSO, 9DWK, 9DYW, 9DYY, 9DZY, 9EJ, 9ELV, 9EQ, 9YY.
Can: 1AR, 2BG.

F. T. Carter, 6FD

Flat A, Glendale Mansions, Streatham,
London, England
Heard on loop, 32 inches square: 1AW, 1BWJ, 2BQH, 2AGB, 2AH, 4FT, Can. 1AR.

H. T. Mapes, "BX" Guanajuato, Gto., Mexico

1YB, 1HX, 2RK, 2BY, 3GK, 3TR, 4FT, 4KU, 5AMA, (5AKC), 5AHD, (5AMW), 5AMU, 5AUI, 5AKN, 5ALL, 5ADV, (5ADB), 5AJJ, 5AMJ, 5AJ, 5AKP, 5ADO, 5AHR, 5ABH (5RE), 5BK, 5DW, 5EK, 5FC, 5FA, (5FT), (5FX), 5GN, 5GF, (5GJ), (5HT), (5HZ), 5HL, 5IF, 5IN, (5JC), 5JE, 5KG, 5KN, 5LR, 5LG, 5MZ, (5MM), 5NR, 5NN, 5NK, (5OV), 5OK, 5OF, 5PH, 5PB, (5QY), 5QE, 5QW, 5QI, 5RR, 5SD, 5SK, 5TJ, (5TG), 5UR, 5UK, (5UO), 5VP, 5VY, 5WG, 5XA, 5XAB, (5YK), spk., (5YI), 5YW, 5ZAV, 5ZB, (5ZG), 5ZAX, (5ZA), (5ADI), 6AK, 6AWT, 6AOL, 6APQ, 6AHC, 6AVY, 6AJD, 6BIC, 6BJQ, 6BDR, 6BRC, (6BRA), 6CGW, 6CHL, 6CDG, 6CFZ, 6CU, 6CHU, 6EC, 6FP, 6LU, 6ZH, (7LN), 7QC, 7QJ, 7ZU, 8DAT, 8ZZ, 8ZY, 9AMI, 9AVN, 9APE, 9AIM, 9APS, 9AEC, 9BKK, 9CAA, 9CV, 9CFY, 9CCZ, 9DFH, 9DSW, 9DZY, 9DIB, 9DWK, (9EPC), 9MC, 9DQU, 9ZT.
Mexican: AX, CX, 1B.
Wud appreciate reports on how ur getting Mex-BX.

S.S. Elkton

Oct. 13th, 725 miles W. Balboa: 2OM, 8XE, 9AOU, 9DXM. Oct. 15th, 1110 W. Balboa: 2E, 5AMA, 5PB, 6CGW, 8BDA, 9CAO, 9CBI, 9DR, 9DWK.
Oct. 17th, 1460 West Balboa: 5AMA, 5IF, 5OV, 5ZA, 6CMW, Mex. BX.
Oct. 18th, 1646 West Balboa: 2CXF, 4FT, 5DR, 5FT, 5GN, 5HZ, 5LR, 5NF, 6BIC, 6BU, 8XE, 9AAU, 9BZI, 9CTR, 9DYZ, 9EBT, 9XV, 9UH, Mex. BX.
Oct. 19th, 1884 West Balboa: 5AMA, 5ZR, 6CGW, 6CMR, 8BDA, 8ER, 8XE, 9AP.

9BEZ, 9BZI, 9UHL, 9ZT, 9ZU, 9ZV. Mex. BX VT. UD

Oct. 20, 2023 West Balboa: 5AIU, 5RE, 5CE, 5CN, 5NN, 6RUO, 6LVE, 6CAE, 6CGW, 6CMR, 6PL, 6CPW, 9AWP, 9AXX, 9BZI, 9CFK, 9CMD, 9OX.

Oct. 22nd, 2619 W. Balboa: 5ZA, 6ADT, 6AOL, 6AUY, 6BIC, 6BUO, 6CDW, 6CL, 6TL, 7HG, 8XE, 9ZG, 9ZT.

Oct. 23rd, 2877 W. Balboa: 4FT, 5ZAV, 6AMS, 6BAH, 6BHF, 6HVE, 6CHD, 6CEJ, 6CGW, 6CNL, 6CU, 6DHH, 6XC, 7AK, 9BK.

At Sea during August

In Cuban waters: 1AR, 1GU, 1MY, 1ACU, 1ALJ, 1ACP, 1BCD, 1ECG, 1BES, 2AR, 2FP, 2RM, 2RS, 3AB, 3BQ, 3VO, 3APT, 3BGT, 3BFU, 3BY, 4EL, 4FT, 4GL, 4GX, 4JZ, 4OM, 5BM, 5BY, 5HL, 5AMA, 5HV, 5ZZ, 9ZY.

Panama, Pacific Side: 1FD, 1KX, 1AJP, 2WR, 4AI, 4DL, 4FT, 4XJ, 5BF, 5FA, 5FL, 5HT, 5IF, 5KR, 5LR, 5NN, 5AHD, 8AQO, 9AAL, 9AAU, 9BED, 9BSP, 9BZI.

(there are probably some Canadian Calls in the above list.—Ed.)

1CNU, aboard NRU, Woods Hole, Mass.

(10 nights in Nov.)

4AG, 4KU, 4MB, 4NA, 4QW, 4SC, 5ABT, 5ADB, 5ADI, 5ADO, 5AGJ, 5AIC, 5AMA, 5AMP, 5AMH, 5AMS, 5ASR, 5BW, 5EK, 5ER, 5FX, 5IN, 5GJ, 5HT, 5KC, 5KN, 5LR, 5NK, 5PH, 5QP, 5UP, 5XV, 5ZA, 5ZAV, 6ACM, 6ADM, 6ALV, 6AVV, 6AWT, 6BDW, 6BEO, 6BIC, 6BLY, 6BNT, 6CGD, 6CGW, 6CKP, 6CMR, 6CU, 6CUS, 6DD, 6EA, 6EL, 6EH, 6KM, 6LA, 6LS, 6LV, 6MS, 6RM, 6XAD, 6ZH, 7AB, 7EG, 7LN, 7SC, 7WM, 7WP, 7ZO, 7ZU.

Canadian: 4CL, 4DY, 4FN, 4HH, 5CN, 5GO, 9BP.

Mexican: BX.

Phone: 5EK, 5AMP, 8BAP, 9AOU, 9BWA.

Can. 3BQ, Kitchener, Ontario

6ACM, 6ACK, 6AHU, 6AOL, 6APJ, 6ARB, 6AUR, 6AUY, 6AVV, 6AWQ, 6BBC, 6BHU, 6BIC, 6BIE, 6BIQ, 6BJT, 6BLG, 6BUN, 6CBD, 6CC, 6CEJ, 6CFZ, 6CGP, 6CGW, 6CMR, 6CWE, 6FP, 6FY, 6GY, 6JI, 6LK, 6MH, 6PL, 6SU, 6TC, 6TS, 6WT, 6ZH, 7ABS, 7ADS, 7APN, 7HA, 7HW, 7NO, 7WM, 7YL, 7ZD, 7ZT, 7ZU.

Canadian: 1DD, 4CB, 4CL, 4CN, 4CW, 5FB, 4FN, 5AH, 5CN, 5GO, 9BX.

Not known: Station sending code word "MON-ISQ" QRZ (QRA?), HV.

Can. 3CG,

Northern Ontario, Lat. 48 N Long 81W

4DE, 4EB, 4JK, 4KU, 4MV, 4NW, 4OA, 5AC, 5BX, 5FW, 5GF, 5GJ, 5GO, 5HH, 5HT, 5IN, 5JN, 5LR, 5NN, 5NK, 5OV, 5PA, 5QF, 5QL, 5SD, 5SR, 5TJ, 5UK, 5UY, 5WO, 5YW, 5ZA, 5ZG, 5ABH, 5ADI, 5AEJ, 5AFQ, 5AGO, 5AGJ, 5AGZ, 5AHD, 5AIC, 5AIU, 5AKF, 5AMB, 5AMP, 5ANE, 5AMH, 5ANC, 5ANH, 5ZAV, 5ZAX, 6AW, 6BQ, 6CZ, 6EK, 6FY, 6TS, 6TU, 6VF, 6ZI, 6AFG, 6AGE, 6AJD, 6ARB, 6ALV, 6AOL, 6AOS, 6AWT, 6BBW, 6BCL, 6BBO, 6BFG, 6BJS, 6BHK, 6BMD, 6BNT, 6BSC, 6CDG, 6CGD, 6CHU, 6CHZ, 6GTR, 6XAD, 6ZAH, 7HE, 7HG, 7KS, 7LN, 7QJ, 7SC, 7TO, 7WM, 7WS, 7ZU, 7ABB, 7AKK, 8AB, 8RW, 8CP, 7WM, 7WS, 7ZU, 7ABB, 7AKK, WNP, NASK.

