

QEST

*Published by the
American
Radio Relay
League*

Devoted Entirely to
**AMATEUR
RADIO**

QRA WNP

LAT. 79° N., LONG. 79° W.

October 1923
20¢

Hubert Van
877-8MR



It Bridges the Vastness of Space

SINCE Marconi first successfully spanned the Atlantic Ocean, with the wireless telegraph, radio has ever been outstanding as an invention of unlimited importance to humanity.

In 1909 the broadcasting of that now famous distress call, CQD, from the sinking passenger liner, S. S. Republic, established in the eyes of the entire world the tremendous importance of radio on the high seas.

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In recent years the development of the vacuum tube has not only improved radio for the purpose of marine, commercial and military communications, but through radio telephony and public broadcasting, has established a new and even greater service to humanity.

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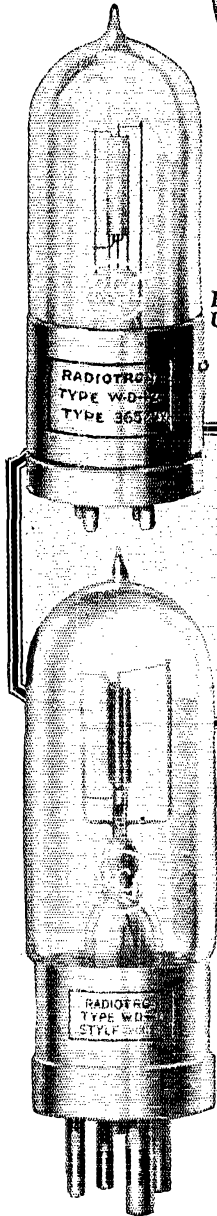
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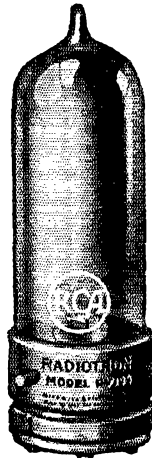
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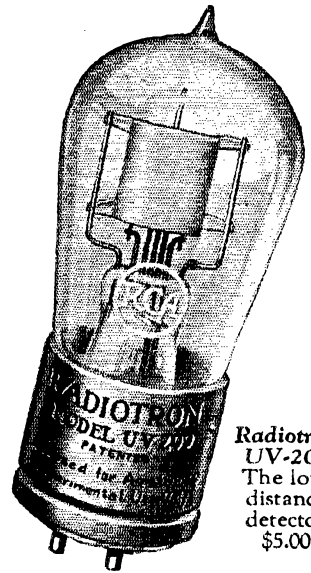
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To Our Readers Who Are Not A.R.R.L. Members

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 big 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.....

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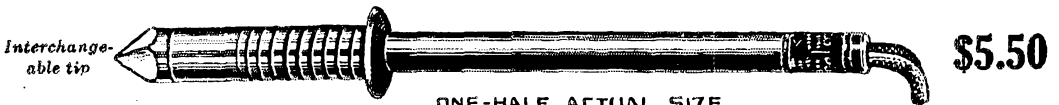
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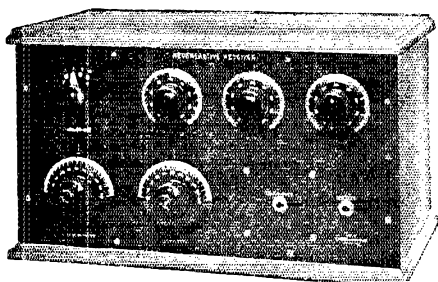
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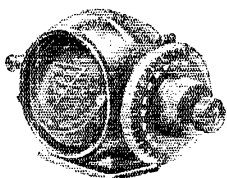
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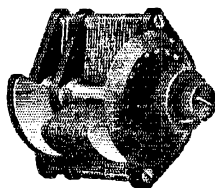
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The National Chelsea Radio Corporation offers a complete line of parts. These are identical with those responsible for the marvelous results obtained by Chelsea Receivers. For complete description and prices write for Booklet "B."



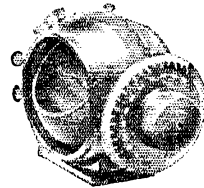
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—Confucius

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THE early experimental work of the Radio Amateur made possible the radio concerts which thousands now enjoy.

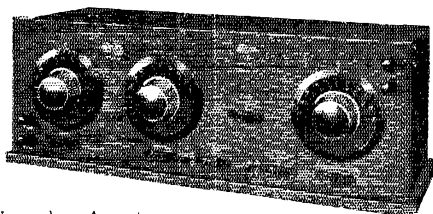
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Sharper Tuning - Greater Range - Quieter Operation

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QST

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

VOLUME VII

OCTOBER, 1923

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QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A.R.R.L.), Editor and Business Manager. S. Kruse, Technical Editor; H. F. Mason, Department Editor. F. C. Beekley, Assistant Editor.

Edwin C. Adams, Advertising Manager.

Subscription price in United States, Possessions, and Canada, \$2.00 per year. Foreign, \$2.50. Single Copies, 20 cents.

Entered as second-class matter May 29, 1919, at the post office at Hartford, Connecticut, under the Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Section 1103, Act of October 3, 1917, authorized September 8, 1922.

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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.

Inquiries regarding membership are solicited. Ownership of a transmitting station, while very desirable, is not a prerequisite to membership, a bona-fide interest in amateur radio is the only essential. Correspondence should be addressed to the Secretary.

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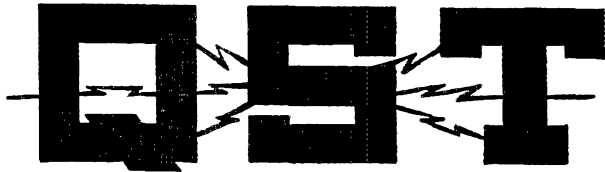
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A Magazine Devoted Exclusively to the Radio Amateur

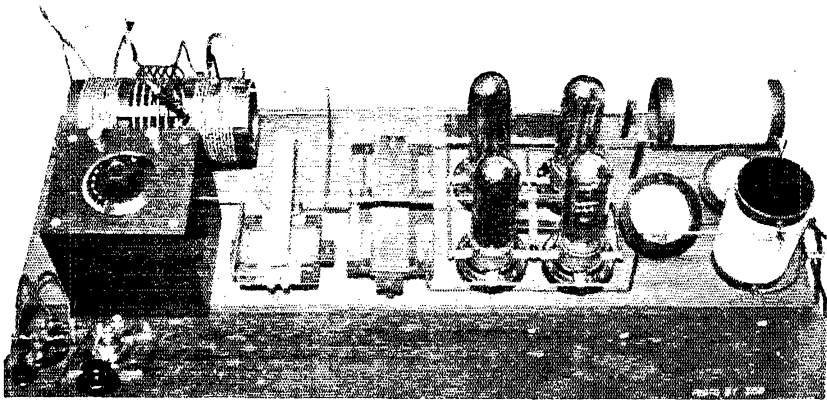
A Real Short-Wave Transmitter

By Brown, Darne & Basim, 3BWT

Here's a set that not only is able to work at 150 meters with the greatest ease but also can drop far below that. Before the new regulations were approved by the Bureau of Navigation this set did splendid work at 100 meters; now it works at 150 until an "X" license can be gotten. Build such a set, get a schedule with another station of the kind, and get the biggest surprise of your radio experience. Before a week is over you too will be trying for an "X" with which to work on down towards 50 meters—Technical Editor.

TO design and build a tube set to operate efficiently on 100 meters is not a very difficult task, although the antenna may have a natural wave of 190 meters. The wave length to which an antenna will tune may be reduced by reducing the value of the series capacity; this process may be continued until the capacity is so small that there is practically an open circuit. At

dielectric, and small glass strip supports and separators, will have a power loss so low that it may be neglected *even in measurement work*. There is no more loss in a condenser placed in series with the antenna than there is in the same condenser placed in any other circuit of similar voltage, current and frequency. Why then the great outcry against antenna series condensers?



just what value of the series capacity this will happen cannot be determined readily; however, an antenna with a natural period of 186 meters was made to oscillate freely on 62 meters with a series capacity of but .00015 microfarads, and even then the antenna current was 1.7 amperes *which represented 340 watts in the antenna*.

The old belief that a series condenser in the antenna circuit represents a series loss has been proven obsolete. A good modern condenser with soldered brass plates, air

To be sure, the antenna current will be less when a small series condenser is used, but that signifies nothing as to the power present. It is easy to see why the smaller current at shorter waves was considered as a calamity in the good old days when the antenna ammeter was the only criterion of efficiency, but now it should be recognized that the radiation resistance at lower waves is so much greater that a very small current may represent *more* power. Note that at 100 meters there were 340 watts

in the antenna at 3BWT altho the current was only 1.7 amps.

For that matter the current in *any* radio circuit will vary between wide limits with a change in the L/C ratio, although the power and the wave length may be entirely constant.

Why a Series Condenser?

The effectiveness of an antenna as a radiator is a function of its capacity and its effective height. If we increase the size of the antenna top, keep it just as high, and then bring the wave back down with a *good* series condenser we have taken a step in the right direction. Obviously, except in some extreme cases, it will be much better to use the regular antenna with a series condenser than to build a small antenna for short-wave work.¹

Where to Put the Series Condenser

Most sets light the filament of the sending tubes by means of a step-down transformer operating on the 110-volt line. If a capacity is inserted between the antenna inductance and the ground, then the full voltage across this condenser is also impressed between the secondaries of the filament and plate transformers and ground. The smaller the ground-series condenser the greater the voltage across it, and the higher the strain on the insulation of the transformers. For this reason alone this method of connection should not be used. If there is any doubt that this effect really takes place, try it; the ground-series condenser can be removed entirely and the set will still oscillate at a lower wave, the current going to ground thru the inherent capacity of the transformers. This capacity is obviously of considerable size and when connected in parallel with a ground-series capacity there is not only a loss of power and danger to the transformers but in addition the lowest wave at which the set will operate is greatly restricted. The ideal place for the antenna series condenser is in the antenna lead and well removed from surrounding objects, especially those of considerable capacity.²

The Sending Set

To get accurate information on the various transmitters tried at 3BWT we set up a single-circuit receiver a short distance away and placed a 0.5 milliammeter in the

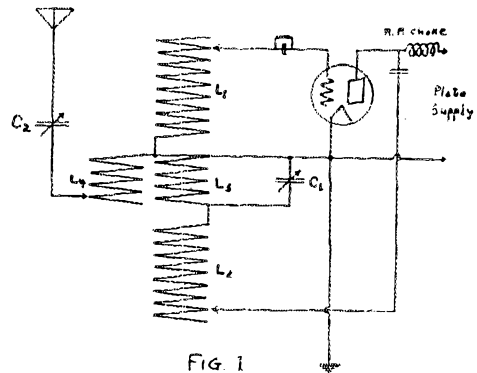
¹Remember that all this is being said about a *good* series condenser. A condenser with glass plates is almost never good enough and only the best of the mica condensers get by. Hardly any variable condensers are good enough. Even a good rubber-insulated variable condenser is doubtful if it is oil-filled, partly because the oil collects water and partly because the oil may attack the insulation.—Tech. Ed.

²Exactly the same remarks apply to a counterpoise, which is another kind of ground-series condenser. If a counterpoise is used, run the upper end of the coil L₄ to it instead of connecting it to L₃.—Tech. Ed.

plate circuit of the detector tube. The reading of this meter gave an idea of the strength of the received signal. Numerous sending circuits were tried with mediocre results until the circuit of Fig. 1 was hit upon. This coupled circuit handled very easily and produced a greater deflection at the distant receiver than did the direct-coupled sending set. The exact location and connection of the coils was found to be of prime importance; therefore a unique coil system was adopted.

The Coil System

Referring to Fig. 1, the grid coil L₁ was wound on a 4" diam. bakelite tube and consisted of 13 turns of No. 14 bare wire,



tapped every turn and spaced with cord. The coil L₃ was wound on a similar tube and consisted of 12 turns of No. 14 wound and tapped like the grid coil. These taps were merely a series of staggered humps in the wire just high enough to get hold of with the clips. The coils were then joined end-on by strips of bakelite 1/2" square and 4" long. These strips were notched both inside and out for 5 turns of No. 8 bare wire. The inside winding L₃ was made a part of the plate coil, and across this winding was shunted a double-spaced variable condenser C₁ to control the wave length of the local circuit. The outside of L₁ was made the antenna coupling coil. One end of these coils was connected together and grounded. Since the coils L₂ and L₁ were made up of the same number of turns, had approximately the same value of inductance, and were tightly coupled in the same magnetic field, the voltage induced in each is practically the same and the loss from capacity shunt is very small.

When working any antenna at or below its natural period it will be found to have a comparatively high total resistance, made up for the most part of radiation resistance which we want to be as high as possible. To work into a high resistance

circuit the coupling must be tight. To get tight coupling it is necessary to wind the coils in close proximity, which in turn gives high mutual capacity, especially when using wire of large area. This capacity can be and generally is quite high and unless the voltages are of the same order and in the same phase a very heavy current will flow thru this capacity shunt and will cause a very substantial power loss. This condition is practically eliminated by the adopted coil system, as can be seen by inspection.³

The voltage may be reduced in the local tuned circuit by using a few turns and a larger capacity; but as this process is carried out, a loss due to extra-heavy currents soon crops up. An optimum L/C ratio of .0005 mfd. and 6 microhenries was chosen in this case. This ratio kept the current within reasonable limits and the voltage impressed across the condenser was

³Read that again. Both amateur and commercial designers seem to think this isn't worth worrying about. By the way, this coil system with L4 removed is a Meissner circuit. When L4 is connected we may describe it as a loose-coupled Meissner, a circuit we have not met before.—Tech. Ed.

low enough to permit the use of a double-spaced variable air condenser.

The following described results were secured about the time of QST's 100-Meter CQ Party. However, the set is now, with a few changes, being used on wave lengths above 150 meters pending the arrival of our "X" license. Trot out the 100-meter issue of QST and look in "Calls Heard" for 3BWT. 1XA has been worked a number of times and invariably reports no QRN or QRM and *very QSA compared with the 200 meter set*. The field in the vicinity of 150 meters seems to be an ideal place for the real traffic man as, when once schedules are established, he can work with very little interference, thereby building up his message total.

For 150-meter operation the capacity C, should be raised to approximately .001 mfd., the series capacity should be increased, and the number of turns increased about 25 per cent in the grid and plate coils. Due to vacations not much information is at hand regarding 150-meter work with this set, although fine results are expected this season in view of the encouraging results already secured.

Transocean Tests

By The Traffic Manager

PLANS are being made at this writing for Trans-Atlantic tests in late December of this year. Instead of going thru the qualification process for our own transmitters as was done last year, we shall devote most of our time listening for foreign signals.

We have yet to convince the European amateurs that we can receive as well as we can transmit before we may hope to establish two-way communication. We defeated ourselves last year by causing so much QRM that those listening hadn't a ghost of a chance to hear a weak signal. To prevent any possible transmission thru error or misunderstanding, we will do no transmitting, at least for the first five or six days, and then only for the purpose of trying to connect up with European stations. French amateurs have asked that we give them a night of rest between test nights; therefore we may expect final plans to be provided for alternate nights of British and French transmission. Probable dates are December 21 to 30th. Immediately after we are sure we can copy British and French amateur signals, we will attempt two-way communication. Details will be announced in the following issues of QST.

THE enthusiasm after the first Trans-Pacific Tests was so general that plans were begun at once for a new series of tests to be run this fall.

This time the object is two-way communication with Australia and New Zealand, all states in the U.S.A. to have an even chance to show that they can equal the performance of the stars of the first test.

The arrangements for this series of tests are being made by A.R.R.L. in cooperation with the Radio Journal, the Southern California Radio Association and the amateurs of Australia and New Zealand. Final details unfortunately have not been completed at this writing but they will be ready within a few days and will be announced in our news bulletins and in the weekly A.R.R.L. broadcast. Listen for these stations at 10:30 P.M. (their own standard time) on Saturday and Sunday night of each week. See another article in this issue for a list of them.

Present plans call for transmission as follows from October 15th to November 3rd: Friday and Saturday nights, free-for-all sending from America. Other nights of the week, schedule sending with use of code words by American amateurs. A request has been made that Australian and New

Zealand amateurs be given special permits for sending on our amateur waves but this is not yet definite. These plans are still subject to change—listen for the broadcasts.

How to enter for the Tests

To save time for everyone concerned we have arranged to assign code words at two places—one on either coast. These two offices have such arrangements that the codes will not be alike and no duplications will occur. Write or wire to one of the following, depending on which is nearer:—
F. H. Schnell, Traffic Manager, A.R.R.L., Hartford, Connecticut.

Radio Journal, 113 Stimson Building, Los Angeles, California.