Can.: 4CL, 4CO, 4EH, 4HH, 4DY, 4EA, 4ER, 5CN, 5GO.

Can. 3WG, Guelph, Ont.

(One N.E. Peanut used only.)

4BK, 4BQ, 4DB, 4DW, 4EP, 4EQ, 4GX, 4HR, 4JK, 4KC, 4LJ, 4ME, 4NA, 4ON, 5AC, 5BW, 5ER, 5FV, 5GF, 5GJ, 5HL, 5HT, 5IN, 5UP, 5XA, 5ZA, 5AFQ, 5AGJ, 5AGO, 5AHR, 5AIC, 6CU, 6FH, 6FP, 6ZH, 6ZR, 6ZV, 6ACM, 6AOS, 6ARB, 6AVV, 6BIC, 6BVE, 6CGW, 6CMR, 6CNH, 6ZAH, 6ZBF, 7KS, 7SF, 7UK, 7ZD, 7ABB, 7AFN, 9BE, 9ES, 9MC, 9SS, 9UH, 9YY, 9ZT, 9ZG, 9AAU, 9AMB, 9AMU, 9APE, 9ASH, 9AVN, 9AYL, 9BAK, 9BDR, 9RGC, 9BJJ, 9BLG, 9BLY, 9BXQ, 9CAO, 9CAP, 9CCS, 9CGN, 9CHD, (9CHO), 9CJC, 9CKD, 9CKM, 9CVC, 9DCR, 9DFH, 9DNF, 9DY, 9DZY, 9EAK, 9ELL, NKF, NRG, HV777.

Can.: 1AR, (1DD), (8NI), 4CR, 5GO.

Mex.: BX.

QRK my "5 watts" gang?

1BEC, Arlington, Mass.

4AI, 4AY, 4BK, 4BQ, 4BY, 4DB, 4EB, 4EP, 4EQ, 4FG, 4FS, 4FT, 4GX, 4GW, 4HR, 4JA, 4JH, 4JR, 4KU, 4LJ, 4MB, 4ME, 4OA, 4RH, 4SH, 5ABH, 5ACU, 5ADH, 5AGJ, 5AIJ, 5AIR, 5AIU,

5AJJ, 5AKN, 5AMP, 5AMH, 5ANP, 5BW, 5EK, 5ER, 5GJ, 5HT, 5IN, 5LR, 5MO, 5NN, 5NR, 5NV, 5OQ, 5TJ, 5UK, 5UP, 5WO, 5XAC, 5XV, 5ZA, 5ZAS, 5ZB, 5ZG, 6AGJ, 6AJF, 6AK, 6AKZ, 6AOS, 6ARB, 6ASX, 6BBU, 6BCL, 6BIC, 6BIE, 6BJC, 6BM, 6BNT, 6CBU, 6CC, 6CDG, 6CFZ, 6CGW, 6CHU, 6CKR, 6FH, 6FP, 6II, 6MB, 6MH, 6PL, 6SU, 6XAD-6ZW, 6ZR, 7ABR, 7ADG, 7ADS, 7AF, 7AGV, 7GS, 7KS, 7LU, 7SC, 7SP, 7XT, 7ZD, 7ZO.

Spk.: 9BIQ? 9BUX, 9DIL.
Can.: 3ADN, 3BA, 3BG, 3BQ, 3CO, 3GK, 3IR, 3JT, 3KG, 3MY, 3NI, 3OE, 3OH, 3PG, 3SG, 3SP, 3XI, 3ZT, 4CL, 4CN, 4CR, 4CW, 4DY, 4ER, 5CN.

1BOQ, Lakeville, Conn.

C.W.: 4AB, 4AF, 4BQ, (4BY), 4DB, (4EB), (4FG), 4GG, 4GX, 4GW, (4HR), 4HS, (4KU), 4LJ, 4OA, 5ABD, 5ABH, 5AHR, 5AIC, 5AII, 5AIR, 5AIU, (5AMH), 5AMN, 5ANC, 5AVV, 5GJ, 5GN, 5EG, 5EH, 5FV, 5FX, 5GF, 5GI, 5GX, (5HT) (5IN), 5KC, 5KR, 5NN, (5NV), 5OV, 5PR, 5QP, 5QL, 5QQ, 5UA, (5UK), 5XV, 5VV, 5ZAV, 6AIR, 6ALV, 6AMB, 6ANT, 6AOS, 6AWT, (6BCL), 6CBU, 6BIE, 6BOE, 6CHP, 6CHU, 6CKP, 6DDR, 6FP, 6GL, 6GR, 6LV, 6PL, 6XG, 6XAD, 6ZW, 6ZZ, 6ZAH, 6ZAS, 7ABR, 7AFH, 7AIH, 7QJ, 7RS, 7SC, 7YL, 7ZD, 7ZU.

Can.: 5GO.

Spark: 9CA, 9BUX.

**Geoffrey Parsons, Jr.
Phillips Exeter Academy, Exeter, N. H.**

(All over 1500 miles)

5AA, 5ADB, 5AEC, 5AIJ, 5FX, 5GF, 5GN, 5HQ, 5HT, 5LR, 5NN, 5OV, 5SK, 5VD, 5ZA, 5ZAK, 5ZG, 6ACM, 6AGE, 6AJJ, 6AJS, 6ALV, 6AOL, 6AOL, 6AOS, 6ARB, 6ATC, 6AUI, 6AVV, 6BCL, 6BIC, 6BIE, 6BM, 6BNT, 6BSJ, 6BUA, 6BVA, 6BVE, 6CC, 6CET, 6CGW, 6CHL, 6CHV, 6CKE, 6P, 6LP, 6MH, 6PL, 6TO, 6XAD, 6ZH, 6ZZ, 6ZAH, 6ZAR, 7ADS, 7GO, 7LN, 7LU, 7UN, 7WP, 7YL, 7ZD, 7ZO, 9AMB, 9AFP, 9AVS, 9AVU, 9BJI, 9BJK, 9BVH, 9CAA, 9CLD, 9CNS, 9CVC, 9DTE, 9DVA, 9EEA.

Can.: 4CL, 4DQ.

E. Peacock, 2A0H, Yonkers, N. Y.

4RY, 4ER, 4EL, 4FT, 4NI, 5AP, 5BP, 5HQ, 5LR, 5ZA, 6AMS, 6ARF, 6AT, 6BIC, 6CGW, 6CHU, 6CKR (QRA?), 6FP, 6XAD, 7AB, 7HG, 7SC, 7ZU, 9AAP, 9AAV, 9AC, 9AGN, 9APE, 9APS, 9AST, 9AUS, 9BCX, 9BED, 9BJ, 9BJL, 9BRK, 9DSW, 9BUN, 9BUJ, 9RX, 9CGU, 9CR, 9CRA, 9CLY, 9CTR, 9DJK, 9DUN, 9DXN, 9DXY, 9DY, 9EEA, 9EFK, 9EKF, 9EKY, 9ELV, 9EQG, 9LN, 9MC, 9MM, 9PJ, 9UB, 9VM, 9XA, 9XI, 9ZG, 9ZT.

Can.: 1AR, 2BG, 2IC, 3IA, 3IC, 3NI, 3QS, 3XI, 5CN.

Eng.: 2SH.

2BME, New Brunswick, N. J.

4CL, 4DB, 4EB, 4EQ, 4FT, 4HR, 4ME, 4MI, 4MY, 4QW, 4RU, 4SC, 4OA, 4OU, 5ABT, 5AC, 5AFQ, 5AGJ, 5AHR, 5AIR, 5AKF, 5AMH, 5DI, 5EK, 5FX, 5JR, 5KH, 5LO, 5LR, 5MI, 5SG, 5UK, 5UP, 5ZA, 5ZAS, 5ZAV, 6ACM, 6BCJ, 6BCL, 6BJC, 6BPZ, 6BTC, 6CC, 6CFZ, 6CGW, 6FP, 6MH, 6ZAG, 6ZH, 7AGR, 7OF, 7OT, 7QJ, 7SC, 7SF, 7SO, 7WP, 7ZO, 7ZU, 9AAD, 9AAV, 9ABT, 9ADP, 9AEC, 9AEK, 9AEM, 9AF, 9AHJ, 9AHY, 9AIM, 9AJW, 9ANA, 9AOM, 9APB, 9APE, 9APF, 9APS, 9AQV, 9ARC, 9ARF, 9ASP, 9ASV, 9AUS, 9AWA, 9AWD, 9AWF, 9AWP, 9AXB, 9AZJ, 9BA, 9BAS, 9BAZ, 9BCH, 9BEZ, 9BMU, 9BMY, 9BPY, 9BQU, 9RI, 9BRY, 9SH, 9BSJ, 9BUU, 9BVN, 9BWV, 9BYE, 9BYX, 9BZI, 9CAO, 9CRJ, 9CCF, 9CCN, 9CCS, 9CDO, 9CFN, 9CFI, 9CFK, 9CFL, 9CGU, 9CHO, 9CJC, 9CJL, 9CJT, 9CLQ, 9CMK, 9CNV, 9COC, 9COL, 9CR, 9CTB, 9CTE, 9CTU, 9CUI, 9CVV, 9CYQ, 9CZS, 9CZW, 9DAI, 9DAY, 9DBI, 9DCT, 9DUD, 9DFX, 9DGE, 9DGL, 9DHL, 9DKK, 9DKX, 9DKY, 9DLR, 9DLV, 9DMC, 9DNN, 9DOE, 9DPU, 9DPX, 9DRW, 9DSM, 9DSO, 9DVM, 9DWW, 9DWK, 9DXL, 9DXN, 9DXU, 9DYI, 9DYV, 9DY, 9DZL, 9DZY, 9EBA, 9ECV, 9EDB, 9EFD, 9EFZ, 9EI, 9EIF, 9EIA, 9EKF, 9EKY, 9ELV, 9ET, 9IG, 9IH, 9KD, 9LM, 9LN, 9LZ, 9QR, 9QW, 9RC, 9UB, 9UR, 9US, 9UT, 9VK, 9VM, 9WO, 9YY, 9ZC, 9ZL, 9ZT, 9ZY, (QRA NA?)