Better wire your application or stick a special delivery stamp on your letter—the time is short.

Announcing the Results

The results of the tests will be announced by newspaper items, A.R.R.L. broadcasts, and the pages of QST. Unfortunately we will have to stand a good bit of delay as the cables are very slow—unless we ESTABLISH TWO-WAY COMMUNICATION. That's what we must try for, fellows!!

White Silence of Arctic Broken

*All Barriers Give Way While Message Cuts Thru
From North Latitude 78:30*

FROM the farthest point north ever reached by a radio transmitter, word has come advising the world of the safety of the MacMillan Arctic Expedition. Of greatest interest to the amateur fraternity is that hams at either end succeeded in overcoming every known obstacle to communication between the polar seas and the United States.

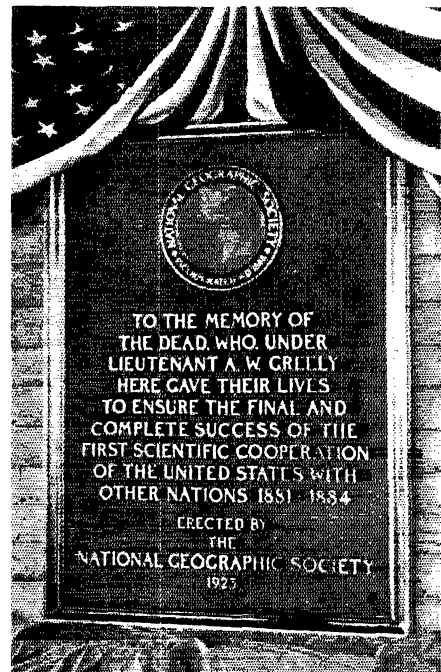
The North Pole and the little town of Chatham, Mass., shook hands by amateur radio over a distance of 2,300 miles, when R. B. Bourne of station 1ANA heard Donald Mix pound out "Latitude 78-30," after three weeks of unbroken silence. And "Don," transmitting from the Arctic perch, nearly hit his own home town.

DX records, as the amateur knows them, faded away with the grim ghosts of the past, when these two New England boys made the contact relieving fears that WNP might be cut off for good. For a moment every barrier slipped back to let this message thru to "Hamdom." Definite two-way contact was established, Mix's transmitter cut a swath clean thru the aurora borealis and the Arctic sunlight to Chatham. Success for the installation in the "Bowdoin" is assured, and with the coming of snappy winter air, WNP will boom down with a kick.

In the interval of blank silence, while many hams listened for signals from the ice floes above, keenly feeling that misfortune might have overtaken the explorers and their brother amateur, the "Bowdoin", under guidance of her captain skilled in all the sailor tricks of Maine fishermen, was wending its way straight North.

Up and up she went, with no word from below penetrating the perpetual Arctic summer sunlight, until finally on the night of August 27th, 11:35 P.M., E.S.T., the signal came. But it was a very weak sig-

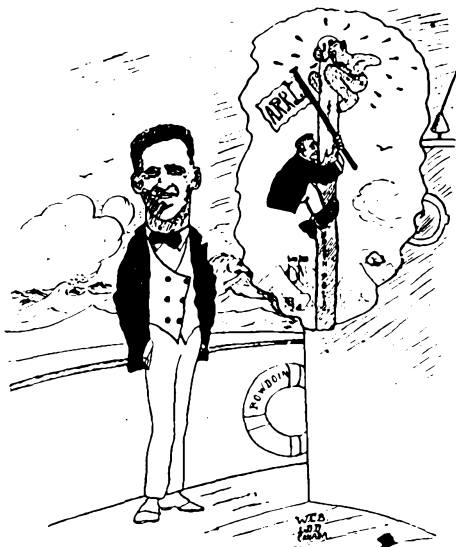
nal and it was fading badly. WNP was on 220 meters and because there was interference from some amateur stations on that wave (11 calls were logged on or near 220), 1ANA asked WNP to try 300 meters. Nil was heard, but when 1ANA got WNP to use 180 meters, signals were better and



The Bronze Tablet, to the Memory of the ill-fated Greely Expedition, which the "Bowdoin" Party was erecting at Cape Sabine about the time WNP was last QSO 1ANA.

a position report was received, giving the "Bowdoin's" location at Lat. $78^{\circ}30'$ North. That would put her past Etah, Greenland, very near her destination. We think it probable that she was then at Cape Sabine, where Capt. MacMillan is to place a bronze tablet to the memory of the Greely Expedition, most of the members of which perished at that spot in 1884. We show a photograph of the memorial tablet, taken at Wiscasset before the "Bowdoin" sailed. 1ANA gave WNP two messages at her position in $78^{\circ}30'$, but WNP was too weak for regular traffic.

After more than three weeks of utter silence, the nightly vigil for WNP was rewarded for Bourne. While other amateurs



were pounding away on their keys, "BO" was watchfully listening for the note of a 500-cycle signal that might come at any moment.

It doesn't taken a super transmitter or receiver to work WNP, as is shown by a description of 1ANA. It takes a good operator who has the patience to sit and listen. With WNP at her destination (get a map and look at it) we believe that amateurs on the west coast with their Australian-New-Zealand-DX transmitters will be able to work WNP as easily as those on the east coast, while the north-central part of the United States and Canada has a better chance than any of the others.

Previous to the work of August 27th, 1ZE worked WNP on July 31-August 1 and gave WNP three messages. On August 3d 1ANA took the last official MacMillan message dated July 28th. 1ARF, at Pittsfield, Mass., reports hearing WNP working

1ANA on August 27th. No other reports were received.

The following letter from Mix was received August 28th. It gives us a good idea of his reception. The list of Calls Heard appears in that department. Every district but the 7th has been heard.

Godthaab, Greenland,
July 28, 1923.

Dear Schnell:

As I have written before, our nights now are exceedingly short and have been decreasing in length all the time until now we have only a couple hours of semi-darkness. For this reason I have picked the stations which were most consistent and who are copying WNP most consistently to shoot the press to, rather than fool around trying to put the MSG over the greatest distance possible and wasting the little period of radio night we now have. As it is, it has been no easy job to get the code MSG off and I think we have been exceedingly fortunate to get it cleared as we have during this kind of weather. Infinite credit should be given to 1ZE and 1ANA for their splendid work.

Have tried to give several other ones and twos a chance at the code msg but after wasting the whole night have had to QSK with only a small part received OK, and have had to wait until the next night to clear it thru 1ZE or 1ANA. Aside from getting the code message off, have had practically no other time to put in at the set as am on watch 12 hours out of every 24. I have managed to get a few minutes now and then, but have logged but few threes or eights and have heard none of them calling us.

Since the set was installed in Southport, I cannot remember a single night which was free from bad QRN. Just before going on watch before 11 P.M. on the 26th, I put on the fones for a minute and was surprised to find that QRN was only moderate and just had time to tune in old 8ZZ, who came in fine. As soon as my trick at the wheel was over. I sneaked down and started listening at 1 A.M. (26th) and within the next forty minutes logged 5AGJ, several eights, and several nines. They certainly sounded good. Signals were all swinging violently, however, as quite a sea was running and the Bowdoin was rolling all over. We were about 200 miles west of Cape Farewell then.

The next night I listened for about 5 minutes and logged 3TB and 9APE. Set didn't sound just right and then I remembered that the antenna was not connected on on the outside. At 12:45 A.M. I got another chance to go below and in quick succession logged 9CVC, 9AAU, 9AXU, 9AVZ, 9DFW, 9AAW, 9DCT, 9AWG, Can. 3XN, 8GT, Can. 9BC, 9BUN, 9MF,

and Can. 3DS, without any ones, twos, or threes in between. At 1:22 heard 6PL call 9BUN but couldn't believe it so did not log him. 1:23, 9CGA called 9BBB and at 1:25 heard 6CMR plainly signing off and a minute later 6PL signing off again. At 1:13 heard 9AVZ calling us. Went back at him but did not hear him again. Think he heard us, as I was working the transmitter at the time. We were less than 50 miles southwest of Godthaab at that time. Listened in last night while we were anchored here in Godthaab and while QRN was bad again, logged three or four nines. The harbor master here tells us that the Danish battleships which visit Godthaab can hear nothing on account of the solid wall of rock hundreds of feet high surrounding us. During the last couple of nights when I was hearing DX well, I called several of them but could raise no one.

Am enclosing a list of calls heard. We are leaving early tomorrow morning for Sukkertoppen. Everything going fine. Had fine trip across from Labrador to Greenland. Mac is enthusiastic over results of few nights and needless to say, I am too. They certainly are most encouraging and indicate that things will go through with the usual A.R.R.L. bang next winter. Tell the fellows out west not to worry and that I am straining my ears for every one of them and will work all of them if they can hear us.

Best 73's to everyone. Remember me to Ken.

As ever, Mix.

R. H. G. Mathews, manager of the Central Division, has offered thru the Chicago Radio Laboratory, a very attractive prize for the first American or Canadian Amateur who takes the next official MacMillan message from WNP. The last received was dated July 28th. The prize consists of a duplicate of the receiver and amplifier installed on the Bowdoin, a Zenith 1R receiver and M2 two-step amplifier. Range about 140-700 meters. It's a dandy for traffic handlers! Whoever goes after it will have to contend with that sleepless night-hawk "BO" of 1ANA. 1ANA already has made room in his shack for this outfit.

Scientific Interest in MacMillan Radio

Our communication arrangements with the "Bowdoin" via A.R.R.L. stations have attracted the joint interest of the Bureau of Standards Radio Laboratory and the Department of Terrestrial Magnetism of the Carnegie Institution of Washington, because of the wealth of unique data they offer on radio transmission conditions and aurora and magnetic disturbances. Both of these institutions for many years have collected data on conditions in their respective fields, and as a result of careful

analysis by their experts, man's knowledge has been increased greatly. Consider, then, what interest they must have in the spectacle of regular communication over a period of a year with a location where no transmitting station has previously been—and with transmission crossing the aurora area.

The Carnegie Institution and the Bureau have prepared a simple form for logging the data that interests them, and amateurs who are willing to make a slight effort on behalf of science are invited to write to the Radio Laboratory, Bureau of Standards, Washington, D. C., and ask to be registered as an observer, whereupon they will be given a supply of recording forms and complete instructions. The forms can be filled out and returned to the Bureau to report radio conditions, whether or not aurora is observed. Observations during visible aurora, however, are going to be particularly valuable and amateur recorders in the more northerly latitudes are particularly desired.

The report form is a very simple thing and can be filled out in but a moment. It is more nearly a report of instantaneous conditions than it is a log. If WNP, the "Bowdoin", be heard on but a single short transmission, it is of course easy to fill out the form. Should WNP be heard over a considerable period, as for example over several hours of an evening, the report can be made to cover an average of conditions during the first five minutes of every hour. Complete instructions will be supplied by the Bureau.

Mix, by the way, is logging on these same forms on board WNP, and when his reports can be tied in with numerous ones made by us amateurs at our stations on land, much valuable information on radio transmission phenomena and meteorological effects is expected to result.

—F.H.S.

LOG SHEET
FOR RADIO AND AURORA - IN NORTHERN REGIONS

RECEIVING STATION ADDRESS _____
STATION CALL _____ OPERATOR'S SINE _____ OPERATOR'S NAME _____
WAVELENGTH OF WNP _____ WAVELENGTH OF YOUR SENDING SET _____
(IF WNP WAS WORKED)

SIGNAL STRENGTH	FADING	STRAYS	WEATHER	AURORA	INTERM.	BAUD	BAVY	CELEST.
WEAK	NONE	NONE	CLEAR	WEAK				
STRONG	SLIGHT	SLIGHT	CLOUDY	MODERATE				
VERY STRONG	BAD	BAD	FOG	VERY BRIGHT				
	VERY BAD	VERY BAD	RAIN					
			SNOW					
			SLEET					

NOTE: CHECK ONLY ONE ITEM IN EACH COLUMN

TIME (STATE IF STANDARD OR DAYLIGHT SAVING)	TEXT OF COMMUNICATION AND REMARKS
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Results of the April Trans-Canada Relay

By F. H. Schnell, Traffic Manager

OUT of the logs that have finally been secured by this office, we have managed to dig up a little more dope on the Trans-Canadian Tests of last April.

As usual, most of the logs were incomplete, lacking texts of messages; times and dates checked in but few cases. 9BP turned in the best log, from which most of the complete messages were taken. His remarks were confined solely to the business of the Transcon Messages, not all bungled up with how badly some "Yank" station was fading, etc. We hope some day to have a relay from which we will get some real logs pertaining to the business at hand. The inability to keep an accurate log is the operating amateur's chief weakness.

Where time does not appear in this report of the messages, it is because the logs do not check and we didn't know which report was correct. The numbers on message were confused and for the purpose of keeping the routing correct, we have had to omit the numbers. The dates may vary slightly, but this is because of the time difference between Eastern and Pacific Standard.

April 13th

9BP started a message to 3TL at 9:58 P.M. P.S.T., reading:

From Prince Rupert, B.C., To Hapgood, 3TL, Niagara Falls, Ont. Greetings from most northerly station will fruit be cheaper this year. (Sig) Barnsley 9BP.

Routing: 9BP-5GO-9BX-3NI-3KO-3JI-3TL. Reply was received by 9BP at 10:58 P.M. P.S.T. on April 15th.

April 14th

5CT started the following at 12:04 A.M. P.S.T.:

From Duncan, B.C. To Tommy Letts, 2BG, Montreal. How are radio conditions in Montreal. (Sig) W. F. Reeves.

Routing: 5CT-4DQ-9BX-4FN-3NI-3GK-2HG.

Failing to raise 2BG, 2HG started a reply:

From Montreal. To W. F. Reeves, Duncan, B.C. Conditions are fine. (Sig) O. Bail.

This reply reached 5CT at 2:40 A.M. Routing: 2HG-3GK-?-9AL-3NI-9BX-5CT.

Another message was started by 5CT: *From Duncan, B.C. To Harries, 2AN, Westmount, Que. What is your best DX to date. (Sig) W. F. Reeves.*

Routing: 5CT-4FN-9BX-3NI-2HG. Again 2HG came to the rescue and replied:

From Montreal, April 15th. To W. F. Reeves, Duncan, B.C. I think that 2AN's record is North Dakota. (Sig) O. Bail.

Routing: 2HG-3NI-9BX-5CT.

It seems that a number of messages were lost on the night of the 14th, as a number of reports of QRM were noticed.

April 15th

The following message was the longest, covering from Prince Rupert to Halifax and return:

From Prince Rupert, B.C. To Greig, 1BQ, Halifax, N.S. How is the weather there now we are enjoying spring here. (Sig) Barnsley 9BP.

Left 9BP at 8:53 P.M. P.S.T. Routing 9BP-4FN-3NI-2HG. Here it took a peculiar twist, as 2CG also copied it from 3NI. However, 2HG failed to raise 1BQ at Halifax and sent a reply which reached 9BP at 10:05 P.M. P.S.T. In the meantime 2CG raised 1BQ and gave him the message and got a reply, but got stuck with it and finally had to give it to 2HG who passed it along following his own. The real reply from 1BQ finally got back to 9BP at 1:14 A.M. P.S.T. April 16th. This was a dandy piece of work and might have made better time but for a slight slip-up at 2HG and 2CG, yet they both did their best. Total time of this message was 2 hrs. 14 mins.



The speed messages traveled from 9BP thru 9BX to 9AL, and came back the same way. The texts were fairly brief. One message left 9BP at 11:09 P.M. P.S.T., was QSR'd by 9BX to 9AL, and a reply returned to 9BP at 11:50 P.M. P.S.T. The next one fairly flew along, leaving 9BP at midnight, QRS's via 9BX, landed at 9AL at 12:03½ and the reply reaching 9BP at 12:06 A.M., making a total of but 6 minutes for the round trip.

From what we can learn, stations taking part in the relay were 1BQ, 2HG, 2CG,

3JI, 3KO, 3TL, 3NI, 4FN, 4DQ, 5CT, 5CN, 5GO, 9AL, 9BP, and 9BX. It wouldn't be fair to divide the credit too widely, but

2HG, 3NI, 9BX, and 4FN played important parts in making the first Trans-Canadian Tests a success.

Hundreds of Wavemeters Being Calibrated

Many Amateurs Taking Advantage of Bureau of Standards Service

THE standard-wave signals from WWV, the Bureau of Standards at Washington, D.C., are reaching out in great style. The signals are reported as "terrific" as far west as Kansas City and at this moment the extreme range is not known; the station reaches the West Coast, tho. Many letters have arrived stating that the service is greatly appreciated and that for the first

7th districts a better chance. Don't miss this chance to find out where 150 and 200 meters really are. The new schedule will be as shown in the table.