Can.: 1AR, 2AM, 2BN, 2CG, (3AA), 3AAO, 3ADN, 3BA, 3FO, 3MV, 3NI, 3QS, 3SP, 3TB, 3TF, 3WP, 3XI, 3ZS, 4CW, 5CN, 5GO, 9BJ, 9BX.

2BXW, Altamont, N. Y.

4AG, (4DB), 4EB, (4FT), 4HR, 4JR, 4KU,

44RR), 5ABH, 5AHR, 5AIU, 5AMH, 5XAC, 5ZAV, 5ZAX, 5EK, (5GJ), 5IN, 5JE, 5KA, 5MO, 5RD, 5OK, 5UK, 6AOS, 6AWT, 6BOL, 6BKE, 6XAD, 6XK, 6ZW, 7ABB, 7WE, 7ZU, (8AB), (8CFQ), 9AAD, 9AAW, 9AEK, (9AEM), (9AHV), (9AHZ), 9AIC, 9AMM, 9ANF, 9APF, 9ARK, 9AWG, 9AYE, 9BAK, 9BAZ, 9BCH, 9BEZ, 9BFX, 9BFX, 9BGI, 9BHE, 9BJI, 9BRK, 9BLG, 9BLY, 9BPD, 9BPI, 9BZI, 9BYC, (9CCS), 9CHH, 9CHO, 9CJC, 9CKW, 9CLY, 9CMN, (9CNN), 9CNS, 9CPB, 9CSD, 9CTD, 9CTN, 9CVC, 9DAF, 9DFW, 9DGN, 9DJN, 9DKX, 9DMJ, 9DON, (9DQU), (9DSW), 9DYV, 9DYR, 9DYZ, 9EFZ, (9EHI), 9EIL, 9EKY, 9ELB, 9ELD, 9ERE, 9DD, (9EG), 9EI, 9GS, 9HK, 9IR, 9MC, 9PJ, (9PO), 9UB, 9VQ, (9VZ), 9XI, 9ZT.

Phone: 5AMM, 9DG.

Can.: 5RW, 5CN, 5EK, 5GO, WNP.

3BGJ, Washington, D. C.

5ABB, 5ABM, 5ABT, 5ABY, 5AFS, 5AGJ, 5AKM, 5AKN, 5AMH, 5AV, 5KH, 5MO, 5NR, 5OA, 5JR, 5PF, 5PW, 5QL, 5UK, 5ZA, 5ZAV, 5AD, 6AHC, 6AJD, 6AJJ, 6ALV, 6AOS, 6ARB, 6ASX, 6AVV, 6AWT, 6BCL, 6BIC, 6BJC, 6BJJ, 6BLG, 6BNC, 6BRF, 6BRK, 6BUO, 6BUW? 6BWP, 6CBU, 6CDG, 6CFZ, 6CGW, 6CKP, 6CMR, 6CNH, 6CQE? 6FP, 6GR, 6SX, 6LU, 6PL, 6SU, 6TC, 6ZAH, 6ZAR, 6ZW, 7AF, 7IO, 7LN, 7SC, 7UF? 7WM, 7ZO, 7ZU, 9AAW, 9ARD, 9AMB, 9APF, 9APS, 9AQ, 9ARH, 9APK, 9AUS, 9AYU, 9AWF, 9AWV, 9BBI, 9BFG, 9BGI, 9BGT, 9BHY, 9BJL, 9BJK, 9BKY, 9BLK, 9BMU, 9BRY, 9BSH, 9BXQ, 9CAA, 9CCS, 9CDB, 9CDJ, 9CJC, 9CKW, 9CLQ, 9CMC, 9CTB, 9CTC, 9CTT, 9CUI, 9CVC, 9CWF, 9DCT, 9DVB, 9DFH, 9DGE, 9DHG, 9DHR, 9DJG, 9DKK, 9DKY, 9DRJ, 9DRO, 9DSV, 9DPT, 9DIU, 9DVK, 9DXL, 9DYV, 9DYZ, 9EDO, 9EBA, 9EAG, 9EHH, 9EHL, 9EJA, 9ELV, 9ELS, 9EM, 9FP, 9JG, 9JM, 9PB, 9PF, 9SS, 9UR, 9US, 9UZ, 9VM, 9VZ, 9YY, 9XAQ.

Can.: 1AK, 1DD, 2BN, 2CG, 2BM, 2HM, 3FO, 3NI, 3ZL, 3ZL, 4CW, 4CN, 4FN, 4HH, 5GO.

3BQZ, Malvern, Pa.

(5UK), 6ZA, 6ACM, 6ADT, 6AFQ, 6AGE, 6AGJ, 6AGK, 6AJJ, 6AKZ, 6AOI, 6AOS, 6AR, 6ARR, 6AVV, 6AWT, 6BBC, 6BBU, 6BCL, 6BIC, 6BTC, 6BUA, 6BUO, 6BWP, 6CBI, 6CBU, 6CBW, 6CDG, 6CFI, 6CFZ, 6CGW, 6CHV, 6CKR, 6CMR, 6CNH, 6CWR, 6FH, 6FP, 6FY, 6GR, 6JD, 6KA, 6LU, 6MH, 6PE, 6TR, 6TU, 6ZAH, 6ZH, 6ZO, 6ZV, 6ZW, 6ZZ, 7ABB, 7ADR, 7AFN, 7AFW, 7AGX, 7EB, 7GE, 7GO, 7HG, 7HM, 7IO, 7IP, 7LU, 7OT, 7PJ, 7QJ, 7CS, 7SE, 7YL, 7ZD, 7ZM, 7ZU, 9AMB, 9APF, 9BUN, 9BKQ, 9CAA, 9CFY.

Can.: 4CW, 5CN, 5GO.

3BOY & 3BVA,

533 W. College Ave., State College, Pa.

4AT, 4BK, 4BQ, 4DB, 4DC, 4EB, 4KL, 4QF, 4RH, 5ABY, 5ACM, 5ADH, 5BM, 5DT, 5HL, 5KH, 5MI, 5OV, 5PB, 5QE, 5QW, 5VV, 5WO, 5WS, 5XAC, 5ZA, 5ACM, 5AGE, 5AGJ, 5AJJ, 5AOI, 5AOS, 5ARB, 5ASU, 5AVV, 5AWQ, 5AWT, 5BCJ, 5BEG, 5BHR, 5BIC, 5BII, 5BIQ, 5BJP, 5BLG, 5BM, 5BMN, 5BNC, 5BPV, 5BPZ, 5BQE, 5BRF, 5BRK, 5BRY, 5BUA, 5BUH, 5BVE, 5BVF, 5CBU, 5CBW, 5CDG, 5CEK, 5CFZ, 5CGW, 5CHU, 5CKL, 5CMR, 5CNI, 5EO, 5FY, 5GR, 5GX, 5JX, 5KM, 5LV, 5MH, 5PL, 5TI, 5VD, 5WT, 5XAD, 5XF, 5ZAH, 5ZAR, 5ZAU, 5ZH, 5ZW, 5ZX, 7ACL, 7AEK, 7AEL, 7AGR, 7AIY, 7AKV, 7ASU, 7FD, 7JD, 7K, 7LU, 7QC, 7QD, 7QF, 7SC, 7SF, 7SH, 7VE, 7VQ, 7WM, 7WS, 7X, 7ZL, 7ZF, 7ZU, 7ZV, 7ZO, 7ZZ, 9AKM, 9AKN, 9AYF, 9AYZ, 9AMB, 9AMU, 9ASV, 9AUW, 9AVU, 9AYF, 9AYZ, 9AWD, 9BAK, 9BEP, 9BFF, 9BJI, 9BJK, 9BMO, 9BMX, 9BPY, 9BRI, 9BRT, 9BXQ, 9BYX, 9BWW, 9CCS, 9CCZ, 9CFL, 9CGA, 9CGU, 9CKW, 9CLD, 9CVC, 9CVY, 9CRA, 9CZ, 9DGN, 9DCR, 9DD, 9DFH, 9DKK, 9DHY, 9DKY, 9DGI, 9DMN, 9DVV, 9DPT, 9DSQ, 9DEG, 9EGH, 9KD, 9PD, 9YU, Ex-8COF.

Canadian: 1AR, 2BG, 2BN, 2CG, 2IC, 3AFP, 3AEC, 3NI, 4CW, 4DY, 4ER, 4HH, 4JA (?), 5GO, 5BX (?).

English: 6NI.

4JK, 1309 Buncombe St., Greenville, S. C.

6ALV, 6ANB, 6BCL, 6BEO, 6BIC, 6BJC, 6BSF, 6BUR, 6BVG, 6BVS, 6CDG, 6CGW, 6CNG, 6CKP, 6IL, 6PL, 6XAD, 6ZAH, 7ABB, 7AIY, 7HG, 7WG, 7YL, 7ZU.

Can.: 4CL, 5CN.

4JR, 413 S. Broad St., Gastonia, N. C.

1AW, 1BWJ, 1CAZ, 1JT, 1OZ, 1VQ, 2AFP,

2AGB, 2AJB, 2AUR, 2BRB, (2BXP), 2CEE, 2CKA, 2CVG, 2CXD, (3CHG), 3CJN, 3CKD, 3WN, 3YJ, 5ABY, 5ADH, 5AKU, 5BW, 5HQ, 5IF, 5NN, 5OV, 5PB, 5PV, 5QL, 5ZA, 6ACM, 6AFQ, 6AGK, 6AKH, 6AOS, 6AUR, 6AVV, 6AWX, 6BCJ, 6BHI, 6BIC, 6BLG, 6BMD, 6BUA, 6CBU, 6CBW, 6CEK, 6CGA, 6CGD, 6CGW, 6CNH, 6MH, 6PL, 7IO, 7QD, 7ZD, (8AFQ), 8AFU, 8AGC, 8AQM, 8ATR, 8AUC, 8AZG, (8BOA), 8BPN, 8CFQ, 8DHV, (8DP), 8DUU, (8GU), 8JJ, 8NZ, 8ZAB, (8ZZ), 9AEC, 9AFB, 9AHP, 9AON, 9ARC, 9AWP, 9AYX, 9BAZ, 9BGC, 9BHN, 9BKC, 9BKH, 9BUH, 9BYC, 9CAA, 9CCS, 9CCV, 9CEA, 9CFK, 9CLD, 9COL, 9CXT, 9DCT, 9DEQ, 9DHB, 9DIH, 9DND, 9DOF, 9DXN, 9DYL, 9EFU, 9EHH, 9ELV, 9IR, 9PW, 9VM.

Phone: 2EL, 2BR.

Can.: 1AR, 2AZ, 2BE, 2BG, 2BN, 2BY, 2CG, 3BA, 3FC, 3OM, 3XL.

4NF, ex-3NF, 2816 10th St., Tampa, Fla.

1AWJ, 1AOL, 1HVB, 1BWD, 1CMP, 1CA, 1SN, 1YB, 2AWH, 2BBO, 2CCD, 2CMP, 2CPA, 2CQZ, 2BG, 2BQ, 2EL, 2ZA, 3ABH, 3AFQ, 3AHR, 3AKN, 3AMA, 3AMP, 3AMG, 3AE, 3AG, 3AU, 3DN, 3FC, 3JR, 3KC, 3KN, 3LR, 3NK, 3OG, 3PJ, 3UA, 3UK, 3UW, 3VV, 3WC, 5XAC, 5ZA, 5ZG, 6AHU, 6AJD, 6AJJ, 6AOS, 6BIC, 6BII, 6BJJ, 6BRK, 6BUO, 6BUI, 6CDG, 6CDZ? 6CFY, 6CFZ, 6CGW, 6CHU, 6CLM? 6CNH, 6CVG, 6BV? 6DE, 6DV, 6FF, 6GA, 6GR, 6HA, 6KA, 6MG, 6MH, 6NJ, 6PL, 6ZA, 6ZB, 6ZH, 6ZHA, 7IO, 7JD, 7SC, 8AFC, 8AFD, 8ALO, 8ALT, 8AUX, 8BBM, 8BBT, 8BAP, 8BDA, 8BFB, 8BFM, 8BGZ, 8BTM, 8BKH, 8BYM, 8CA, 8CJP, 8COT, 8CYT, 8DAW, 8DGO, 8DID, 8BF, 8HI, 8NB, 8NF, 8NR, 8OW, 8SF, 8TT, 8ZAE, 9AAU, 9AEK, 9AHZ, 9AIC, 9AIM, 9AMB, 9AMN, 9APS, 9AUS, 9AVN, 9AWA, 9AWK, 9BEY, 9BLY, 9BPD, 9BSH, 9BYN, 9BKQ, 9BZI, 9CAH, 9CUI, 9CJL, 9CJQ, 9CTR, 9CTE, 9CTU, 9CUD, 9CEM, 9DCP, 9DJI, 9DGN, 9DHD, 9DHZ, 9DJB, 9DKY, 9DWK, 9DZU, 9EAK, 9ELV, 9BF, 9CO, 9LZ, 9MC, 9OX, 9SS, 9TN, 9VM, 9PB, 9Y.

Can.: 2BG, 3BA, 3AB, 3DP, 3OM, 3TB, 3ZL, 4CA.

R. W. Bush, Hobart, Okla.

1AJX, 1AR, 1BHW, 1BKQ, 1BTE, 1DQ, 2CQI, 2TS, 3HML, 3CBM, 4BK, 4DB, 4EL, 4EN, 4FA, 4FT, 4GL, 4GX, 4JH, 4JK, 4JZ, 4ME, 4QF, 4QW, 4RK, 4ZV, 6AAK, 6ACM, 6AHU, 6AII, 6ALK, 6AMK, 6AOL, 6AOS, 6AVP, 6BBC, 6BOS, 6BGW, 6BIC, 6BII, 6BH, 6BIQ, 6BJJ, 6BRF, 6BUA, 6BUH, 6BVE, 6BWE, 6BWP, 6BEG, 6BUR, 6BAW, 6CC, 6CU, 6CCB, 6CEG, 6CFY, 6CFZ, 6CGA, 6CGW, 6CHU, 6CHZ, 6CIA, 6CKC, 6CMU, 6CMR, 6CNG, 6CNH, 6DUH, 6EH, 6FP, 6GH, 6HC, 6LV, 6MH, 6MS, 6NX, 6OD, 6PL, 6US, 6VD, 6VG, 6WT, 6ZAW, 6ZH, 6ZO, 7ADR, 7ADQ, 7AEL, 7AFN, 7AKH, 7AVW, 7AF, 7AK, 7FD, 7GO, 7WE, 7ZX.

Can.: 3BA, 3BO, 3XL, 4CW, 4IU, 8GO????
Mex.: CB.