By no means forget to let us have your log on the results secured—that's what the future schedules will be based on. If you want a splendid service to continue and become permanent—speak up. Don't worry the Bureau with it, tho—let us know here

A.R.R.L. Special Schedule—Night of October 7-8 ONLY

Eastern Standard Time		Wavelength in meters	Frequency in kilocycles
A.M.			
1:55-2:04	QST Call	222	1350
2:04-2:08	Test		
2:08-2:11	Announcements		
2:15-2:19	QST Call	200	1500
2:19-2:23	Test		
2:23-2:26	Announcements		
2:30-2:34	QST Call	187	1600
2:34-2:38	Test		
2:38-2:41	Announcements		
2:45-2:49	QST Call	176	1700
2:49-2:53	Test		
2:53-2:56	Announcements		
3:00-3:04	QST Call	167	1800
3:04-3:08	Test		
3:08-3:11	Announcements		
3:15-3:19	QST Call	158	1900
3:19-3:23	Test		
3:23-3:26	Announcements		
3:30-3:34	QST Call	150	2000
3:34-3:38	Test •		
3:38-3:41	Announcements		

Note: All announcements are in both voice and code but code signal very much more powerful; can be heard all over station at points where voice not audible at all.

time a large number of amateurs are quite certain as to their wave lengths. The League has asked the Bureau to continue the schedules beyond the last one which is listed as coming on October 7th.

The "A.R.R.L. Special" tests on October 7th have been shifted to a later hour to reduce interference and give the 8th and

at headquarters, addressing your letters to the Technical Editor.

Just how to use the signals has been explained in our previous reports—see "U.S. Will Send Standard Waves for A.R.R.L." on page 28 of *QST* for July, and also "Getting away from 200 Meters" on page 19 of *QST* for September. If you are with-

out either of these send the Circulation Manager 20¢ in stamps and he'll be glad to send one at once.

About one amateur tuner in five is a real amateur tuner—the rest can't go below 190 meters. Make it a point to have a *real amateur tuner* when October 7th

comes around. If you don't hear WWV's short waves it will be the fault of your tuner because the lower waves have much more "punch" than the 200-meter one.

Look up "Tuners that Work Below 200 Meters" on page 25 of *QST* for July.

—S.K.

A New Radio System

By Howard J. Tyzzer*

The Radio System here described will be a complete novelty to most of us. It belongs to the class known as "Double Modulation Systems." These systems have just been given new prominence by the successful lawsuit of the Hammond Radio Research Laboratory against the Western Electric Co.

The Technical Editor has used the Hammond system while in the employ of that firm and knows that Mr. Tyzzer's claims as to the freedom from interference are very modest. It is perfectly practical to work two stations on the same wavelength without interference, and interference from ordinary spark or tube sets is practically never heard.—Tech. Editor.

PRESENT day radio is not ideal, due mainly to the following limitations. First, interference by two stations of approximately equal intensity, operating on nearly the same wave length. Second, interference caused by regenerative receivers radiating energy. Third, interference from static and other forms of transient effects as produced by street cars, elevators, motors, power supply, etc.

Considerable thought and time has been devoted to the elimination of these undesirable features until, at the present time, we have nearly reached a point of perfection that is limited by the inherent character of the radio system now employed. Of course the obvious answer is to *adopt some other system* if possible, but this is not as easy as it sounds. The present methods of radio communication have been years in their development and anything which would call for any drastic change might occupy an equivalent length of time before becoming popular.

The writer, however, who has had at his disposal the Amrad laboratories, has done considerable work on a new system for point to point communication, which deviates but slightly from the methods now employed and promises to overcome the disadvantages enumerated above as well as presenting many new possibilities. Any radio man will recognize the feasibility of the new system, as no new principles are involved.

There are two methods of radio communication, namely, radio telegraph and radio telephone. The new system accommodates both of these equally well. As the radio telegraph arrangement is somewhat simpler, we will consider that first.

At the present time, there are three

systems of radio transmission: first by means of what is known as damped waves; second, undamped or continuous waves; and third, by interrupted or modulated continuous waves. Certain forms of radio telegraph and all forms of radio telephone transmitters employ waves of the latter

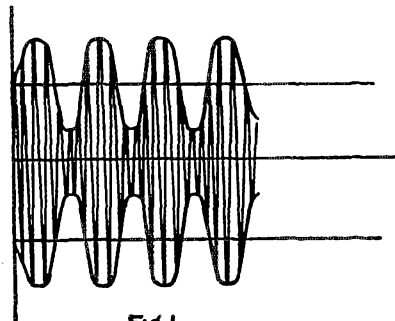


Fig. 1

type and the improvements about to be described apply to it.

In ordinary practice, the continuous waves are modulated or varied in intensity at an audible frequency rate (in radio telephony by the voice frequency itself).

The New System

In the new system for telegraph work the continuous wave is modulated at a radio frequency rate corresponding to a higher wave length or somewhat lower frequency than the continuous wave itself. For instance, if a continuous wave of 300 meters' or 1,000 kilocycles is employed, it may in turn be modulated at a rate corresponding to 5,000 meters' or 60 kilocycles. In this instance, one cycle of the lower frequency would contain in itself, or in other words,

*Chief Radio Engineer, American Radio & Research Corporation.

be composed of, about sixteen cycles of the higher frequency. For telephone work, the lower frequency itself may be varied, or in other words, the amount that it modulates the higher frequency may be varied at an audible frequency rate.²

antenna system as well as the grid of the first tube is tuned to 300 meters, practically no 5,000 meter signals would be picked up, even if they were present. On the other hand an ordinary C.W. 300 meter signal having no 5,000 meter component

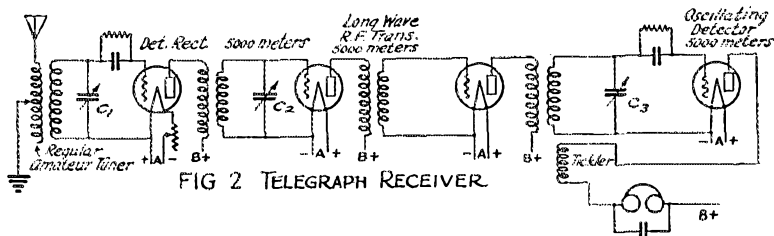


FIG 2 TELEGRAPH RECEIVER

In radio telegraph transmission, we are interested in the first two frequencies involved, that is, the 300 meter and 5,000 meter wave lengths, or 1,000 kilocycle and 60 kilocycle frequencies. A wave of this character if laid out on graph paper or observed through an oscillograph would appear as shown in Figure 1. A receiver for picking up such a wave consists of a vacuum tube detector having its grid circuit tuned to a 300 meter wave length and its plate circuit tuned to a 5,000 meter wave length. This tube must not oscillate. Several 5,000 meter radio frequency amplifiers follow, after which another oscillating detector tube is added, which heterodynes the 5,000 meter signal and produces an audible sound in the telephones. Such a receiver is shown in Figure 2. As the

would not affect the radio-frequency amplifiers to any appreciable extent. In other words, the receiver would be responsive only to a 300 meter wave modulated at a 5,000 meter rate. It can, therefore, be seen that several stations might operate simultaneously on the same wave length with different modulating frequencies corre-

¹300 meters and 5,000 meters are chosen as illustrations only, the carrier wave may have any value (down to 10 meters if one wishes) and the modulation wave may be a very long one, even as long as 30,000 meters (10,000 cycles). In fact such very long modulation waves are not so likely to radiate and cause local QRM. However, waves above 10,000 meters (30,000 cycles) tend to spoil the quality of voice or music exactly as they do in a super-regenerative receiver.

²Other ways of modulating may be tried but they should all operate on the grid of the oscillating modulator.

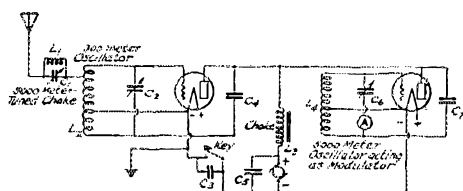


FIG 3 TELEGRAPH TRANSMITTER

Inductive coupling between set and antenna is recommended to decrease local interference caused by the 5,000 meter wave.

L_1 —500-turn coil of honeycomb type or other coil with inductance of about 15 to 18 millihenries.

L_2 —Ordinary amateur helix.

L_3 —Modulation choke, 6 henries; see design on page 151 of Ballantine.

L_4 —5 pounds of No. 14 double-cotton-covered wire, left on the spool on which it came unless that is a tin spool. Almost any 5-millihenry coil of low resistance will do. Don't try to use a receiving coil and don't dope the windings. If you feel am-

bitious to do a finer job, wind 500 turns of No. 14 S.C.C. in 20 layers on a spool two inches wide, putting 25 turns in each layer and a $\frac{1}{2}$ -inch sheet of cardboard between layers, the ends of the cardboard not lapping but just meeting. The core of the spool should be 2 inches in diameter.

C_1 —0.001 microfarad variable condenser of good quality; one with "moulded mud" insulation will not do.

C_2 —0.0005 microfarad variable condenser. May be omitted and position of grid and plate clips on helix reversed.

C_3 —Any large paper condenser. If 1 microfarad does not stop sparking, put a 100 ohm resistance (60 watt lamp) in series with it before connecting across the key.

C_4 and C_5 —0.002 mfd. condenser of any kind that will stand the voltage. A small sending condenser or some Murdock moulded sections will do.

C_6 —Any good filter condenser larger than 1 microfarad.

C_7 —0.005 mfd. mica or glass condenser. Most convenient construction is two .002 mica sections or one .004 mica section shunted by a good .001 variable condenser.

sponding perhaps to 3,000, 5,000 and 7,000 meters and still not interfere at the receiver. A transmitter which would emit such a wave is shown in Figure 3. Briefly, it consists of two oscillating tubes, one oscillating at 300 meters and the other at

receiving end, two detectors are used, together with the intermediate radio-frequency amplifiers in place of the heterodyning oscillator. Diagrams of both transmitter and receiver are shown in Figures 4 and 5.

The system may be summed up then as follows:

1. A radio transmitter emitting a 300 meter wave (1,000 kilocycles) which acts as a carrier for a lower frequency (60 kilocycles) which in turn acts as a carrier for voice or audible frequency. The transmitted wave is pictured in Figure 6.

2. A radio receiver employing a two-circuit tuner adjusted to 300 meters, together with a tube detector having a circuit coupled to its plate tuned to 5,000 meters which alters the wave character as shown in Figure 7, thereby leaving only the 5,000 meter wave acting as a carrier to the lower audible frequency. This is passed through several radio-frequency amplifiers tuned to 5,000 meters and then to a second detector tube which delivers its output to the phones or audio-frequency amplifiers. The output to the phones of

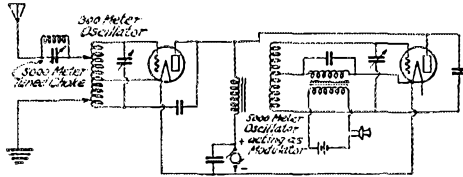


FIG. 4 TELEPHONE TRANSMITTER.

Inductive coupling between set and antenna is recommended to decrease local interference caused by the 5,000 meter wave.

5,000 meters, with a common plate supply, thereby causing modulation in accordance with the well-known Heising plate modulation scheme.

Freedom from Static

The receiver will respond but little to

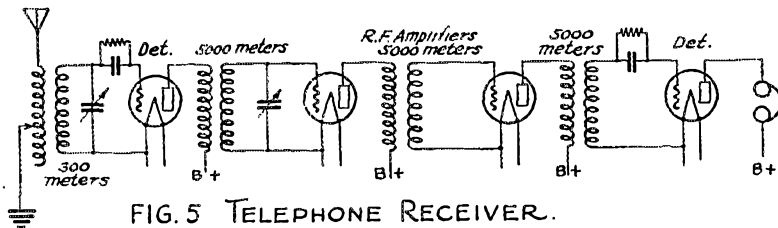


FIG. 5 TELEPHONE RECEIVER.

static influences as any shock excitation on the antenna system produces a wave train at a 300 meter frequency, which does not get through the 5,000 meter amplifiers. On the other hand, if there is static on a 5,000 meter wave length, the antenna circuit and grid circuit of the first tube is not tuned to it and therefore will not be affected appreciably.³ Similarly any audible beat set up by two transmitting stations on approximately the same wave length will not get through the amplifiers. Sufficient tests have been made to prove that these things are actually true and that all kinds of interference are practically eliminated, thus revealing the tremendous possibilities of the system.

For radio telephone work, the transmitter is practically the same with the exception of the fact that the voice frequency is introduced into the grid circuit of the 5,000 meter oscillating modulator. At the

course, will, be as shown in Figure 8. The advantages of the system in brief are as follows:—

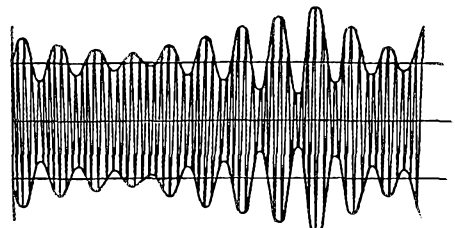


Fig. 6

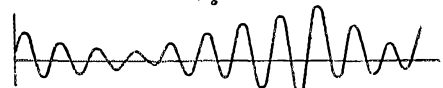


Fig. 7

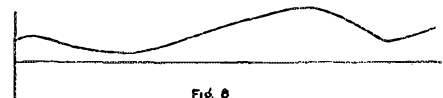


Fig. 8

³Of course the radio amplifier itself with all its batteries must be shielded or it will pick up static without help from the antenna.

For actual telegraph work the static-eliminating and non-interfering qualities make it highly desirable. Here, of course, a 200 meter carrier with perhaps a 4,000 meter modulating frequency might be employed. One of the features of the system is the fact that the amount of amplification at the receiving end is practically unlimited inasmuch as it consists of radio amplification at 4,000 meters. 4,000 meter

amplifiers are much easier to construct and much more practical than radio frequency amplifiers on short wave lengths.

Any amateurs desiring to experiment with this new system may obtain detailed information regarding experiments which have been conducted by communicating with the Engineering Department of the American Radio and Research Corporation, Medford Hillside, Mass.

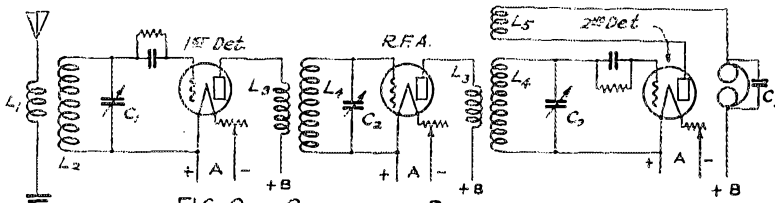


FIG. 9 SIMPLIFIED RECEIVER

L_1 —Untuned primary, 1 to 5 turns of annunciator wire wrapped around the filament end of the secondary.

L_2 —One layer of No. 14 D.C.C., 40 turns, wound on tube 4 inches in diameter and 8 inches long, wind a short coil with 20 to 40 turns in a single layer as a primary (plate winding). Starting at the same end and winding over the primary make a second winding of 300

turns; this will extend considerably above the primary.

turns; this will extend considerably above the primary.

L_3 —Tickler put inside the second r.f. transformer on the end that has the primary winding. Tickler may be 3 inches in diameter and have about 25 turns, arranged to slide or rotate. If tube does not oscillate, use more turns; if it squeels, use less.

C_1 —.0005 microfarad with low resistance.

C_2 —.001-microfarad variable or a .0005-microfarad condenser shunted by a fixed mica condenser of .0005-microfarad capacity.

C_3 —.001 fixed or variable.

Electrostatic Voltmeters

By R. R. Ramsey*

IN the March, 1923, issue of QST under "Strays" is an article entitled "SOS to Meter Makers" which calls attention to the fact that an ordinary voltmeter when used to measure high potentials, takes a relatively large current and the power used in the voltmeter may be a large percentage of the total load. At times when an electrostatic voltmeter was needed I have made use of an electrostatic voltmeter such as is used in radioactivity measurements. In order to get an idea of the limits of such an instrument I have recently had one of my students make some tests.

I shall first describe the electrostatic voltmeter, which is shown in Fig. 1. The case of the

electroscope is a can $2\frac{3}{4} \times 3\frac{1}{4} \times 5$ " with a lid made of sheet tin. A tall asparagus can is about right. Openings about 1×2 " are cut in the broad sides of the can. The lower edges of these openings should be about $1\frac{1}{4}$ " from the bottom of the can and the edges on the sides about $\frac{3}{8}$ " from the sides of the can. Rectangular tin tubes A and B are soldered to the outside of the can and cover the openings just cut. These tubes are $\frac{3}{8}$ " long and large enough to leave a $\frac{1}{4}$ " margin around the opening as shown by the dotted line in the upper view in Fig. 1. Glass windows W and Z are fitted into the tubes or secured to their ends with sealing wax. This is to prevent air currents from destroying the delicate indicating foil. In one of the narrow sides of the can there is sol-

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dered a tin collar C, about $\frac{3}{4}$ " in diameter. A short rod or heavy wire R, with its inner end bent upward, is secured in the center of the Collar C by pouring melted sulphur into the collar while a cork (see upper view Fig. 1) holds the rod in position. In melting the sulphur care must be taken not to get it too hot; when melted

looked at thru the window Z, this mirror should not cover more than half the height of the window W, also the mirror should have a straight edge. It may be a strip cut from any ordinary mirror.