G. E. Sinclair 1630 Marburg St., Dallas, Texas (One tube).

1ADN, 1AHQ, 1AOK, 1ASI, 1AW, 1BCG, 1BHW, 1BKQ, 1BQO, 1BWJ, 1CMP, 1EF, 1RV, 1YB, 1YK, 1ZT, 2AAV, 2AGB, 2AJD, 2BGI, 2BM (?), 2BTW, 2BY, 2BZV, 2CJR, 2CKA, 2CQZ, 2CTU, 2EL, 2GK, 2RB, 3AAO, 3ABW, 3ALN, 3BAU (?), 3BGG, 3BJI, 3BNU, 3FQ, 3JY, 3ME, 3PZ, 3SU, 3TE, 3TF, 3WF, 4AG, 4AL, 4AY, 4BR, 4BY, 4CS, 4DB, 4EB, 4EL, 4EQ, 4FT, 4GX, 4HR, 4IU, 4IZ, 4JH, 4JL, 4KC, 4KU, 4MB, 4ME, 4MY, 4NA, 4OA, 4QF, 4RB, 4SC, 6ACM, 6AGJ, 6AJD, 6AJF, 6AJJ, 6AJK, 6ALK, 6ANB, 6ANI, 6ANQ, 6AOL, 6AOL, 6AOS, 6ARB, 6ASA, 6ASX, 6AUP, 6AVV, 6AWQ, 6AWT, 6AWX, 6AKZ, 6BAH, 6BBW, 6BCJ, 6BCL, 6BOS, 6BEO, 6BHT, 6BIC, 6BII, 6BJC, 6BIA, 6BMC, 6BPZ, 6BQL, 6BRF, 6BSF, 6BTT, 6BUA, 6BUB, 6BVE, 6BVG, 6BWE, 6BWT, 6CC, 6CCP, 6CCS, 6CDG, 6CEJ, 6CEK, 6CEP, 6CEU, 6CFZ, 6CGD, 6CGW, 6CHU, 6CKP, 6CKR, 6CMR, 6CNG, 6CNH, 6CU, 6EC, 6FP, 6GX, 6JQ, 6JX, 6KA, 6LI, 6LU, 6MH, 6NX, 6OD, 6PL, 6PZ, 6SU, 6VD, 6VF, 6XAD, 6XK, 6ZAF, 6ZAU, 6ZBA, 6ZH, 6ZQ, 6ZZ, 7ABB, 7ACG, 7ADS, 7AGR, 7AK, 7CA, 7H, 7LU, 7LY, 7NA, 7OH, 7OT, 7QD, 7SF, 7SH, 7WM, 7ZD, 7ZO, 8AA, 8AGN, 8ACV, 8AGO, 8AGD, 8AGP, 8AHQ, 8AIG, 8AII, 8AIM, 8AJE, 8AJH, 8AL, 8ALW, 8ALX, 8AME, 8AMM, 8APN, 8APY, 8APZ, 8ARD, 8ARZ, 8ASV, 8ATC, 8ATK, 8ATP, 8AWL, 8AXT, 8AXZ, 8BCL, 8BCL, 8BDA, 8BF, 8BFM, 8BFR, 8BGO, 8BGW, 8BXX, 8BMB, 8BQI, 8BVX, 8BYM, 8BYN, 8BZC, 8BZD, 8CDD, 8CED, 8CEI, 8CEJ, 8CEO, 8CJP, 8CLD, 8CP, 8CPP, 8CNH, 8CNN, 8CNO, 8GNW, 8CRC, 8CRN,

8CRW, 8CTP, 8CWK, 8CZZ, 8DAW, 8DBP, 8DCB, 8DGO, 8DJF, 8DLE, 8DLH, 8DO, 8DPG, 8DPZ, 8DUU, 8DW, 8EF, 8GX, 8HN, 8IJ, 8JJ, 8KG, 8MZ, 8NZ, 8OE, 8OM, 8OW, 8PL, 8PU, 8PX, 8QN, 8TI, 8UE, 8UF, 8VQ, 8VY, 8WP, 8WX, 8WY, 8XE, 8XH, 8XAN, 8YAE, 8ZC, 8ZD, 8ZW, 8XZ, 8ZY, 8ZZ, 8ZAB.

Can.: 2BM (7), 2BN, 3AA, 3ADU, 3BA, 3BG, 3BP, 3CQ, 3CO, 3GK, 3IR, 3KG, 3KO, 3NI, 3OA, 3OH, 3OM, 3OS, 3TR, 3XI, 3YW, 3ZL, 3ZT, 4CB, 4CL, 4CN, 4CQ, 4CR, 4DY, 4ER, 4FN, 4HH, 5AH, 5CN, 5GO, 5BJ, 5BP, 5XB, 5CG, 5NP, 5WZ, 5ZP.

Mex.: BX, NA.

Spark: 4FG, 5EB, 5RQ, 5TH, 5AFK, 5BOF, 5BUX, 5EFC, 5GC.

Dalite G.W.: 6CJL, 7ZU, 8ADK, 8CPW, 8DAT, 8FU, 8YN, 9AIM, 9BZL, 9CLQ, 9DJQ, 9ZY.

6AJH, Lancaster, Calif.

1SN, 1ARB, 1WH, 1RM, 1YB, 1H, 1AJX, 1JL, 2CR, 2RK, 2CG, 2BVA, 3KU, 3EX, 3VW, 3NI, 3OO, 3UN, 3BP, 3QF, 3WG, 3AEA, 4HF, 4CB, 4AO, 4BY, 4FT, 5TF, 5TM, 5KW, 5KB, 5MM, 5ADB, 5MN, 5LG, 5KG, 5AU, 5IF, 5AMH, 5ZAV, 5AMU, 5ZA, 5QL, 5DE, 5QQ, 5ABT, 5EK, 5BW, 5AHR, 5IN, 5KP, 5UA, 5HL, 5IK, 5AJC, 5OC, 5ABB, 5DKM, 5AR, 5KG, 5PX, 5PO, 5APT, 5BVT, 5CWR, 5PD, 5AW, 5IG, 5BDA, 5RB, 5ARD, 5BNN, 5DAT, 5DLH, 5SF, 5FM, 5AA, 5AIG, 5BQK, 5LF, 5IV, 5DHQ, 5BGJ, 5BVT, 5APM, 5BGR, 5BJQ, 5CLZ, 5AAP, 5ADG, 5MU, 5BQJ, 5EA, 5FAE, 5DTE, 5BRK, 5BID, 5APF, 5DZV, 5AGX, 5ARM, 5BJL, 5DPX, 5AVU, 5EL, 5CJY, 5DFH, 5BHZ, 5CGU, 5EEA, 5DKG, 5EHT, 5QU, 5DKX, 5AUU, 5QR, 5CKW, 5AAW, 5PS, 5CAA, 5BK, 5CW, 5DX, 5OX, 5MC, 5BSH, 5ZT, 5BJ, 5VM, 5ANY, 5DKW, 5DWK, 5DKB, 5DJN, 5CEH, 5AAB, 5EKY, 5BBJ, 5AMB, 5CVC, 5AMF, 5DAW, 5BCK, 5DPW, 5MR, 5AWK, 5BUN, 5AIM, 5NU, 5CVD, 5AVC, 5CC, 5BRC, 5BXQ.

6AWT, 653 Union St., San Francisco

(1CMP), (2RK), (2AGB, 3GK, (3HG), (4KU), 4ZA, 5AC, 5EK, 5HT, 5HK, 5HZ, 5IN, 5KC, (5KR), (5LG), (5LR), 5NK, (5QF), 5TJ, 5UE, 5UP, 5XV, 5ZG, 5ACY, 5ADO, 5AGJ, 5AHR, 5AIU, 5AMA, 5AMH, 5XAC, (5ZAV), (5ZAX), (6CBU), (6CEU), (7IT), (7WP), 8AB, 8ER, 8FA, 8FU, 8GT, (8GZ), 8RA, (8YN), 8ZY, 8ABM, 8AGY, 8AGO, 8AIB, 8AII, 8BAW, 8BDA, 8BNI, (8XX), 8BYN, 8CDD, 8CVG, 8CUX, 8DAT, 8PB, 9CO, (9EI), (9LZ), 9MC, 9OI, 9UH, (9ZT), 9AMB, 9AMK, 9APF, 9APS, 9AON, (9AVS), 9AVU, 9BAL, (9BAK), (9BED), 9BHD, 9BJL, 9BLY, (9HRK), 9RUN, 9BVN, (9BZU), (9CJY), 9CLQ, 9CNS, 9CVC, 9CYF, 9DFH, 9DJJ, 9DSW, 9DYZ, 9DZY, 9EHL, (9EHT), (WNP).

Can.: (3RP), 3NL, 4HF, 4DQ, (4CL), 4CW, 4CB, 4BX, 4BP, (5CN), 5GO.

6CEU, Hilo, Hawaii

1BHK, 1SN, 1BCG, 1YB, 1BWJ, 2TS, 2XAP, 2CQZ, 2BY, 3BNU, 4FT, 4KU, 5ZAV, 5ZA, 5LR, 5GN, 5AMA, 5DW, 5OV, 5ZB, 5HT, 5AGJ, 5XV, 5GL, 5HP, (6AU), 6AO, (6BQL), (6AFQ), (6CID), 6CGD, (6BUZ), (6CGW), (6AWT), 6CHV (6ARB), (6BCR), (6AOS), (6CKP), 6CFS, (6AOT) 6CNH, 6CNG, (6CKC), (6BRF), 6CU, 6ZQ, (6CFZ) (6AJP), 6DD, 6UA, 6CS, 6ZL, 6AIX, (6BIH), 6AKT, 6CEJ, (6BBC), 6CHU, 6DDD, 6ADM, 6DFQ (7BJ), 7QT, 7YL, 7ZZ, 7SH, 7KS, 7AEA, 7LR, 7ABB, 7SF, (7ADR), 7NN, 8XT, 8DAT, 8AZO, 8AB, 8XE, 8ER, 8ADT, 8HCP, 8AII, 8VT, 8WX, 8ABE, 8BDA, 8ZZ, 8ZW, 8AWP, 8DGO, 8BZI, 8AMM, 8CED, 9MC, 9EKY, 9DHF, 9CMK, 9CNV, 9BZL, 9BLY, 9CGU, 9AAW, 9ZT, 9OX, 9COC, 9RC, 9CVC, 9BHD, 9CYS, 9EL, 9DGH, 9AIM, 9CTG, 9EKB, 9DZY, 9BQQ, "US 9BP," 9DKY, 9DGE, 9AVZ, 9XRR, 9BCB, 9AVU.

Can.: 3CO, 3BP, 4CL, 4CN, 4HF, 4DY, 5CN, 5EB, 5GO, 9BP.

Every district in a little over two hours: Nov. 6th, 7:30 to 9:46 P.M.: 1SN, 2CQZ, 3BNU, 4HF, 5EB, 5GN, 5GO, 5LR, 5AMA, 6AFQ, 6AOS, 6AOL, 6CFS, 6CKP, 7KS, 7LR, 7SF, 7SH, 7ZZ, 7AEA, 7ABB, 8AB, 8ER, 8ADT, 8BCP, 8DAT, 8XE, 8XT, 9BP, 9MC, 9AAW, 9BLY, 9BZL, 9CGU.

6TO, Honolulu, T. H.

3EL, 4KU, 5CN, 5ZA, 9MI, 9BAK, 6AD, 6CC, 6CU, 6IK, 6KA, 6KM, 6MH, 6PL, 6SP, 6TI, 6TS, 6ZL, 6ZQ, 6AAJ, 6ABB, 6ABS, 6ABX, 6ACM, 6AFJ, 6AFQ, 6AJF, 6AJL, 6AJP, 6AJQ, 6ALV, 6ANB, 6AOS, 6APZ, 6ARB, 6AWP, 6AWT, 6AUP, 6AVV, 6BBC, 6BCK, 6BGS, 6BEG, 6BEO, 6BFM, 6BHC, 6BIC, 6BIO, 6BPQ, 6BPZ, 6BQL, 6BSG, 6BSH, 6BSY, 6BUO, 6BUY, 6BVG, 6BVS, 6CEU.

6CEJ, 6CEO, 6CFM, 6CGO, 6CGW, 6CHL, 6CHV, 6CKR, 6CML, 6CMK, 6CMR, 6CMW, 6COI, 6CPQ, 6ZAF, 6XBG, 7QU.

7ADP, Seattle, Wn.

1AW, 1UL, 1XM, 1YD, 1BER, 1BCE, 1CDV, 2BY, 2TS, 3DE, 3HG, 3QV, 3YO, 3ZO, 3AJD, 4BU, 4CS, 4FT, 4JK, 4KU, 4QF, 4ZA, 5BE, 5RM, 5EK, 5FD, 5FK, 5FX, 5HG, 5GN, 5HL, 5HT, 5KG, 5LR, 5LG, 5MK, 5NN, 5OO, 5PB, 5PH, 5UA, 5UK, 5UO, 5VP, 5WG, 5XV, 5ZB, 5AAT, 5ARR, 5ABD, 5ADH, 5AIU, 5AJJ, 5AMA, 5ZAV, 5AB, 5BF, 5BO, 5ER, 5FU, 5JJ, 5KG, 5NB, 5QN, 5RO, 5TR, 5TT, 5UF, 5VT, 5WE, 5WX, 5XE, 5ZM, 5ZW, 5ZZ, 5ACW, 5ADA, 5ADK, 5AFU, 5AMM, 5AQM, 5ARD, 5ARF, 5ARV, 5BDA, 5BCE, 5BCH, 5BED, 5BHF, 5BNN, 5BJV, 5BYM, 5CAE, 5CDF, 5CEL, 5CGJ, 5CJD, 5CNO, 5CNR, 5COI, 5CRL, 5CUX, 5CVG, 5DAA, 5DAG, 5DAT, 5DFA, 5DGM, 5DGO, 5DIG, 5DLB, 5XAN, 5AI, 5AN, 5BK, 5CR, 5CT, 5DT, 5EC, 5EP, 5HS, 5KP, 5LZ, 5MA, 5MC, 5MO, 5QC, 5SP, 5SS, 5VM, 5XJ, 5YB, 5YY, 5ZT, 9AAQ, 9AAU, 9AFM, 9AIC, 9AIV, 9AMB, 9AMF, 9AON, 9APE, 9AFP, 9AQC, 9ASF, 9AUA, 9AUV, 9AVN, 9AVV, 9AVZ, 9AWF, 9AWM, 9AWN, 9BAK, 9BAL, 9BAN, 9BAV, 9BCB, 9BHD, 9BDU, 9BDS, 9BDZ, 9BED, 9BEP, 9BEY, 9BFK, 9BHZ, 9BK, 9BIS, 9BJL, 9BJM, 9BKC, 9LKB, 9BMX, 9BQJ, 9BRL, 9BSQ, 9BTL, 9BTP, 9BTT, 9BZI, 9CAA, 9CBU, 9CCV, 9CEH, 9CFJ, 9CEU, 9CJC, 9CKM, 9CLK, 9CLN, 9CLQ, 9CJY, 9CNT, 9COI, 9CQU, 9CTG, 9CTR, 9CVV, 9DAW, 9DAY, 9DCL, 9DPC, 9DHB, 9DJG, (9DKB), 9DKQ, 9DKS, 9DKY, 9DLG, 9DLM, 9DMA, 9DSM, 9DSO, 9DSW, 9DVG, 9DXN, 9DXY, 9DZY, 9DZZ, 9EBD, 9EBT, 9EDE, 9EEA, 9EHL, 9EJ, 9EJZ, 9ELV, 9EY, 9EYK, 9EKB, 9EJZ, 9XAQ, 9YAU.

Can.: 3BG, 3BP, 3CO, 3JN, 3NI, 3OH, 3TR, 3ZS, 4CN, 4CL, 4DX, 4FR, 4FN, (4HF), 4HH, 9BP, 9BX.

7EL, Stevensville, Montana

1APC, 1BKQ, 1BWJ, 1CMP, 1JV, 1XM, 1XU, 1YB, 2AGX, 2BY, 2CFB, 2CQZ, 2KF, 2LV, 2TS, 3BG, 3RGT, 3MB, 4DY, 4FT, 4HL, 4JK, 4OB, 5AR, 5ANG, 5HL, 5HQ, 5HT, 5KW, 5QL, 5SD, 5ZA, 5ZAV, 5AZL, 6AGB, 6AGK, 6AJP, 6ALV, 6ALX, 6AMG, 6ANB, 6AOL, 6AOS, 6AOU, 6AVV, 6AWI, 6BHH, 6BHQ, 6BJJ, 6BPF, 6BRF, 6BRK, 6BSG, 6BUA, 6BUP, 6CBG, 6CDG, 6CGZ, 6CGD, 6CGW, 6CHU, 6EB, 6IL, 6NX, 6PE, 6PL, 6VF, 6ZAH, 6ZAM, 6ZAU, 6ZV, 8AA, 8AAJ, 8AB, 8AIM, 8AMB, 8AMM, 8APN, 8APT, 8AVL, 8BDA, 8BOE, 8BXM, 8CED, 8CEL, 8CDI, 8DTE, 8FM, 8Y, 8PL, 8PW, 8SP, 8SZ, 8VY, 8XE, 8XZ, 8ZC, 8ZZ, 9AAP, 9ABO, 9AIZ, 9AIM, 9AON, 9AOU, 9APF, 9AUW, 9AVN, 9AVZ, 9AWV, 9BAK, 9BAV, 9BEZ, 9BJ, 9BJL, 9BLT, 9BQY, 9BRI, 9BXQ, 9BZI, 9CAA, 9CBJ, 9CCZ, 9CE, 9CHO, 9CVD, 9CWF, 9DAW, 9DCH, 9DDJ, 9DFH, 9DJX, 9DKQ, 9DKY, 9DLF, 9DLI, 9DPX, 9DRK, 9DSL, 9DSW, 9DTE, 9DXY, 9DZG, 9EFA, 9EGG, 9EH, 9EJZ, 9EQ, 9MC, 9VM, 9YY, 9ZL, 9ZT.

Spark: 9AUU, 9BOF, 9BXT.

Fone: 8EA, 9DLF, 9DYJ.

Can.: 2BN, 3NL, 3TB, 4AW, 4CN, 4CR, 4CW, 4EK, 4FN, 4HF, 4HH, 5AH, 5CN, 5EB, 5GO, 9BP, 9BX.

Mex.: BX.