When reading the voltmeter one looks thru the window Z. One sees in the mirror M an image L' of the foil L. The eye should be moved from side to side until L just covers L' (see dotted line in the lower view of Fig. 1). The scale S is then read at the point where L seems to cross the upper edge of the mirror. Those that have used an ordinary voltmeter, ammeter or wattmeter with a mirror scale will understand this at once.

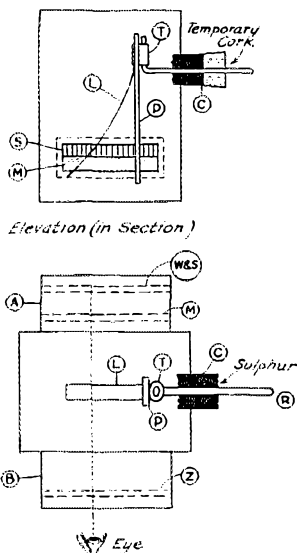


FIG. 1 THE ELECTROSTATIC VOLTMETER.

it should be a clear amber liquid. If it assumes a waxy appearance the sulphur must be discarded. After a few hours the cork may be removed, leaving an excellent insulating bushing.

(Note—Do not substitute any other insulator; nothing else is as good.—Tech. Ed.)

The metal plate P has soldered to its back a small length of brass tubing T which fits snugly over the bent-up end of the rod R. This supports the plate firmly but permits its easy removal for the attachment of the indicating foil.

The leaf, or indicator, L is a narrow strip of gold or aluminum foil, the kind that tears when touched with the hand. Sign painters use this material, and are familiar with the ways of handling it. The leaf is attached to the plate P with gum from a postage stamp taking care that the foil hangs straight and bends at a point near the upper end of the plate.

A scale S, made of a strip of cross-section paper, is stuck to the rear window W with hot paraffin. The paraffin makes the paper translucent. About half way between the window W and the leaf L there is mounted a narrow mirror M. When

Calibration

The simplest way of calibrating the electrostatic voltmeter is to connect it in parallel with an ordinary high-reading voltmeter, using a high voltage B or storage battery to supply the potential as shown in Fig. 2A. If the high voltage battery is not available a generator may be used. If the generator does not have a field rheostat different voltages may be obtained by tapping a potentiometer made of 110 volt tungsten lamps connected across the ma-

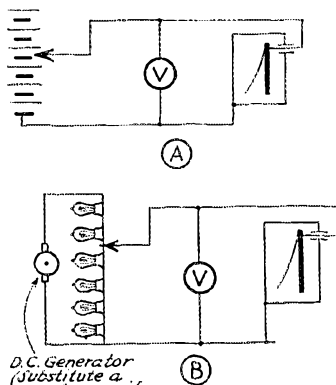


FIG. 2 CALIBRATING

chine as in Fig. 2B. A transformer may be used to supply the voltage if the high reading voltmeter available happens to be for A.C. use.

Making a Direct-Reading Scale

A calibration-table is not particularly handy as it gives only a few voltages and the corresponding scale readings. A curve should be plotted as shown in Fig. 3. If desired a direct-reading scale may be made from this curve. The direct-reading scale may then be substituted for the strip of graph-paper S.

Range of Electrostatic Voltmeters Description of foil strip L	Maximum Voltage Range
Aluminum foil 1 mm. wide	75 to 300
Gold foil 1 cm. wide	100 to 500
Heavy Aluminum foil .05 mm. thick and 9 mm. wide	500 to 3000

(Note—Length of the foils not given but assumed from drawing to be 3")

This last is the upper limit of voltages for this instrument as sparking starts at 3500 volts. The power used by such an instrument is approximately zero since it is essentially a condenser whose capacity is very small, from 5-10 centimeters (micro-microfarads).

High Voltage Electrostatic Voltmeters

Electrostatic voltmeters for potentials between 10,000 and 30,000 volts should have a case about 6"x9"x15", an insulating bushing at least 4" in diameter (sulphur preferred) and other parts in proportion.

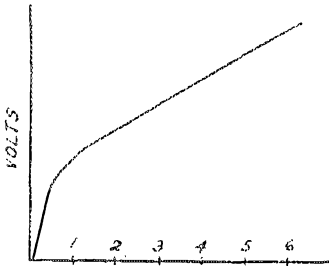


FIG. 3 CALIBRATION CURVE

All sharp corners and edges should be rounded off. The leaf must be heavier, hence must be hinged as it cannot bend as do the thinner leaves. A leaf of .05 millimeter aluminum was hinged by hanging over a small wire.

A high voltage electrostatic voltmeter can be calibrated by the use of a (step-

up) high potential transformer provided that there is available a calibrated low-potential electrostatic voltmeter reading to say 500 volts. It is necessary to determine first the voltage ratio of the transformer. Connections are made as in Fig. 4 and a small A.C. potential (4 or 5 volts)

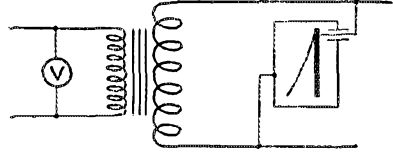


FIG. 4 FINDING TRANSFORMER VOLTAGE RATIO.

is applied to the primary of the transformer. The primary and secondary voltages are then read and the voltage ratio of the transformer is—

$$\text{Voltage Ratio} = \frac{V_s}{V_p}$$

Where V_s = secondary voltage read on the electrostatic meter, and V_p = primary voltage read on the low-reading voltmeter.

The meter on the secondary must be an electrostatic one. When the voltage ratio has been found the high-reading electrostatic meter takes the place of V_s and any desired primary voltage is applied to the place of V_p and any suitable 150 or 300 volt meter takes the place of V_p . One can then go ahead, knowing that the secondary voltage is always the primary voltage times the voltage ratio. However, clear thru this procedure the secondary of the transformer must have no load on it except the electrostatic meters—ordinary voltmeters will not do.

Acknowledgement

I am indebted to Mr. Robert W. Fee for the above data. I shall be glad to hear what success is obtained with the larger instrument.

I.C.W. Without Mechanical Motion

By Howard M. Williams, 9BXQ

PERHAPS the best way to describe this type of I.C.W. is to begin with its theoretical action.

Anyone who has operated a C.W. set which is keyed in the grid leak has experienced that awful howl that results under some conditions when the key is up. The idea is to make this sound pretty, be silent when the key is up, and go ahead when the key is down.

Why does the set howl when the key is up? Obviously it is due to the charge on the grid building up to such a point that it is able to break down the insulation and discharge to the filament, permitting oscillation for a very short time. After discharge, the voltage again builds up, and again discharges when it reaches a certain value. Each one of these discharges makes a kind of "click" in the phones, sometimes

following each other rapidly, sometimes slowly, depending on the degree to which the circuit is insulated. Now if these discharges follow each other at audio frequency we have I.C.W.

Many of us have experienced this delightful phenomenon, and have cursed our neighbor for the howl he possessed when we were trying to work DX. Most of us are able to get rid of it by better insulation, better tuning, or by changing the

Broadcasting A.R.R.L. News

For the purpose of giving the amateurs of the country the latest and hottest information from A.R.R.L. Headquarters, there has been organized a system of broadcasting stations thru out the country. These Official A.R.R.L. Broadcasting Stations broadcast every Saturday and Sunday night at 10:30 P.M. Standard Time.

Official messages of about one hundred words are made up from information at hand and distributed to these stations each week. Every station broadcasts the same information on the same nights at 10:30 P.M. Standard Time. Pacific stations use P.C.T., Central stations use C.S.T., etc.

Messages are sent in Continental telegraph code at a speed of about 15 words per minute; wave length is usually about 200 meters. No matter in what part of the country you are located, it is possible for you to pick up at least one or two of the following stations: 1CKP, 1CPO, 1GV, 1BAC, 1AIQ, 1BSZ, 1BKQ, 2CFE, 2BRB, 1FB, 1FD, 1CK, 1BDI, 1HX, 1GL, 2AWL, 2CRQ, 2GK, 2OM, 3HH, 3ASP, 3WF, 3AIS, 3JJ, 3ZS, 3BA, 4HS, 4EL, 4EA, 3BMN, 4NT, 4EB, 4HZ, 4BX, 5XA, 5EK, 5ADB, 5VA, 5ZAV, 5XB, 9AOG, 5AE, 5UO, 5UI, 5XBF, 5YE, 5MB, 5ZM, 6BBH, 6AJR, 6ABX, 6KM, 6APL, 6ZAM, 6ZH, 6BKE, 7JF, 7ZN, 7SC, 7ZO, 7TO, 9US, 7AGF, 7ZV, 7DH, 7ZU, 8AWP, 8VQ, 8ZW, 8ATP, 8AND, 8ZAF, 8CED, 8ZZ, 8BDA, 9UR, 9UH, 9CWC, 9DXY, 9DJB, 9AAU, 9BGT, 9BZI, 9EEA, 9II, 9CA, 9MC, 9APS, 9CFY, 9ADZ, 9AZA, 9BAV, 9ZY, 9OX, 9BBF, 9ARZ, 9AVZ, 9DNC, 9DKQ, 9AAW, 9APW, 9AUU.

method of keying. This must be done before we can proceed, as we want it when the key is down, not up.

Put a very high resistance in series with your regular grid leak, and you will have a nice howl when the key is down. By high resistance I mean one expressed in megohms or fractions of megohms. The one I use consists of a pencil mark about an inch wide and one or two inches long. The exact value will have to be determined

by experiment. The lower the resistance, the higher the pitch, and vice-versa.

The fellows in Denver had been using this system for some time but it always sounded very rough and unpleasant and was almost placed in the discard when I found that by raising the filament voltage slightly above the normal, and adjusting the set again, a nice even tone could be secured, ranging in pitch from zero to infinity according to the resistance in the grid leak and the adjustment of the set. In the grid tickler, or reversed feedback, circuit every adjustment—filament, grid coil coupling, and capacity across said coil—changes the pitch.

About the only trouble I have ever experienced with this system was its failure to work at all. This I found due to the fact that the pencil I used for making the resistance apparently did not contain enough carbon, for a resistance made using another pencil worked fine. I do not believe any harm is done the filament from running it at the higher voltage (about 11 V. on a fifty watter) as there is only a very small fraction of the usual plate current. The plate does not heat up at all.*

In a panel set a resistance can be made by dipping a piece of fibre in India Ink, contact made to this, and a small switch arranged to short it when using straight C.W. This resistance varies widely with sets, conditions, and adjustments, so no set rule can be given regarding it, but the ham will have no trouble finding what works best under his conditions—he wouldn't be a ham if he couldn't. This makes an extremely simple and convenient I.C.W. One has but to open the shorting switch to change from C.W. to I.C.W., and there is no bothersome buzzer or chopper to be run from an external power supply, nor troublesome adjustments to be made.

*We hardly agree with the author that no harm is done the filament by burning it at increased voltage—the normal life at 11 V. probably will be about half that at rated voltage. It should also be understood that this system of I.C.W. operates the tube at sub-normal output and that it is therefore essentially a short-range system.—Editor.

Experimenters Take Notice

We have had fine response to our request for names of experimenters who wish to take up the problems of the A.R. R.L., and Department Editor Mason is now getting ready to have actual work started.

There's still room for a few more. Let's have your name and address, a sketch of your location and a list of your equipment, also the kind of work you are interested in.

Come on and help us make the new Experimenter's Section a live thing. Write to the Department Editor or the Technical Editor at once.

Have A Chat With QST'S Editors

We Get A Lot of Rambling Talk Off Our Chests

*By S. Kruse, Technical Editor and
H. F. Mason, Department Editor*

AS we gaze into all these bright and eager faces we are reminded—no that's a different speech. 'Scuse us and we will start again.

As we sit staring at the white and black keys of the L. C. Smith "mill" we think of so many things to say that it's hard to start. Guess we had better chop the story up into subjects and treat them one at a time. Is that alright? Then let's go.

This Thing Called the "Editorial Department"

Nobody knows why we are called the "Editorial Department"; all of us have at least 19 other things to do. First off there is the Editor-in-Chief, K. B. Warner, who is also Secretary of the League and has to put 107 per cent of his time on that job. This leaves only 30% of "Kay Bee's" time to put on *QST*. That's rotten arithmetic but it is absolutely an airtight fact. Next after that comes Kruse, Technical Editor, nickname "LQ", who spends just about all his time in tending to the "League's Radio Information Service" that we told you about in the August issue of *QST*. And finally there's H. F. Mason, Department Editor, who also spends most of his time on the queer problems that 15,000 brass pounders and a country full of experimenters can dig up. Naturally you wonder—"If they do that then who gets out the magazine?" Well, that's where the Production Editor, F. C. Beekley, comes in; he takes the manuscript down and "fights the printer" with it.

Going Thru QST

Pick up between *QST* and we will go thru it together and tell you how it happened. First we will wade thru the pages that tell about the League and get to

The Articles

The "articles section" of *QST* goes from about page 7 to the Editorials. This is Kruse's part of the magazine and it's about the hardest part of the magazine to adjust to everyone's wishes. Still the mail brings many more roses than bricks and on the whole we feel satisfied—to try harder the next time.

The Editorials

Next after that come the editorials. Editorials is the private section of the Editor-in-Chief.

"The Departments"

After Editorials there come the "Departments" and these run to the advertising matter. These "Departments" are run by Mason and age entirely his work except for the material in the "Operating Department" and "Club News" which is furnished by Traffic Manager Schnell.

The Advertisements

Don't overlook the ads. They are the product of our hard-working advertising manager Ed. Adams. He isn't on the editorial staff and there isn't an excuse in the world for dragging him in except that it's his section that pays for *QST* and keeps the League going. And have you ever noticed that *QST* never prints any foney ads? We have refused a good many hundreds of dollars worth of bunk.

Why Did You Print That?

Once we talked to a citizen of Arizonay (that's what he called it) who was "agoin' to Old Mexico 'cause there ain't no excitement around here no more." He should have joined the *QST* staff and tried to make everyone happy with the stuff he printed. We have a little rule to the effect that a good article draws about 30 roses, a pretty good article draws 15 roses and 15 bricks and a rotten article meets with a dead silence.

There isn't any such thing as making everyone happy. If we tell how to abuse a 5-watt tube so as to get 100 watts out of it all of our scientists and experimenters (there are thousands of 'em) give us the grand razz. If we print a serious article telling how to measure antenna resistance all the brass-pounders say "Blaaah!" and start to chew the moulded-mud sockets off their sets. A story is met with shrieks of delight—and showers of bricks.

How to Tell What to Print

As we said before, you can't always make everyone happy. But we do know that *QST* makes most of the League happy most of the time—they tell us so. We watch the demands of the members as expressed in their letters and when quite a few ask for any one thing in *QST* they get it—right now. At other times we are able to watch legislation and know that there will be a demand for certain dope before the letters ask for it. For instance we foresaw that filter dope would be in demand and Dellenbaugh's article has been

enormously appreciated; dozens and dozens of letters say so.

But to be real sure that someone wasn't nursing a valuable opinion we asked for kicks and printed a full-page question sheet on page 126 of the August issue. Well, we got back a wagonload of them and they agreed beautifully—practically everyone wanted the same things.

The Answers to the Questionnaire

One thing about them was funny—almost half of the papers said—"Don't make your articles so technical" and then followed that up with "Give us another number like the May issue" (antenna number). Now it happens that the May issue was full of technical articles—it was as heavy as a bride's first fruit cake. How we are supposed to make a number like that and still be "less technical" is clear past us. We

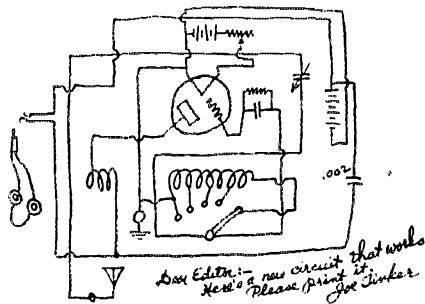
have felt our way. We are now about ready to pass a flock of problems out and get a big gang at work on them—they should clear up a lot of knotty problems in short order.