8BFH, Norwalk, Ohio

6AAK, 6ACB, 6ACM, 6AGE, 6AHH, 6AHU, 6AJD, 6AK, 6AME, 6AOH, (6AOL), 6AOS, 6ARB, 6ARZ, 6ASX, 6ATC, 6AUP, 6AUC, 6AUY, 6AVV, (6AWT), 6BBW, 6BCG, 6BCY, 6BEG, 6BEH, 6BEO, 6BH, 6BIC, 6BII, 6BIQ, 6BJC, (6BKX), 6BLG, 6BLM, 6BMD, 6BNC, 6BNI, 6BNT, 6BON, (6BQB), 6QE, 6BPZ, 6BRF, 6BSH, 6BSJ, 6BUA, 6BUT, 6BVG, 6BWE, 6CBD, 6CBU, 6CBW, 6CDG, 6CFZ, 6CGA, 6CGD, 6CGW, 6CHC, 6CHJ, 6CHL, 6CHU, 6CID, 6CMU, 6CNH, 6EA, 6FY, 6GR, 6GX, 6II, 6IN, 6KM, 6LI, 6MH, 6OD, 6PL, 6RM, 6SU, 6TI, 6TS, 6UF, 6VF, 6WT, 6XAD, 6XL, 6ZAH, 6ZAR, 6ZAU, 6ZH, (7ABB), 7ADR, 7AE, 7AFN, 7AJE, 7AKH, 7BJ, 7BB, 7CA, 7CE, 7EM, 7FD, 7GE, (7GO), 7GX, 7HG, 7IH, 7IW, 7KS, (7LN), 7LW, 7NO, 7QC, (7QJ), (7SC), 7SF, 7SH, 7VE, 7WB, 7WM, 7WS, 7ZD, 7ZL, 7ZT, 7ZU, 7ZY.

Can.: (1AR), 1DD, 4CN, 4CP, 4DY, 4FN, 4HH, 5AH, 5CN, (5GO), 9BP.

8CZI, Ithaca, New York

4DB, 5ABD, 5ABG, 5ABY, 5ACT, 5ADB, 5ADN, 5AFQ, 5AIC, 5AIU, 5AMW, 5CV, 5DN, 5DW, 5HT, 5IN, 5JN, 5LI, 5LJ, 5LR, 5NN, 5QL, 5QL, 5QR, 5QW, 5SD, 5TJ, 5UA, 5UK, 5WC, 5YK, 5ZA, 5ZI, 6ACM, 6AGE, 6AHA, 6AHU, 6AJD, 6AJJ, 6ALV, 6ANB, 6ANH, 6AOL, 6AJH, 6AOS, 6AOU, 6ARB.

6ARU, 6ANA, 6ATA, 6AUQ, 6AUY, 6AVV, 6AWT, 6BBU, 6BCL, 6BCS, 6BEO, 6BIC, 6BIF, 6BIQ, 6BIL, 6BM, 6BNC, 6BPZ, 6BRF, 6BUA, 6BUH, 6BVE, 6BWE, 6BWP, 6CBU, 6CBW, 6CC, 6CDG, 6CEK, 6CFY, 6CFZ, 6CGA, 6CGW, 6CHC, 6CHU, 6CHV, 6CID, 6CJE, 6CJL, 6CKP, 6CKR, 6CMR, 6CNH, 6EO, 6FP, 6FY, 6GR, 6GX, 6JX, 6LV, 6MH, 6NX, 6PE, 6PL, 6RM, 6SU, 6VF, 6WT, 6ZB, 6ZAU, 6ZL, 6XAD, 6ABB, 6ABY, 6ACG, 6ADR, 6ADS, 6AEL, 6AF, 6AFN, 6AGE, 6AGX, 6AIY, 6AKH, 6AKM, 6GE, 6GI, 6GS, 6HG, 6HW, 6IT, 6JD, 6KS, 6LN, 6LW, 6OB, 6OH, 6OS, 6OT, 6QJ, 6QY, 6ZS, 6ZT, 6SH, 6UW, 6VE, 6WF, 6WP, 6WS, 6ZD, 6ZU, 6ZV, 6ADC, 6AIM, 6AMB, 6AML, 6AOD, 6APP, 6AUV, 6AVS, 6AVU, 6AWD, 6BCG, 6BDZ, 6BG, 6BHY, 6BJC, 6BJJ, 6BJK, 6BRI, 6BUN, 6BYM, 6BXQ, 6CAA, 6CCS, 6CDO, 6CEA, 6CFI, 6CFY, 6CGA, 6CJY, 6CKM, 6CLD, 6CLH, 6CPB, 6CYX, 6DFH, 6DKX, 6DME, 6DNX, 6DTE, 6EAE, 6EFE, 6EFU, 6QW, 6YY.

Can.: 1AR, 1CW, 1DQ, 1ER, 4FN, 4GR, 5AH, 5CN, 5EB, 5GO.

Mex.: 5JD, 9BOF.

9ARB, 710 W. Prospect St., Kewanee, Ill.
 1HX, 1IL, 1JT, 1MY, 1RV, 1AFA, 1AJX, 1ASP, 1BKQ, 1BOM, 1BOQ, 1BWJ, 1YK, 2BY, 2QS, 2SY, 2WB, 2WR, 2AA, 2AGB, 2ATE, 2BQC, 2BSI, 2CDB, 2CGL, 2CXL, 2XQ, 6CU, 6FP, 6LV, 6NX, 6PE, 6PL, 6AGK, 6ANI, 6AOL, 6ARB, 6AUY, 6BBW, 6BCS, 6BDS, 6BEG, 6BIC, 6BIF, 6BJQ, 6BLM, 6BRF, 6BTT, 6BVE, 6CEK, 6CFZ, 6CGW, 6CKP, 6CKR, 6CMU, 6ZH, 6ZQ, 7AF, 7AK, 7CH, 7DC, 7OT, 7SF, 7WP, 7AFN, 7AKH, 7ZD, 7ZL.

Logged by 9CMN from Nov. 2 to Nov. 26.
 1AJF, 1AJX, 1ALL, 1AOL, 1AW, 1BCU, 1BIN, 1BKL, 1BOQ, 1BPL, 1CKP, 1CMP, 1DE, 1ER, 1FD, 1HX, 1IC, 1KJ, 1LV, 1MK, 1MY, 1OK, 1RV, 1WC, 1XAM, 1XM, 1YB, 6ABX, 6AHP, 6CHV, 6AJA, 6AJD, 6AJH, 6AKZ, 6ALK, 6AOL, 6AOL, 6ARD, 6ASU, 6AUY, 6AVV, 6AWT, 6BBE, 6BBU, 6BBW, 6BCK, 6BCL, 6BDS, 6BEG, 6BEO, 6BIC, 6BIL, 6BM, 6BO, 6BQL, 6BRK, 6BRF, 6BRW, 6BSG, 6BUA, 6BUE, 6BUH, 6BVA, 6BWP, 6CAO, 6CBI, 6CRU, 6CC, 6CDG, 6CDM, 6CED, 6CEJ, 6CGD, 6CGG, 6CGP, 6CGW, 6CHU, 6CIE, 6CKP, 6CKR, 6CMR, 6CMT, 6CMW, 6CNH, 6CRD, 6CRZ, 6CUB, 6CUE, 6DU, 6EN, 6ER, 6FB, 6FH, 6FP, 6GN, 6GX, 6IF, 6JX, 6KM, 6LM, 6LU, 6LV, 6MH, 6NX, 6PL, 6TA, 6TI, 6VD, 6VX, 6ZAF, 6ZAH, 6ZAW, 6ZB, 6ZH, 6ZO, 6ZP, 7ABB, 7ABY, 7ACL, 7AEA, 7AED, 7AEG, 7AEK, 7AEL, 7AIN, 7AF, 7AFN, 7AGE, 7AGR, 7AK, 7DK, 7DU, 7FD, 7IF, 7IG, 7OT, 7PX, 7QC, 7RD, 7SF, 7SC, 7SW, 7TU, 7ZD, 7ZV.

Can.: 1AR, 2BE, 2BG, 2BN, 2BV, (2CG), 2IC, 3AA, 3ADN, 3BA, 3BF, 3BG, 3CA, 3CP, 3DE, 3FG, 3GK, 3IA, 3KG, 3KP, 3MN, 3MVAP (QRA), 3NI, 3OH, 3OJ, 3PZ, 3QS, 3TB, 3WS, 3XL, 3XV, 3XX, 3ZL, 4CA, 4CN, 4TB, 5CN, 5GO, 9BW, 1C.W.: 1BOQ, 6BRF, 6CGW, 7ABB. Can.: 1AR, 2BG, 3BA.

Mex.: 8X.