Club News Dies

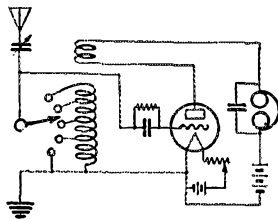
We also found out that the "village journal" method of reporting anything that any club does is not popular even if every radio paper has been doing it since 1890. We were invited by a large chorus to "Can affiliated clubs as a cut-and-dried-department and print only unusual stunts." That has been done.

The Covers

There was also a large and joyous chorus that jeered at the "detachable covers" that the printer puts on. This was news to the printer and he has changed his glue.



WE GET WILD CIRCUITS THAT ARE SUPPOSED TO BE BRAND NEW —



— WHEN WE GET THEM UNSCRAMBLED THEY ARE SOME OLD STANDBY.

figure that what is wanted is technical articles about the things that are bothering most operating amateurs. That's what we are doing, but we can't print a May issue each month 'cause we had to heave out everything else to make room for articles that time.

The answers to the questionnaire came from the brass pounders, the message hounds, more than from any other gang. You did not know that there was anyone else in the League? Man, man, for every message shooter there are about 3 fellows that can be classed as "serious experimenters"—fellows like Groves and Murray and Reinartz and Sturley and Budlong and Hatry and Best and West—you'll find their names in QST because it's the experimenter who solves the brass-pounder's problems and writes articles about them.

Then why did the answers come from the brass-pounders? Simply because the experimenter has no particular department of his own, no particular person with whom he keeps contact as does brass-pounder with the Traffic Manager. This showed us that there was call for a sort of "Experimenters Service". In the past month we

The Kicker

Then of course there was the man with a near-grouch—the lad whose station description hasn't been printed yet or whose article didn't quite make the grade but is being kept for the use of the Information Service. Some of the men are "off us" and unless we print that article or description at once they are "going out in the yard and kick down the antenna pole and take up golf—enclosed find \$2 for a year's membership and subscription." Doggone it, we do our very level best to pick the best there is and anyone can see that you can't describe all the stations in the U.S. every 12 months. All we can do is to describe about 30 that have some especially remarkable thing about them, or else that have done fine consistent work. Every district gets the same chance at these positions—check it up and see.

Now we come to the main storm-center—

The Operating Department

Every solitary brass-pounder in the U.S., every message-hound in all the divisions, would like to see his division get 10 pages and the rest of the divisions get half a

page each. We have a cartload of letters to prove this. He wants more space and b'gum he is going to have it or get the bum Division Manager canned. Now as a matter of fact the space for the O.D. is split up by Traffic Manager Schnell according to the number of A.R.R.L. stations in that division; the way to get more space is to go out, help the A.D.M., and get more A.R.R.L. members in your division; Then make them apply for Station Certificates.

Now someone is about due to rise up and say "Well, then, enlarge the magazine." Now it is unfortunate but

QST Has to Pay the Printer

The only way to make *QST* still larger (have you noticed how much bigger it is than 5 years ago?) is to have more income so that we can pay the printer for a larger magazine. Natural answer to that is "Raise the subscription price."

The Advertiser Pays for QST

But to make *QST* twice as big and pay for it from *subscriptions* would mean that each copy would cost about \$1 to the man that read it. You see the income of a magazine is *not* from subscriptions nor from newsstand sales so much as it is from advertising. That's a sad fact but it's a *fact* and we might as well face it. The only way to increase the size of *QST* is to get more ads or make the ads pay more per page and that can't be done unless the League gets bigger. It's up to you—hustle up some members. Remember that word MEMBERS, not fellows that get *QST* off the newsstand. If we had about ten men like Corlett this League would be twice as big. Why, he has nailed practically every radio man in Texas, makes most other states look sick, and—aw, shux, we have got off the subject again.

"There Ought To Be More of This"

The biggest demand of all was for *more* of this, that, or the other, kind of article or department. Now as we just explained—we can't make the magazine bigger unless the League gets bigger. As long as *QST* is at its present size there is *only one way* to put anything in and that's to throw something else out.

Writing to the Editors

It's a good idea when writing to the Editorial Department to address it just that way: "Editorial Department". And above all don't inflict on the Circulation Manager or the Traffic Manager a letter that has in it some questions for the Editors.

How to Send in Articles

If you are sending in an article or a station description it will help us enormously if you will type it on standard typewriter paper and double-space it. Then we have room to make notes on it. And by the

way—let's have your name and address complete *on the letter*. The envelope never gets to us; Larry pulls that off in the outer office. Drawings of circuits can just as well be in pencil, friend Harry Hick re-draws most of 'em anyway to make the style uniform. *Photographs, however, have got to be GOOD*. No ordinary amateur snapshot of a set is good enough to make a halftone from, unless the print is especially and beautifully clean-cut. If it's going to cost too much to get a big photo made on the chance of getting it into *QST*, then let us have a snapshot to judge from.

Dizzy Letters

This hasn't a thing to do with the last—we just thot of the funny letters that trail in here. Of course you all start to think of the kind that the B.C.L. writes. Our own gang can ask questions that are fully as woozy. We get wild circuits that are supposed to be brand new and when we get them unscrambled they are some old standby that we all know about. And the Tech. Editor has received 20 or 30 questions from fellows who forgot to sign their letters. Lately we have had several requests for the "best circuit you ever printed". Now what does that mean? The best circuit for *what*, sending, receiving, or soldering? In the same class with that is the lad that wanted us to help him sell a new contraption that "get's 'em all every nite but which you absolutely must not tell anyone about." Don't quite get the curves on that either—sell it but don't let anyone know about it. That's what keeps life from getting stale.

Signing Off

Well, we've just come back from SAQO where we did some mighty interesting antenna work—tell you about it in *QST* when



we get thru figuring. That made a lot of letters stack up, and there is a daily allowance of 60 to be dictated. Gess better get at it—want to get home before 9 so as not to go to sleep with the cans on.

Let's hear from you once in a while, OI' Timer. Good night.

LQ and MN

CONVENTION STORY

The complete story on the Second National A.R.R.L. Convention will appear in our next issue—don't miss it.

Desert Radio

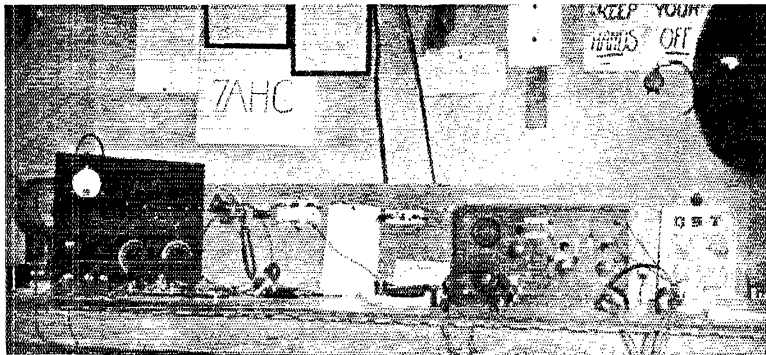
By Ludwig Stanley Landmichl

ON the Eastern slope of the Rockies, where the Big Wind River cuts harshly through the Red Desert of Wyoming, the United States Reclamation Service had established a camp for the hundreds of men who were building the huge dam and headgate for a 65-foot irrigation ditch which wandered snakily across the desert. The men were paid in cash which always arrived at camp on the last day of the month, coming from the Riverton Headquarters. Pay-day was

outdoors, leaving the office door open, and went around the corner of the building to the shed that housed the electric light generator and its gas engine. Reaching into the shed he closed the line switch and returned to the office.

* * * * *

Under the stage of the Acme Theater at Riverton, 35 miles down the river from Reclamation Camp, is the tiny radio room of 7AHC. The sending and receiving apparatus stands on a bench built against the



A nice clever little fiction story, eh? Not a bit of it, Old Man. The events depicted by Mr. Landmichl actually happened and the author has merely woven them into an interesting story. So while you are entertained by reading it, remember that it records an actual service rendered the community by Amateur Radio. 7AHC, the station that did the good work, is shown in the photograph above.—Editor.

the first of the month so it was necessary for Walt Dillon, the timekeeper, who also acted as paymaster, to work late into the night to get the payroll straight and the money sealed in the little envelopes.

It lacked but half an hour of midnight on the last day in September, 1922, when Walt closed his time book, sealed the last envelope, and dropped it into the low metal cash box which he placed in the heavy safe. He swung the safe door shut but did not lock it for he had yet to put in several books that he had used in his work. He picked up a couple of books from the desk but as he turned to the safe his gaze swung to his radio set and an uncontrollable desire urged him to try it out.

Walt was an enthusiastic radio bug and had but recently installed his sending and receiving set at the camp office. The sending set, a phone, was not entirely finished but could be put into temporary working order with a few minute's work. Walt stepped

concrete foundation of the building. A 3-stage amplifier connects the receiving set with a Magnavox loud speaker on the stage above.

On the same night of that last day of September when Walt Dillon was getting ready the month's payroll a 12-reel feature photo-play was being run at the Acme Theater. It was nearing midnight when the picture came to an end and coincidentally with its finish, Baxley, who was operating, switched on the Magnavox. Warned by the strong click as the connection was made those who had risen from their seats dropped back silently. There came over the audience a heavy suppressive hush which smothered their gaiety as a heavy wet blanket smothers the merry crackle of a tiny flame.

For a moment there was silence; then, with startling plainness, there came from the metal mouth of the Magnavox a sharp cry for help and a loud explosion. An

Dillon finally regained consciousness the instant later something fell heavily and seemingly carried with it some piece of furniture that crashed loudly.

A murder had been committed somewhere!

In the radio room Baxley sprang to the phone and called the sheriff at Lander. He was almost instantly informed that the sheriff was in Riverton. As he hung up the receiver several men from the audience rushed into the room.

"Hunt the sheriff, quick!!", cried Baxley, "he's here in Riverton. Bring him down here at once!"

Several rushed out and Baxley started his motor-generator and began jarring the ether in a hasty attempt to locate the crime.

The sheriff appeared suddenly and asked "Who's killed?"

"I don't know," Baxley replied, speaking rapidly. "There's only one station near here that has a radiophone and that's clear over at Lander---no, hold on, Walt Dillon at the Reclamation Camp has just put in a phone."

Suddenly Baxley's excitement increased. "Sheriff, this shooting affair came in strong and clear and I wouldn't be surprised if something has happened to Walt. The pay money goes up to the camp at the end of the month and he makes up the payroll the same night."

The sheriff promptly reached for the telephone and asked to be connected with the camp. There was no response.

"Boys, let's go!" the sheriff said.

As the men left, Baxley turned to his set and again the voice of 7AHC asked in vain where the shooting had been committed.

* * * *

An hour and a half later the sheriff and men arrived at the camp in a driving rain. The entire camp was in darkness except for a tiny streak of light which came from the small office window and cut into the blackness of the night. The sheriff opened the door and stopped stiffly, the men behind craning their necks to get a better view.

There, on the floor beside an overturned chair, near the radio equipment, lay the timekeeper. His outflung right hand still held the microphone; his tanned, bloodless face was turned up to the glare of the transmitting tubes above him. From under the edge of his coat a pool of crimson showed.

The inactivity caused by the scene was suddenly broken by the sheriff who strode to the side of the timekeeper, gently picked him up and placed him upon a flat topped desk where they cut the clothing from his shoulder and examined the bullet wound from which the blood was still trickling. Quickly the camp was roused and the camp

doctor summoned. The men jerked off their coats to pillow the timekeeper's head while the doctor began to dress the wound. No probing for the bullet was necessary for it had gone through, leaving an ugly hole.

Owing to the great loss of blood the timekeeper had suffered, the doctor doubted if consciousness could be revived very soon. An examination of the open safe disclosed no money whatever, a positive proof that robbery was the motive of the shooting.

"How many were there and which way did they go?" the sheriff asked himself.

The timekeeper could not talk so the sheriff had to depend upon his own wits. He searched about the office carefully while some of the men rushed out with a searchlight and began scanning the ground for recent automobile tracks. All signs of tire tracks though, had been obliterated by the rain.

The whole camp was now astir and brightly lighted, but a search from one end to the other revealed no clue and the searchers returned to the office. An attempt by the sheriff to use the telephone disclosed that the wires were cut. These the camp electrician hastily repaired and Baxley at 7AHC was given the details of the shooting. The surrounding towns were quickly notified of the crime and as soon as was possible the roads were patrolled.

Dubois, which was up the river and in the mountains, could not be roused and the sheriff gave it up.

"Sure a sleepy bunch up there if they can't hear a telephone ring!" he said disgustedly. "Some of you fellows better take a car and go up there and see what you can find out, though I hardly think you will find anything up that way. I think these fellows went the other way!"

* * * *

Under the stage in the tiny radio room in Riverton, Baxley locked himself in; he wanted no interference. Constantly he was sending out the news and after tuning in on the receiving set found that even Calgary, way off in Canada, was hearing 7AHC and awaiting further developments in the case, while other stations relayed the news along by code and voice. Both radio and the wires had done their duty faithfully; the whole of the mountain states was roused.

When the auto of armed men had reached Dubois they could find no one who had seen or heard any automobile pass during the night, and they telephoned this fact to the sheriff, who was now in Riverton.

The sheriff was at his wits' end, he could do nothing. It all depended now on the outsiders, it was up to them to question all strangers.

During all this time Baxley stuck close to the radio instruments and awaited anxiously any news that might come in. When

camp doctor telephoned a description of the bandit to Riverton and Baxley sent this out broadcast. It was not until late in the afternoon, though, that the telephone bell rang again in the tiny room and he reached out to answer it.

"Are you Baxley?" the receiver spoke to him.

"Yes, this is Baxley,"

"Well, we've got your man," came evenly over the wire. "We're bringing him right down but it will be late tonight before we get there!"

The man had hung up, cutting off the connection before Baxley could ask a question.

After an almost endless wait to those gathered in the radio room, Winkley, a mountaineer, and two forest rangers brought in the bandit and turned him over to the sheriff who had come during the evening.

Baxley was loaded with questions, but as quickly as possible he got the crowd out of the radio room and sent out the news of the capture. Then he was free to put his questions.

"Where did you catch this fellow?" he asked.

"We got him up in the mountains," Winkley returned.

"But how did you know about him? The men who had gone to Dubois in the car could find no trace of him!"

"Well, he went through Dubois only two or three hours after midnight and of course no one would have noticed him at that time," Winkley replied.

"But how did you know a bandit was at large?" Baxley was perplexed.

"That's easy," said Winkley, filling his pipe and lighting it, "you see, we've got a hunting camp up near Black Rock and I had my wireless outfit along to entertain the dudes who are hunting with us. Last night after we had our supper I was going to give the dudes a radio concert but you came in like a ton of lead with that bandit dope.

"So early this morning we were out looking for game with the glasses and we spied an empty car standing below us on the new road to the Yellowstone Park. At first we thought it was a hunting party but there was no camp near the car nor any people around it.

"At once we thought of the bandit dope you sent out last night, so we rode down to the car. There wasn't a soul in sight and we found that the gas tank was empty. Another thing that looked strange to us was that the car had a Colorado license on it. Ahead of the car in the road were the tracks of one man headed towards Moran and this too didn't look just right, because gasoline is very much nearer the other way and the fellow certainly knew that

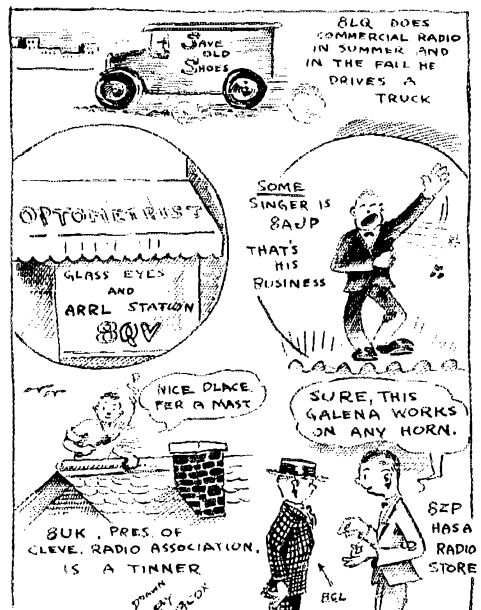
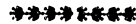
he had recently passed a gas station. Well, we started after him in a hurry and soon came onto him as we rounded a sharp bend. He ducked off the road into some brush and tried hard to hide the hand bag he carried, but we saw this and he gave it up. We took his gun and then the bag and made him walk ahead of us in the road. Of course, we looked into the bag and found the money and then we knew we had your bandit. So we took him to the ranger station from where I phoned you and then after getting some gasoline into the car we started down. The sheriff says the car was stolen in Denver."

"But where was the fellow headed for up that way?"

"Well, here's the idea; if he had had enough gas to get him to Moran he would have crossed over to the old road leading down Green River way and that would have taken him out of the mountains on the other side. He either knows the country or else had studied a map showing that road."

"Oh! So that's how he figured his getaway. Well, I am sure glad we got that bird," Baxley exclaimed. "And we got him through wireless!"

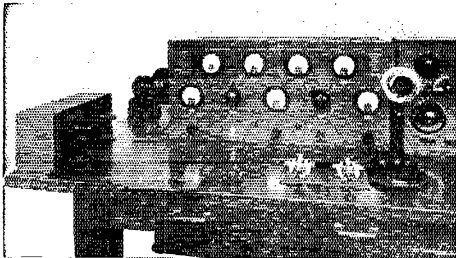
"Yep, through wireless." Winkley replied. "Darned handy thing—that there wireless!"



A C.W. Transmitter Deluxe

THE transmitter shown in the accompanying photos is a piece of workmanship that incorporates several features of interest to members of the A.R.R.L. This set was first exhibited at the Second District's Radio Convention in March of this year. It is the result of experiments performed at stations 2XE and 2ZV of A. H. Grebe and 50-watt tubes are used in a Hartley circuit, during the past year. Four so-called cut. Transmission by C.W., I.C.W., or Phone may be effected at will by means of a special switch. Two of the tubes are connected as modulators according to the Heising system when phone or I.C.W. is used.

Referring to the front view of the transmitter, the meters from left to right in the top row indicate the values of filament voltage, oscillator grid current, oscillator plate current and modulator plate current. The meter to the extreme left of the panel shows the generator voltage and next to it is a switch for selecting either of three wave lengths for transmission. A Weston 0-8 ampere meter in the center of the panel indicates the antenna current. A three-position switch to its right provides a means for transmitting on C.W., I.C.W., or phone, while a meter showing the modu-



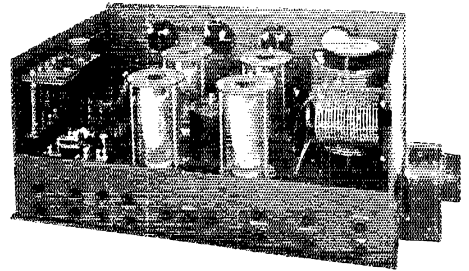
lator grid current appears at the extreme right of the panel. In the original plans for the set there was also a meter calibrated to read percentage modulation. This was to have been connected across the secondary of a transformer in the modulator grid circuit. The secondary of the transformer has several taps which provide a means of causing the meter to read accurately on several values of plate current.

Power for the plate circuit is supplied by an Esco motor-generator delivering 1500 volts at the output terminals and operating either from 110 or 220 volts A.C. To the left of the operator is a cabinet housing the filament rheostat and the generator

field rheostat, with the adjusting handles extending through the side. The filament transformer and filter system is mounted on a shelf underneath the table top.

External connections to the set are all brought to a set of terminals on the rear, arranged through spring contacts so that the complete transmitter may be slid forward on a runway without having to undo any wires. The cabinet, which is of bakelite, has all sides hinged so that the inside of the set is readily accessible.

Perhaps the most novel feature of this transmitter is the manner in which the



tubes are kept cool by means of a motor driven exhaust blower. The transmitter is built with a false bottom, thus forming an air duct, and there is a glass chimney over each tube. A current of air is thereby drawn in around the top of each tube, passing through the false bottom, thence out through the blower.

The arrangement of the essential parts of the set may be seen by reference to the view of the back of the set. The main inductance is shown mounted vertically at the right-hand side of the cabinet while the counterpoise loading inductance is mounted horizontally in front of it. The inductance frames are engraved with the whole and fractional turns number to facilitate the recording of adjustments. A switch at the left of the rear view of the set is connected to vary the grid leak in four steps from 2500 ohms to 10,000 ohms. The single-layer coil mounted vertically between the tubes is the radio frequency choke coil in the plate circuit. The relay key and break-in relay can be seen to the left of the tubes.

This set is now a part of the regular station equipment at 2XE. During transmission tests, straight C.W. has been reported by amateurs on the West Coast, and voice and music has been reported as heard clearly at 2000 miles.

—H.F.M.

EDITORIALS

de AMERICAN RADIO RELAY LEAGUE



"Wireless North Pole"

THE accomplishment of IANA in working WNP, the MacMillan arctic schooner "Bowdoin", on August 27th must stand as another notable amateur feat. The "Bowdoin" was then in North Latitude 78°30', within fifty miles of her objective, Flagler Bay, and something like 2500 miles north of IANA. It is not the overcoming of this distance that is remarkable, nor that it happened in midsummer; the astounding thing is that communication was established when WNP was in a location where the sun does not set for months and where daylight covered a great part of the distance between the two stations.

Previous to this the "Bowdoin" had last been worked on August 3d, when thirty miles southwest of Disco Island, about a third of the way up the Greenland Coast. For more than three weeks not a peep was heard from WNP. Then it was remembered that Operator Mix had complained that as he progressed northward the interval of darkness was decreasing steadily, until at that time he had but two hours of "night" out of twenty-four—the sun didn't set until 11:30 p.m. and it was up again by 2 o'clock—and he could hear signals only during the short period of darkness. It was obvious, of course, that the "Bowdoin" had traveled into the area of continuous Arctic sunlight and so no signals were getting thru. Her set could not be expected to cover any such distance in daylight, and all amateurs know that if there has to be daylight at one end of "the line", signals get thru much better from darkness into light than vice versa, and even that was against us. But we had an abiding faith that there would come a time when conditions were right, when there would be a little "hole" in the absorbing area of ionization, which would permit a signal to get down to us; and we knew that if that signal got thru an amateur would hear it. Now we see, fellows, the reward of perseverance. For three weeks Bourne of IANA sat on the job, listening for his friend Mix on WNP; the right conditions came and the signals were interchanged, weak and fading it is true, but enough to relieve anxiety for the safety of the brave little crew and to tell the world that the "Bowdoin" was "almost there". We are

filled with the greatest admiration for this achievement. Only amateurs could put it over.

The worst of the difficulties of communication with WNP are now past. Just as our own days are growing shorter, the Arctic sun is circling nearer and nearer the horizon, and by the time this issue of QST reaches our readers Mix again will be having "nights". Short tho they be, they will get longer as each twenty-four hours rolls by, until finally the sun appears no more and the long Arctic night of many months duration has started. With IANA's convincing demonstration that even daylight cannot shut off WNP for long, need we have any worries? We know that signals then will be reaching Mix from the entire northern hemisphere and, barring the effects of aurora, he should be able to work any of us when it is dark in North America, and, as he will be in continuous darkness himself, European amateurs when it is night in Europe.

The best time for American and Canadian amateurs to try for WNP is on Monday nights after quiet hours. We've got a reputation to uphold this winter, fellows, but it should be lots of fun at the same time, for we have a brother "ham" at the other end.

Fall WX!

'RAY for winter, gang! She's coming, to be, too. It looks to us like we and a great old winter she promises were all lined up for the greatest season American amateur radio ever enjoyed.

Our average of skill with C.W. has reached the point where we have done better this past summer than we ever hoped to do in winter. The west coast has heard 1s and 2s and 3s and 4s all summer, and 6s and 7s have been snaffled along the Atlantic right thru July and August, while intermediate 9s have worked both coasts night after night. (Try to do that on spark!) How much greater, then, must be the things in store for us this winter! Do you remember those "boxes" we used to run in each issue last season, summarizing the month's records? Well, sir we don't believe they'll be able to hold the chronicle of what we do this winter, and we haven't quite decided what to do about it. (Run

em in 6-point, somebody said.) What with Transpacifics, and "westbound" Transatlantics, and two-way trials over both oceans, and WNP to watch for, we're going to be as busy as a one-armed B.C.L. with a 17-knob tuner. Our advertisers sense it too, and they are presenting their best in QST's pages. (And say, gang, when you write them, be sure to mention QST, for we have to show them results to keep their patronage, and that's what pays our printing bills.)

Our shorter waves are going to be the scene of much new work too. There are lotsafellers down on 150 to 165 now, having the time of their life with little or no QRM, and just itching for company.

One of the nicest aspects of the whole business of winter prospects is that we don't have to wait for any new invention to be able to cash in on them. We've got the stuff now: our shorter waves; our D.C.C.W. transmitters; and for receiving, who wants anything better than a good tuner wound with big low-resistance wire and equipped with low-loss condensers and a picked detector tube?

Are you all set for fall, O.M.? If you don't want to be left out of our biggest winter yet, better get a move on, for QRN is disappearing and every night the sigs pound in more QSA.

Fishing

WE'VE got a new game all our own—logging during quiet hours. We don't mean logging violators, but taking advantage of the difference in time to fish for stations in other time zones whose quiet hours are not then in operation. As most of one's neighbors are quiet, it is easy to get good DX and it provides an interesting way to spend the time while the clock runs around to 10:30.

Here is how it works. When 8 o'clock comes around in the eastern states and amateurs on Eastern Time start their quiet period, it is only 7 o'clock in Central Time and all kinds of 9s and 5s can be logged, to say nothing of dozens of Canucks, most of whom would be smothered in QRM from nearer stations if it were not for the quiet period. When it gets to be 8 o'clock Central Time, the entire eastern half of the country is silent and the western boys roll in by the carload. Soon nobody is going but the Pacific Coast fellows, and there will be many five-watt 6s and 7s bagged on the east coast this season just because Uncle Sam has put into practical operation what we once proposed for ourselves—"listening hours". Then when the west coast quiet period begins, the Atlantic Coast amateurs will just have opened up, with all the rest of the country quiet, and

the western fellows will have a chance to go fishing. Hour by hour as the quiet period passes different sections will come back on the air, with perfectly gorgeous chances for testing our new receiving dope—and in the early evening hours at that. There ought to be plenty of opportunity to bag good lists of "Calls Heard" over the required 1000 miles.

Talking about quiet hours, let us say a word about violations. Most of us some day expect a Z license to use the entire amateur band from 150 to 220 meters, as soon as we get real D.C.C.W. But the Department of Commerce stipulates that such license will not be issued to any amateur convicted of violation of regulations. They will tighten down on us now that cold weather is approaching, and fellows caught transmitting during their quiet hours are sure to get "nailed". And that spoils forever the chance of getting a special license. It isn't worth the risk—don't slop over on your quiet hours.

New Zealand

IF we should ever get run out of the United States we're going to head southwest and never stop until we hit New Zealand. And there we want to stay, for in that little country there is amateur radio more nearly like we know it in the States and the Dominion than in any other country on the face of the globe. We get a little magazine from down there, "New Zealand Wireless & Broadcasting News", published in Wellington, and it does our heart good to read it, so much does it resemble our early days in amateur radio. There is the same old amateur spirit, the same decisions as to what is the best apparatus to use, the same skill in getting results. To any of our fellows who are interested in watching the history of American amateur radio re-enacted, we cheerfully recommend this magazine.

The New Zealanders start with two big advantages; first, they have no sparks but enter the game with tube transmitters and radio-frequency amplification; and, second, their receiving conditions seem to be little short of marvelous. In common with the Australians they are past masters of the gentle art of getting real transmitter efficiency and reaching out with but a few watts input, and their receiving record in the recent "Transpacifics" was greatly superior to that of the "Aussies", as they call their neighbors in Australia. In New Zealand the government has not yet decided definitely on its amateur policy but their attitude is a liberal one and temporary transmitting permits are being issued for 200 meters, the calls being 3s and 4s. In Australia the amateur wave is 400 meters, the calls again

(Concluded on page 43)

The Operating Department

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



WITH a certain amount of pride, the Operating Department opens its ledgers and presents its personnel to the A.R.R.L. and readers of QST. Quietly, but steadily, has the work of forming this organization been going forward for some months. It represents a diligent and careful search for the best we have in our membership.

The search hasn't ceased, nor will it, as we hope to locate many more available amateur stations and with our present organization we can work more efficiently and

We do want to mention that at this time an emergency communication system is being formed for the American Railways Association to be used when all other means of communication fail. Very often railroads are faced with snow storms and washouts which have cut off communication. It is in these and other emergencies that we must have a material organization productive of results. We must have the best amateurs available and we believe we have most of them.

Message Traffic Report By Divisions AUGUST

DIVISION	C.W.		SPARK		TOTAL	
	Stns.	Msgs.	Stns.	Msgs.	Stns.	Msgs.
Atlantic	104	4432	10	617	114	5049
Central	83	5291	5	116	88	5407
Dakota	33	1310	2	48	35	1358
Delta	5	121	—	—	5	121
East Gulf	19	680	2	24	21	704
Midwest	52	2374	5	107	57	2481
New England	60	4658	—	—	60	4658
Northwestern	17	836	1	5	18	841
Pacific						
Roanoke	23	1359	1	15	24	1374
Rocky Mountain	9	688	—	—	9	688
West Gulf	65	3192	4	70	69	3262
Hawaiian	1	121	—	—	1	121
Ontario	16	416	—	—	16	416
Total	490	25478	30	1002	520	26480

C.W. Messages 25,478—96%

Spark Messages 1,002—4%

rapidly. Our Operating Department will grow steadily. There is always room for more and we are anxious to enter new stations upon our roll. Vacancies exist. They must be filled with the right kind of material. Perhaps you would like to take up official duties in some way or another. Perhaps you know some other amateur who is interested in this work. If so, we would like to know it.

"What good is such an organization?" is the question many will ask. Space doesn't permit all the answers we know.

Each month following, corrections, additions, or cancellations will be made in the Operating Department, thus enabling everybody to keep an accurate list.

Abbreviations in titles are: D.M.—Division Manager; A.D.M.—Assistant Division Manager; D.S.—District Superintendent; C.M.—City Manager; E.A.—Executive Assistant; R.M.—Route Manager; O.R.S.—Official Relay Station.

It wouldn't surprise us if there were some errors, and we will thank you if you will advise us of any you find. We want

the list correct and as accurate as it can be made.

Mr. H. L. Reid, 4KU, Atlanta, Ga., has been elected and appointed manager of the East Gulf Division. The list of personnel for that division and the Northwestern Division will appear in next QST.

Mr. Glenn H. West, 7ZU, Billings, Mont., has been elected and appointed manager of the Northwestern Division.

Of course, the regular activity and traffic reports could not be included in this issue. The total traffic figures are given for each division. There were some splendid reports, too.

III takes first honors; incidently he is the only "Brass Pounder" this month.

 * F. S. Huddy, III *
 * Providence, R.I. *
 * New England Division *
 * 432 Messages. *

ATLANTIC DIVISION

Delaware, Maryland, New Jersey, New York, Pennsylvania, District of Columbia.
D.M.—Charles H. Stewart, St. David's, Pa. 3ZS

SOUTHERN SECTION

Delaware, Maryland, District of Columbia, Pennsylvania.
E.A.—E. B. Duvall, 1514-31st St., N. W., Washington, D. C., 3EM

Delaware (Dist. No. 1 to No. 3.)

A.D.M.—H. H. Layton, 805 Washington St., Wilmington, 3AIS

Dist. No. 1—County: New Castle.

D.S.—R. T. Shaw, 1914 Park Drive, Wilmington, 3AFB
O.R.S.—3AFB, 2AIS, 3BSS.

Dist. No. 2—County: Kent.

Dist. No. 3—County: Sussex.

District of Columbia.

A.D.M.—H. J. Wadsworth, 70 V. St. N. W., Washington, 3JJ
D.S.—H. L. Strang, 2020 First St. N. W., Washington, 3IL
O.R.S.—NOF, 3AB, 3AJH, 3ALN, 3ARO, 3BHM, 3BSS, 3BWT, 3IL, 3JJ, 3KM, 3LR, 3OD, 3PZ, 3SU, 3ZW.

Maryland (Dist. No. 1 to No. 5.)

A.D.M.—G. L. Deichmann, Jr., Pk. Hights and Bancroft Ave., Baltimore, 3HG

Dist. No. 1—Counties: Cecil, Kent, Queen Anne's, Talbot, Caroline, Dorchester, Wicomico. Worcester, Somerset.

Dist. No. 2—Counties: Carroll, Baltimore, Harford, Howard, Anne Arundel.

C.M.—Section of city east of Charles St.; C. A. Miller, 405 No. Curley St., BALTIMORE, 3WF
C.M.—Section of city west of Charles St.; D. P. Shafer, 2107 Bolton St., BALTIMORE, 3AC
O.R.S.—3AC, 3AJD, 3APT, 3HG, 3LC, 3MF, 3SQ, 3TE, 3WF.

Dist. No. 3—Counties: Prince Georges, Charles, Calvert, St. Mary's.

Dist. No. 4—Counties: Washington, Frederick, Montgomery.

Dist. No. 5—Counties: Garrett, Allegany.

Eastern Pennsylvania (Dist. No. 1 to No. 6.)
A.D.M.—James F. Rau, 2085 E. Kingston St., Philadelphia, 3FM.