9DJB, 3808 Wyoming St., Kansas City, Mo.
 1AEZ, 1AFA, 1AJX, 1ALL, 1ALJ, 1APC, (1AQI) 1ARY, 1BCU, 1BHK, 1BOM, (1BOQ), (1BWJ), 1CAB, (1CMP), 1CPL, 1CSW, 1AW, 1ER, 1FM, (1HK), (1HX), 1IL, 1IL, 1MO, 1PA, 1QP, 1RV, 1SN, 1TS, 1VV, 1YB, 1YK, 2AA, 2AGB, 2ANA, 2AYW, 2BMO, 2BQB, 2BRB, 2BWR, (2BXP), 2BXW, 2BYG, 2CDM, 2CJR, (2CPA), 2CPQ, 2CQN, 2CQZ, 2CRQ, 2CJV, 2CXD, 2CXF, 2CXL, 2CXY, 2AN, 2AK, 2BY, 2DS, (2KU), 2RB, 2RK, 2RM, 2SQ, (2TS), 2WR, 2XAB, 2XQ, 3AAO, 3ARW, 3ACY, 3ADB, 3ADP, 3ADY, 3AEC, 3AEK, 3AHP, 3AJD, 3ALN, 3ALR, 3ATB, (3BED), 3BJJ, 3BNU, 3BOF, 3BSB, 3BSS, 3BVA, 3BWT, 3CBL, 3CEL, 3CFV, 3CHG, 3CJN, 3CJV, 3AS, 3CA, 3HH, 3JJ, 3JY, 3KQ, 3LL, (3OQ), 3PZ, (3TR), 3YP, 3ZM, 3AAK, (3ABX), (6ACM), 6ADH, 6AFH, 6AFQ, 6AGE, 6AHP, 6AHP, 6AHU, 6AJA, 6AJD, 6AJH, 6ALO, (6ALV), 6ANB, 6ANI, 6AOL, 6AOS, 6AOU, 6ARB, 6ARU, 6ATG, 6AUP, 6AVV, 6AWQ, 6AWS, 6AWT, 6AWX, 6BBC, 6BCL, 6BDS, 6BDR, 6BEO, 6BEQ, 6BFG, 6BIC, (6BIF), 6BIL, 6BIF, 6BJJ, 6BJK, 6BRI, (6BQP), (6BQL), 6BRF, 6BRK, 6BUO, 6BVE, 6BWE, 6CAE, 6CBD, 6CBK, 6CBU, 6CBW, 6CEJ, 6CEK, 6CFZ, 6CGD, 6CGL, 6CGW, 6CHU, 6CIA, 6CID, 6CKH, 6CKP, (6CKR), (6CMR), 6CNH, 6CNI, 6AK, 6BH, 6BM, (6DD), 6EA, 6EB, 6EJ, 6FH, 6FP, (6FY), 6GR, 6HP, 6JX, 6KA,

6LL, 6LV, 6MG, 6MH, 6MS, 6NX, 6OL, 6PL, 6RM, 6UA, 6VD, 6VF, 6WT, (6XAD), 6XL, 6ZAH, 6ZAR, (6ZAU), 6ZH, 6ZQ, 6ZR, 7ABB, 7ABY, 7ADZ, (7AKA), 7AEZ, 7AFN, 7AHI, 7AK, 7GO, 7H, (7IT?), 7IW, 7JD, 7KS, (7LY), 7NN, 7OT, 7QC, 7QJ, (7QT), 7QH, 7QY, (7SG), 7SF, (7TO), (7WS), 7ZD, 7ZO, 7ZU, 7ZY.

Can.: 2BN, 2CG, 2IC, 3AA, 3BA, 3BP, 3BQ, 3GK, 3IA, 3JJ, 3NI, 3OH, 3OM, 3PG, 3SI, 3TF, 3XL, 3ZS, 3ADU, 3AEC, 4DY, 4HH, (5CN), 5GO.

5ADB, El Paso, Tex.
 Oct. 15 to Nov. 15
 1APC, 1ARY, 1ASV, 1BBO, 1BES, 1BHK, 1BKQ, 1BQD, 1CMP, 1CPA, 1CPN, 1FV, 1HX, 1OJ, 1OW, 1VV, 1WO, 1XM, 1YB, 1ZL, 2AFP, 2BJX, 2BRB, 2BXY, 2RY, 2EZY, 2CBG, 2CLU, 2CSR, 2CWI, 2DAC, 2GK, 2KF, 2LV, 2RB, 2ABW, 3AJD, 3AS, 3ATB, 3BDO, 3BDQ, 3BGI, 3BNU, 3BOF, 3CJN, 3CM, 3COK, 3HK, 3JJ, 3SU, 3TR, 3YO, 3ZL, 3ZM, 3ZT, 4BX, 4EL, 4FA, 4FT, 4HR, 4KU, 4QF, 4RH, (6AAT), 5ACR, 5AE, 5AEE, 5AGI, (5AHR), 5AIB, (5AIV), (5AJJ), (5AMA), 5ANA, 5AU, (5BX), 5CE, 5CV, 5EZ, (5FA), 5FJ, 5FT, (5GI), 5HQ, 5IF, (5IN), (5LD), (5LR), (5LG), 5NH, (5NK), (5NN), (5NR), 5OK, (5OV), (5PB), 5QQ, 5QR, 5QW, 5RM, (5SD), 5UP, 5ZAX, 5ZB, (6AHP), (6AJD), (6AJH), (6ASA), 6BCS, (6BFG), (6BJQ), (6BEQ), (6BQE), (6BRA), (6BSG), (6BIS), 6BVG, 6CBB, (6CFZ), (6CGA), (6CGG), (6CGW), (6CMU), (6CU), (6FP), 6KM, (6NB), 6SU, (6UA), 6XAD, 6ZX, (6ZAU), 7ABB, 7ABG, 7ADQ, 7AGR, 7BJ, 7BO, 7EM, 7HW, 7KS, 7LU, 7OB, 7LY, 7QJ, 7WS, 7ZD, 7ZO, 7ZU, 7ZZ, 8AAJ, 8AAM, 8AB, 8ACY, 8ADG, 8AFD, 8AFN, 8AG, 8AIH, 8AJH, 8AMD, 8AMM, 8ATC, 8AXZ, 8BBF, 8BCP, 8BDA, 8BDU, 8BJV, 8BNH, 8BOB, 8BYN, 8CED, 8CEI, 8CGJ, 8CP, 8CWN, 8CYZ, 8CZD, 8DAT, 8DAW, 8DJF, 8EU, 8HN, 8KG, 8PD, 8PK, 8PL, 8SE, 8SP, 8UF, 8WA, 8WX, 8XE, 8CZ, 8ZZ, 9AD, 9AEC, 9AED, (9AIM), (9AMB), 9AOD, 9AON, (9APP), 9ARZ, 9AVA, 9AVS, 9BAF, 9BAL, 9BBW, 9BDU, (9BDS), (9BHZ), 9BKM, 9BLY, 9BSV, 9BSZ, 9BVO, (9CCV), 9CCZ, 9CDO, 9CFI, (9CFJ), 9CGA, (9CGU), 9CHD, 9CHG, 9CIN, 9CJE, 9CJY, 9CLJ, 9CLQ, 9CPB, 9CR, 9CTE, 9CZW, 9DKW, 9DKY, 9DLL, 9DMN, 9DSW, (9DTE), 9DUQ, 9DWX, 9DXC, 9DXN, (9DXU), 9DZY, 9EAK, 9EI, 9EJ, 9EKT, 9EQ, 9FG, 9JCS (QRA?), 9MC, 9NA, 9NR, 9SS, 9TI, 9VL, 9VM, 9PW, 9QR, 9YU, 9YY, 9ZT.

Mex.: (BX).
 Spark: 5RV, 9BOF, Army WUJ, WZE.
 Will appreciate QSLs on our sigs. The above calls QSL'd if requested.

THE OPERATING DEPARTMENT
(Concluded from page XI)

very busy and not on much just now, and when he has the time he is busy trying to get that big aerial down to 200 meters.
 Regina promises 4 transmitting stations this winter. 4AJ and 4FV are working and handling some traffic. 4BR got his new sink rect. out of Customs OK, but the YL has been causing a little QRM and he hasn't been able to devote much time to his outfit lately. (Give her some code practice, OM, and follow 4AJ's example, it saves complications.) 2nd opr. from 3NI made some of the owls at Regina a pleasant call. Our understanding is that the Department of Marine and Fisheries has made no ruling on quiet hours yet, but has made a statement that if complaints are made between 7:30 and 10:30 P.M. of amateur interference, they would have to make a ruling which would be severe. So, gang, let's watch our step and keep the good will of the department at Ottawa.)
 Manitoba—The gang is getting on OK now, and reaching out FB. 4CN works everything from coast to coast on his 50-wattter and shoots a few messages thru. 4AS will be on the air by the time this issue is printed. 4CR has his 100-watt set going now. 4CO has been making big smoke on his spark set (????) working to 8BDA. (That's FB for spark, OM, but your C.W. set has that whip-out of the map for both QRK and DX.) 4AW on a 10-wattself-rect. set is amongst the operating sets here now. Hurray! there's another hole going to be filled up. 4BI is ready to go on 10 watts. That cuts about 120 miles off the distance 4AG has his 20 watts working and is QRV for traffic. 4DY wishes some of those Sask. stations would be more QRV to QSR.