Dist. No. 1—Counties: Delaware, Montgomery, Bucks.

D.S.—W. P. Lukens, 527 Spring Mill Ave., Conshohocken, 3QN
O.R.S.—3AEN, 3AKR, 3AWF, 3AWH, 3BLU, 3BOB, 3BTL, 3CC, 3GC, 3GJ, 3HE, 3QN, 3ZM, 3ZS.
C.M.—E. E. Miles, 206 West 24th St., CHESTER, 3ADQ
O.R.S.—3ADP, 3ADQ, 3BIP
C.M.—Phila.—Northeast (All of Phila. north of Lehigh Ave. and east of Broad St.), R. S. Fisher, 3520 Diaston St., Tacony, PHILADELPHIA, 3HX
O.R.S.—3BUT, 3FM, 3HX
C.M.—Phila.—Northwest (All of Phila. north of Lehigh Ave. and west of Broad St.), D. O. Boggs, 147 Pelham St., PHILADELPHIA, 3UD
O.R.S.—3ASY, 3BMS, 3TA, 3UD
C.M.—Phila.—Central (All of Phila. south of Lehigh Ave. and between the Delaware and Schuylkill Rivers.), C. G. Benzing, 2425 South 12th St., PHILADELPHIA, 3FS
O.R.S.—3ABH, 3AWA, 3FS, 3HB, 3QV, 3RB, 3SM
O.R.S.—Phila.—West (All of Phila. west of the Schuylkill River.), 3AGN, 3ANJ, 3BB, 3BJ, 3BJY, 3IH, 3KD, 3OE, 3CDG.

Dist. No. 2 Counties: Lehigh, Northampton, Carbon, Monroe.

D.S.—O. A. Hiskey, 22 West Fairview St., Bethlehem, 3BNU
O.R.S.—3ALU, 3AVL, 3CTZ, 3LK, 3YO.
C.M.—Kenneth K. Keck, 117 S. St. Cloud St., ALLENTOWN, 3FR
O.R.S.—3BAQ, 3FR
C. M.—W. T. Young, 635 Spring St., BETHLEHEM, 3JG
O.R.S.—3BNU, 3BLP, 3BUV, 3JG.

Dist. No. 3—Counties: Lackawanna, Luzerne, Susquehanna, Wyoming, Pike, Wayne.

D.S.—Roy C. Ehrhardt, Dunmore, 3ZQ
O.R.S.—3CMZ, 3RQ
C.M.—Geo. Travis, 732 Wheeler Ave., SCRANTON, 3BIQ
O.R.S.—3AJA, 3ATA, 3BIQ, 3RH.

Dist. No. 4—Counties: Chester, Berks, Schuylkill.

D.S.—A. Bertha Hilton, Parkesburg, 3ZO
O.R.S.—3AUY, 3ZO
C.M.—F. G. Delong, 141 Oley St., READING, 3AGI
O.R.S.—3AGI, 3AUW, 3BDI, 3BJ, 3LP, 3MB.

Dist. No. 5—Counties: Lancaster, Lebanon, Dauphin, York, Juniata, Perry, Cumberland, Adams.

D.S.—J. A. Koehn, 666 Union St., Lancaster, 3DM
O.R.S.—2ACY, 3AQR, 3CCU, 3GM
C.M.—R. C. Weigel, 49 South Queen St., YORK, 3AAV
O.R.S.—3AAV, 3ARP
C.M.—C. R. Grim, 1940 Bellevue Rd., HARRISBURG, 2BBV
O.R.S.—3AOD, 3API, 3BBV, 3CCX, 3CX
C.M.—S. E. Fraim, Jr., 802 North Duke St., LANCASTER, 3BIT
O.R.S.—3BIT, 3DM.

Dist. No. 6.—Counties: Branford, Sullivan, Columbia, Tioga, Lycoming, Montour, Northumberland, Union, Snyder.

D.S.—H. M. Walleze, Danville, 3BQ
O.R.S.—3AIW, 3BQ, 3BRE
C.M.—F. J. Demarat, 811 Walnut St., WILLIAMS-PORT, 3DT
O.R.S.—3DT, 3AVI.

Western Pennsylvania (Dist. No. 7 to No. 14.)
A.D.M.—P. E. Wiggins, 5106 Liberty Ave., Pittsburgh, 3ZD.

Dist. No. 7—Counties: Center, Clinton, Cameron, Potter.
D.S.—G. L. Crossley, Penna. State College, State College, 8XE
O.R.S.—2CDI, 8XE.

Dist. No. 8 Counties: Blair, Bedford, Fulton, Franklin, Mifflin, Huntingdon.
O.R.S.—3DY, 3ACQ
C.M.—W. K. Aughenbaugh, 1432-12th St., ALTOONA, 8AKI
O.R.S.—8AKI

Dist. No. 9—Counties: Allegheny, Beaver, Washington and Westmoreland.
D.S.—G. W. Dalzell, 212 Spring St., E. Pittsburg, SAIO
O.R.S.—8AEL, 8AIO, 8CEO, 8CIX, 8CKM, 8EW, 8LF, 8QD, 8UT, 8VQ, 8ZE.
C.M.—H. J. Lehman, Jenny Lind St., McKEESPORT, 8OC
O.R.S.—8OC
C.M.—F. H. Westervelt, 5806 Westminster Ave., PITTSBURGH, 8VE
O.R.S.—8BT, 8CEI, 8CTF, 8VE, 8ZD, 8ACO.

Dist. No. 10—Counties: Armstrong, Indiana, Cambria, Clearfield, Jefferson, Clarion.
D.S.—Wm. M. Shoup, 160½ Jefferson Ave., Vandergrift, 8HY
O.R.S.—8HY
C.M.—N. L. Straub, 1045 Sunday St., JOHNS-TOWN, 8BYI
O.R.S.—8BYI.

Dist. No. 11—Counties: Warren, McKean, Forrest, Elk.
D.S.—M. A. Swanson, 1104 Pennsylvania Ave., East Warren, 8CON
O.R.S.—8CON.

Dist. No. 12—Counties: Erie, Crawford, Venango.
D.S.—Kenneth B. Lloyd, 231 East 8th St., Erie, 8VX
O.R.S.—8BRC
C.M.—F. D. Hiley, 450 West St., ERIE, 8AGR
O.R.S.—8AGR, 8VX.

Dist. No. 13—Counties: Lawrence, Mercer, Butler.
D.S.—John Leighner, 606 East Pearl St., Butler, 8ALF
O.R.S.—8ALF, 8QC.

Dist. No. 14—Counties: Greene, Fayette, Somerset.
D.S.—T. H. Scott, 401 East Cedar Ave., Connellsville, 8BJV
O.R.S.—8AAF, 8BJV.

NORTHERN SECTION

New York, New Jersey.
E.A.—F. B. Ostman, 180 Broad St., Ridgewood, N. J., 20M

New Jersey (Dists. No. 1 to Nos. 6.)
A.D.M.—R. S. Johnson, White Street, Red Bank, 2AWL

Dist. No. 1—Counties: Bergen, Passaic.
D.S.—J. Van Riper, 117 La Fayette Ave., Passaic, 2AJF
O.R.S.—2AJA, 2AKO, 2ANZ, 2AZL, 2AWH, 2AWT, 2ZM, 2BBB, 2BMR, 2BOI, 2CJA, 2CJX, 2CKE, 2EK, 2OM, 2RZ, 2SQ, 2AJF, 2CKA, 2AQI.
C.M.—G. O. Milne, 142 Totowa Rd., PATERSON, 2AFP
O.R.S.—2AFP, 2BEM, 2BG
C.M.—Robert Fulton, 179 Madison St., CLIFTON, 2AQI

Dist. No. 2—Counties: Essex, Hudson
D.S.—E. H. Canfield, 894 S. 16th St., Newark, 2ALY
O.R.S.—2AOS, 2BLR, 2BK, 2BQZ, 2CUI, 2EY, 2MP.
C.M.—L. Gardanes, Jr., 21 West 48th St., RAYONNE, 2AFC

O.R.S.—2AFC, 2CQI
C.M.—E. A. Dickinson, 11 Hawthorne Place, ORANGE-E. ORANGE, 2BNZ
O.R.S.—2BNZ
C.M.—A. G. Wester, Jr., 1075 Chancellor St., (IRVINGTON), Hilton, 2WR
O.R.S.—2AXF, 2WR
C.M.—V. J. Gilcher, 37 Sherman Ave., JERSEY CITY, 2CBK
O.R.S.—2CBK, 2NE
C.M.—C. E. Huffman, 28 Union St., MONTCLAIR, 2RU
O.R.S.—2RU, 2ZE
C.M.—J. J. Glauber, 151 N. 12th St., NEWARK, 2BMS
O.R.S.—2ALY, 2BMS, 2CDR
C.M.—J. A. Erhard, 311 Maple St., W. HOBOKEN, 2UE
O.R.S.—2CJT, 2CUV, 2UE
C.M.—L. R. Shropshire, Columbia Ave., (W. NEW YORK), Palisades Pk., 2CHG
O.R.S.—2CHG, 2CKL.

Dist. No. 3—Counties: Sussex, Morris, Warren.
D.S.—V. M. Wintermute, 47 Spring St., Newton, 3CG
O.R.S.—3BCJ, 3BDT, 3CG, 3JL.

Dist. No. 4—Counties: Union, Middlesex, Somerset.
D.S.—H. H. Sampson, 307 Prospect St., Westfield, 2OF
O.R.S.—2AAF, 2ACD, 2AER, 2AGB, 2BJP, 2CMS, 2KK, 2OF
C.M.—R. M. Morris, 327 Cross Ave., ELIZABETH, 2CQZ
O.R.S.—2BXY, 2CQZ, 2JZ
C.M.—C. Holman, 306 N. 3rd Ave., NEW BRUNSWICK, 2AZY
O.R.S.—2AZY
C.M.—F. W. Huff, 665 State St., PERTH AMBOY, 2AMB
O.R.S.—2AMB
C.M.—H. W. Blackford, 220 Park Ave., PLAINFIELD, 2QB
O.R.S.—2QB.

Dist. No. 5—County: Monmouth.
D.S.—F. G. Clayton, 814 Cookman Ave., Asbury Park, 2FC
O.R.S.—2AWL, 2BUY, 2FC, 2JG, 2MN.

Dist. No. 6—Counties: Mercer, Hunterdon.
D.S.—F. W. Applegate, 84 Hillcrest Ave., Trenton, 3FP
O.R.S.—3XM
C.M.—E. G. Raser, 931 Edgwood Ave., TRENTON, 3CS
O.R.S.—3CS, 3FP.

New Jersey (Dists. No. 7 to No. 9.)
A.D.M.—H. W. Densham, 140 Washington St., Collingswood, 3EH

Dist. No. 7—Counties: Ocean, Atlantic.
D.S.—Wm. Jordan, 3rd, 126 Atlantic Ave., Atlantic City, 3FB
O.R.S.—2BGI, 3FB.

Dist. No. 8—Counties: Burlington, Camden, Gloucester.
D.S.—Wm. W. Filson, 253 E. Atlantic Ave., Audubon, 3BEI
O.R.S.—3ACO, 3ACQ, 3ANV, 3BEI, 3EH.

Dist. No. 9—Counties: Salem, Cumberland, Cape May.
D.S.—V. J. Braidwood, 205 New Jersey Ave., Anglesea, 3BA
O.R.S.—3BA, 3NB.

Eastern New York (Dists. No. 1 to No. 8.)
A.D.M.—Dr. E. A. Cyriax, 219 East 71st St., New York City, 2DI.

Dist. No. 1—Counties: Nassau, Suffolk, (Long Island.)

D.S.—H. S. Collins, Babylon, L. I., New York, 2AJW.
O.R.S.—2AJW, 2AWS, 2AZC, 2BLP, 2BRC, 2BSC, 2CPK, 2ZL.

Dist. No. 2—Counties: Westchester, Putnam, Dutchess.

D.S.—R. W. E. Decker, 80 Greenridge Ave., White Plains, 2UA
O.R.S.—2ATF, 2BJO, 2CBJ, 2CEI, 2KV, 2UA.
C.M.—A. C. Stevens, 150 North Terrace Ave., PORTCHESTER, 2CBI
O.R.S.—2CBI.
C.M.—Geo. Korper, 300 Webster Ave., NEW ROCHELLE, 2CFE
O.R.S.—2CFE
C.M.—Arnold Brillhart, 10 Cornell Ave., YONKERS, 2DN
O.R.S.—2AJF, 2CDK, 2DN.

NEW YORK CITY

Manhattan and Bronx

C.M.—Northern Manhattan Dist.: W. F. Bingham, 2345 Broadway, NEW YORK CITY, 2AEO
C.M.—Southern Manhattan Dist.: A. Reehert, 181 Waverly Place, NEW YORK CITY, 2TT
C.M.—Bronx Dist.: R. Herizberg, 740 Prospect Ave., NEW YORK CITY, 2FZ
O.R.S.—2AEO, 2AEQ, 2AQL, 2AUJ, 2BNL, 2BRO, 2BUF, 2CEC, 2CHK, 2CIM, 2CJR, 2CNK, 2CT, 2CTQ, 2DI, 2FZ, 2IF, 2IN, 2KP, 2TT, 2VH.

NEW YORK CITY

Brooklyn

C.M.—E. M. Glasser, 545 E. 13th St., BROOKLYN, 2BRB
O.R.S.—2ATZ, 2AUZ, 2BEG, 2BPF, 2BRB, 2BWR, 2CFA, 2CJR, 2HV, 2KE, 2PF, 2RM, 2WB.

NEW YORK CITY

Queen's Boro.

C.M.—J. V. Cunningham, 44 Kingston Rd., JAMAICA, L. I., 2AVE.
O.R.S.—2AVE, 2BCK.

NEW YORK CITY

Richmond Boro., S. I.

C.M.—T. Schreyer, 21 Sanford Place, NEW BRIGHTON, 2TS
O.R.S.—2AGC, 2CEV, 2IG, 2MJ, 2ND, 2NZ, 2TS.

Dist. No. 3—Counties: Columbia, Rensselaer, Washington.

D.S.—F. W. Hanna, 1211 Hatton St., Troy, 2HW.
C.M.—Wm. A. Dubois, 198-10th St., TROY, 2ANM
O.R.S.—2ANM, 2HW.

Dist. No. 4—Counties: Rockland, Orange, Ulster, Sullivan, Greene.

D.S.—Theo. Van Loan, 31 Prospect Ave., Catskill, 8CKN
O.R.S.—8CKN
C.M.—A. A. Johnson, 23 O'Neil St., KINGSTON, 2CNI
O.R.S.—2CNI
C.M.—S. Vanderveer, BALNIVILLE, 2CNP
O.R.S.—2CNP

Dist. No. 5—Counties: Albany, Scholarie, Schenectady, Montgomery.

D.S.—A. J. Kastenmayer, 417 Paige St., Schenectady, 2GK
O.R.S.—2BXW, 2MX, 8APU, 8AVJ, 8DDC, 8CKC.
C.M.—E. Wirsing, 33 Quail St., ALBANY, 2AWF
O.R.S.—2ABQ, 2AWF, 2PV.
C.M.—H. S. Conaughy, 172 Furman St., SCHE-NECTADY, 2BQD
O.R.S.—2AIF, 2BQD, 2GK.

Dist. No. 6—Counties: Hamilton, Fulton, Saratoga.

D.S.—Carl Rossback, 15 McNab Ave., Gloversville, 8AOT
O.R.S.—8AOT.

Dist. No. 7—Counties: Clinton, Essex, Warren, Franklin.

Dist. No. 8—Counties: Herkimer, Otsego, Delaware.

Western New York (Dist. No. 9 to No. 16.)
A.D.M.—S. Woodworth, 425 Brownell St., Syracuse, 8AWP.

Dist. No. 9—Counties: Lewis, Jefferson, St. Lawrence.

C.M.—N. S. Sherman, 418 Sherman St., WATER-TOWN, 8BEO
O.R.S.—8BEO.

Dist. No. 10—Counties: Madison, Oneida, Onondaga, Oswego.

D.S.—A. R. Marcy, 113 W. Raynor St., Syracuse, 8BUM
O.R.S.—8XH
C.M.—C. H. Schrader, 1412 Dudley Ave., UTICA, 8ADG
O.R.S.—8ADG, 8COK
C.M.—Theo. Dickinson, 217 W. Embargo St., ROME, 8BRI
O.R.S.—8BCW, 8BRI, 8RZU, 8CNV, 8DEC
C.M.—H. O. Quick, 335 Coolidge Ave., SYRACUSE, 8COI
O.R.S.—8AWP, 8BIN, 8BNY, 8BUM, 8COI, 8CQL, 8DBW.

Dist. No. 11—Counties: Cortland, Chenango, Tioga, Broome

D.S.—Theron Tappan, 547 Clark St., Waverly, 8AVD
O.R.S.—8ADH, 8AVD, 8AXX, 8BFV, 8COO, 8DAA.

Dist. No. 12—Counties: Tompkins, Seneca, Cayuga, Wayne.

O.R.S.—8ACM, 8XQ.

Dist. No. 13—Counties: Steuben, Schuyler, Chemung.

D.S.—J. J. Young, 717 Gray St., Elmira, 8HJ
O.R.S.—8AUH
C.M.—Joseph Meyer, 1184 College Ave., ELMIRA, 8VW
O.R.S.—8ASK, 8HJ, 8VW.

Dist. No. 14—Counties: Monroe, Livingston, Ontario, Yates.

D.S.—Chas. F. Nichols, Elm St., Webster, 8AMM
O.R.S.—8ABX, 8AMM
C.M.—Stephen Nelson, 525 Benton St., ROCHESTER, 8NB
O.R.S.—8ADN, 8AHK, 8AIW, 8AMQ, 8AMR, 8ATR, 8ATU, 8AZO, 8BCP, 8CSE, 8CUU, 8KS, 8NB, 8QE, 8TC.

Dist. No. 15—Counties: Erie, Niagara, Orleans, Genesee, Wyoming.

D.S.—G. Schaeffer, 32 Broadway, Lancaster, 8UE
O.R.S.—8BAR, 8UE
C.M.—A. A. Lenz, 203 Moselle St., BUFFALO, 8QB
O.R.S.—8FE, 8PJ, 8QB
C.M.—R. H. Collignon, 2222 Willows Ave., NIAGARA FALLS, 8DAJ
O.R.S.—8DAJ.

Dist. No. 16—Counties: Cautauqua, Cattaraugus, Allegany.

D.S.—R. C. Belden, 160 Temple St., Fredonia, 8ASL
O.R.S.—8ASL, 8AXN, 8BMM, 8BUX, 8CTN
C.M.—Malcolm Nichols, 78 Newton St., JAMES-TOWN, 8AYM
O.R.S.—8AYM, 8BQA.

CENTRAL DIVISION

Illinois, Indiana, Kentucky, Michigan, Ohio, Wisconsin.

D.M.—R. H. G. Mathews, 332 S. Michigan Ave., Chicago, Ill.

Illinois (Dist. No. 1 to No. 6.)

Cook County comes under direction of the C.M. of Chicago and is regarded as a separate district.

C.M.—J. E. Brennan, 5714 W. Race St., CHICAGO.
 9AC
 O.R.S.—9US, 9LZ, 9AAW, 9AC, 9AOY.
 A.D.M.—N. C. Smith, 518 E. Seminary St., Hoopes-
 ton, 9AIH

Dist. No. 1.—Counties: Rock Island, Henry,
 Bureau, Putnam, Stark, Marshall, Knox,
 Mercer, Henderson, Hancock, McDonough,
 Fulton, Peoria, Tazewell, Woodford, Warren.
 D.S.—J. H. Burke, 564 E. Second St., Galesburg,
 9NQ
 C.M.—O. L. Denton, 211 Faraday St., PEORIA, 9BIJ
 O.R.S.—9DYU, 9DBP, 9CTV, 9DGA, 9ET, 9DOB,
 9BIJ, 9CCY, 9LF, 9PQ, 9DAY, 9BUH, 9CFK,
 9BIZ, 9AFQ, 9DC, 9NQ, 9EJ, 9CHF, 9BWA,
 9AIJ, 9AZF, 9DXO, 9DZU, 9BZQ, 9VM, 9AWU.

Dist. No. 2.—Counties: LaSalle, Kendall, Will,
 Grundy, Kankakee, Livingston, Iroquois, Ford,
 McLean, DuPage.
 D.S.—C. W. Bergman, Dwight, 9CA
 O.R.S.—9GI, 9CA, 9DDY, 9CCM, 9CTF, 9AMK,
 9BUC, 9CCN, 9AIC, 9ERA, 9CXH, 9BDF, 9BBE,
 9DXL, 9AHQ, 9EBN, 9DYN, 9BJT, 9BTA,
 9ARM, 9AJH, 9DVL, 9WX.

Dist. No. 3.—Counties: Adams, Schuyler,
 Mason, Logan, Menard, Cass, Brown, Pike,
 Scott, Bond, Morgan, Sangamon, Christian,
 Montgomery, Macoupin, Greene, Jersey,
 Calhoun, Madison.
 D.S.—A. L. Cain, Roodhouse, 9MC
 C.M.—K. H. Schnepf, 217 Cook St., SPRING-
 FIELD, 9ASL
 O.R.S.—9EFQ, 9TV, 9CIE, 9AWQ, 9DPV, 9CWG,
 9CXT, 9BAA, 9ODU, 9RAH, 9CMC, 9CKP,
 9DWF, 9EAC, 9CMN, 9MC, 9BYX, 9BLU, 9CLZ,
 9DFC, 9ASL.

Dist. No. 4.—Counties: DeWitt, Champaign,
 Vermillion, Piatt, Macon, Moultrie, Douglas,
 Edgar, Coles, Clark, Cumberland, Shelby,
 Fayette, Effingham, Jasper, Crawford,
 Marion, Clay, Richland, Lawrence.
 D.S.—M. C. Spies, 1538 N. Edward St., Decatur,
 9DQU
 C.M.—F. C. Weeks, 701 Randolph St., URBANA-
 CHAMPAIGN, 9AQA
 C.M.—M. C. Spies, 1538 N. Edward St., DECATUR,
 9DQU
 O.R.S.—9KX, 9CFH, 9BGC, 9BHX, 9BL, 9EFW,
 9UK, 9CPA, 9BPW, 9BIT, 9CZL, 9AP,
 9BXD, 9VV, 9DRV, 9DZG, 9DQU, 9ASD, 9OCR,
 9DWS, 9COX.

Dist. No. 5.—Counties: Hancock, Henry,
 Wayne, Union, Fayette, Rush, Shelby,
 Bartholomew, Decatur, Franklin.
 D.S.—C. J. Butler, Crothersville, 9DYU
 O.R.S.—9DYU, 9ALP, 9ARR, 9DIS, 9BRK.

Dist. No. 6.—Counties: St. Clair, Monroe, Clin-
 ton, Washington, Jefferson, Wayne, Edward,
 Wabash, White, Hamilton, Perry, Randolph,
 Jackson, Williamson, Saline, Gallatin,
 Union, Johnson, Pope, Hardin, Alexander,
 Pulaski, Massac.
 D.S.—Verner Hicks, Marion
 C.M.—I. R. Dye, 504 N. 59th St., EAST ST.
 LOUIS, 9AMS
 O.R.S.—9AMS, 9AUS, 9DBN, 9DMW, 9CED, 9BCE,
 9CKE, 9BLO, 9PE, 9DZG, 9DG, 9BDA, 9DLR,
 9CHM, 9BEE.

Dist. No. 7.—Counties: Jo Daviess, Stephenson,
 Winnebago, Boone, Lake, McHenry, Carroll,
 Ogle, Whiteside, Lee, DeKalb, Kane.
 D.S.—W. F. Ridgway, 507 Clark St., Freeport,
 9AKU
 C.M.—E. B. Gobrecht, 129 N. St. James St.,
 WAUKEGAN, 9ACW
 C.M.—R. S. Rea, 628 Center St., ELGIN, 9OS
 C.M.—Wm. Anderson, 721 Sixth St., ROCKFORD,
 9DVV
 O.R.S.—9CEB, 9EBH, 9BBC, 9ACW, 9AKU,
 9DVV, 9DJO, 9DVL, 9BRO, 9BHD, 9AMR,
 9AFN, 9ALW, 9DHD, 9BQW, 9BUO.

Dist. No. 8.—Counties: Jo Daviess, Stephenson,
 Winnebago, Boone, Lake, McHenry, Carroll,
 Ogle, Whiteside, Lee, DeKalb, Kane.
 D.S.—W. F. Ridgway, 507 Clark St., Freeport,
 9AKU
 C.M.—E. B. Gobrecht, 129 N. St. James St.,
 WAUKEGAN, 9ACW
 C.M.—R. S. Rea, 628 Center St., ELGIN, 9OS
 C.M.—Wm. Anderson, 721 Sixth St., ROCKFORD,
 9DVV
 O.R.S.—9CEB, 9EBH, 9BBC, 9ACW, 9AKU,
 9DVV, 9DJO, 9DVL, 9BRO, 9BHD, 9AMR,
 9AFN, 9ALW, 9DHD, 9BQW, 9BUO.

Dist. No. 9.—Counties: Jo Daviess, Stephenson,
 Winnebago, Boone, Lake, McHenry, Carroll,
 Ogle, Whiteside, Lee, DeKalb, Kane.
 D.S.—W. F. Ridgway, 507 Clark St., Freeport,
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 C.M.—R. S. Rea, 628 Center St., ELGIN, 9OS
 C.M.—Wm. Anderson, 721 Sixth St., ROCKFORD,
 9DVV
 O.R.S.—9CEB, 9EBH, 9BBC, 9ACW, 9AKU,
 9DVV, 9DJO, 9DVL, 9BRO, 9BHD, 9AMR,
 9AFN, 9ALW, 9DHD, 9BQW, 9BUO.

Dist. No. 10.—Counties: Jo Daviess, Stephenson,
 Winnebago, Boone, Lake, McHenry, Carroll,
 Ogle, Whiteside, Lee, DeKalb, Kane.
 D.S.—W. F. Ridgway, 507 Clark St., Freeport,
 9AKU
 C.M.—E. B. Gobrecht, 129 N. St. James St.,
 WAUKEGAN, 9ACW
 C.M.—R. S. Rea, 628 Center St., ELGIN, 9OS
 C.M.—Wm. Anderson, 721 Sixth St., ROCKFORD,
 9DVV
 O.R.S.—9CEB, 9EBH, 9BBC, 9ACW, 9AKU,
 9DVV, 9DJO, 9DVL, 9BRO, 9BHD, 9AMR,
 9AFN, 9ALW, 9DHD, 9BQW, 9BUO.

Northern Indiana (Dists. No. 1 and No. 2.)
 A.D.M.—M. W. Hutchinson, Middlebury, 9HR

Dist. No. 1.—Counties: Elkhart, La Grange,
 Steuben, Kosciusko, Noble, DeKalb, Whitley,

Allen, Wabash, Huntington, Wells, Adams,
 Grant, Blackford, Jay, Madison, Delaware,
 Randolph.

D.S.—E. E. Pippenger, 806 S. 7th St., Goshen, 9FS
 C.M.—Robt. Driesbach, 1257 Lake Ave., FORT
 WAYNE, 9DFB
 O.R.S.—9DFB, 9CBA, 9EHL, 9II, 9DAX, 9PC,
 9CBB.

Dist. No. 2.—Counties: Lake, Porter, La Porte,
 St. Joseph, Marshall, Starke, Newton,
 Jasper, Pulaski, Fulton, Benton, White,
 Cass, Miami, Howard, Carroll, Warren,
 Tippecanoe, Clinton, Tipton, Hamilton,
 Boone, Montgomery, Fountain.

D.S.—J. Ralston Miller, 354 Calumet Ave., Ham-
 mond, 9CP
 C.M.—P. O. Libbe, 744 N. Allen St., SOUTH
 BEND, 9AKD
 C.M.—W. F. Lanterman, KOKOMO, 9AVO
 O.R.S.—9BON, 9DVK, 9RLC, 9BBJ, 9AGR, 9AIU,
 9AKD, 9DEK, 9MM, 9DSS.

Southern Indiana (Dists. No. 3 to No. 5.)
 A.D.M.—J. E. Hall, Seymour Electric Co., Sey-
 mour, 9ASJ

Dist. No. 3.—Counties: Knox, Daviess, Martin,
 Lawrence, Jackson, Clark, Floyd, Washing-
 ton, Harrison, Orange, Crawford, Perry,
 Dubois, Jennings, Ripley, Dearborn, Ohio,
 Switzerland, Jefferson, Scott, Spencer, Pike,
 Gibson, Posey, Vanderburg, Warrick.

C.M.—M. E. Druly, 317-20th St., RICHMOND, 9PD
 O.R.S.—9PD, 9AMO.

Dist. No. 4.—Counties: Marion, Johnson,
 Brown, Monroe, Green, Owen, Clay, Sullivan,
 Vigo, Parke, Vermillion, Putnam, Hen-
 dricks, Morgan.

D.S.—C. J. Kniel, 285 N. Tremont St., Indiana-
 polis, 9BCT
 C.M.—Dudley Andrews, R. R. B1 Box 267 L.,
 INDIANAPOLIS, 9EAD
 O.R.S.—9NH, 9EAD, 9PF, 9DXE, 9UR, 9YJ, 9BCT,
 9BJR, 9RCW, 9RVZ.

Dist. No. 5.—Counties: Hancock, Henry,
 Wayne, Union, Fayette, Rush, Shelby,
 Bartholomew, Decatur, Franklin.
 D.S.—C. J. Butler, Crothersville, 9DYU
 O.R.S.—9DYU, 9ALP, 9ARR, 9DIS, 9BRK.

Kentucky (Dists. No. 1 and 2.)
 A.D.M.—J. A. Kolb, 1101 E. Broadway, Louisville,

Dist. No. 1.—Counties: Fulton, Hickman,
 Carlisle, Ballard, McCracken, Graves, Callo-
 way, Marshall, Livingston, Lyon, Crittenden,
 Trigg, Caldwell, Union, Henderson,
 Webster, Hopkins, Christian, Todd, Muhlen-
 berg, McLean, Daviess, Ohio, Butler, Logan,
 Hancock, Simpson, Warren, Allen, Edmond-
 son, Grayson, Meads, Hardin, Breckinridge,
 LaRue, Hart, Barren, Monroe, Metcalfe,
 Green, Adair, Taylor, Marion, Nelson, Wash-
 ington, Bullitt, Spencer, Shelby, Jefferson,
 Oldham, Henry, Trimble.

D.S.—C. L. Pflumm, 1944 Deerwood Ave., Louis-
 ville, 90X
 C.M.—Eddie Smith, 688 E. 39th St., LOUISVILLE,
 9GX
 O.R.S.—90X.

Dist. No. 2.—Counties: Clinton, Russell,
 Casey, Boyle, Mercer, Anderson, Franklin,
 Henry, Carroll, Gallatin, Owen, Scott, Wood-
 ford, Jessamine, Lincoln, Pulaski, Wayne,
 McCreary, Whitley, Laurel, Rockcastle,
 Garrard, Madison, Clark, Bourbon, Harrison,
 Grant, Boone, Kenton, Campbell, Pendleton,
 Fayette, Bracken, Robertson, Nicholas,
 Bath, Montgomery, Powell, Estill, Jackson,
 Clay, Knox, Bell, Harlan, Leslie, Owsley,
 Lee, Wolfe, Menifee, Rowan, Fleming, Mason,
 Lewis, Morgan, Magoffin, Letcher, Perry,
 Greenup, Carter, Boyd, Elliott, Lawrence,
 Johnson, Martin, Floyd, Knott, Pike.

D.S.—J. C. Anderson, Glengarry Farm, Lexington, 9EI
 C.M.—E. V. Kesheimer, 311 Madison Pk., LEXINGTON, 9ASE
 C.M.—Aloys Depenbrock, 1023 Russell Ave., COVINGTON, 9APS
 C.M.—T. D. Phillips, WINCHESTER, 9DRQ
 C.M.—A. C. Hengelbrok, 910 Washington Ave., NEWPORT
 O.R.S.—9DRQ, 9EP, 9EI, 9APS, 9ASE, 9BOO, 9AWF, 9LH.

Michigan (Dist. No. 1 to No. 6.)

A.D.M.—C. E. Darr, 137 Hill Ave., Highland Pk., Detroit, 8ZZ

Dist. No. 1.—Counties: Cheboygan, Presque Isle, Alpena, Alcona, Iosco, Arenac, Bay, Huron, Tuscola, Sanilac, Genesee, Lapeer, St. Clair, Livingston, Oakland, Macomb, Washtenaw, Wayne, Lenawee, Monroe.
 D.S.—E. D. Fallain, 321-1st Ave., Flint, SAND ARBOR, 8BXA
 C.M.—E. W. Esslinger, 123 Chapin St., ANN ARBOR, 8BXA
 C.M.—E. G. Boyes, 688 W. Willis St., DETROIT, 8BY
 C.M.—J. C. Fountain, 2633 Walnut St., PORT HURON, 8CAZ
 C.M.—G. R. Cowing, Box 47, FLINT, 8AHO
 O.R.S.—8AAR, 8RGT, SAHO, 8BDO, 8CBO, 8BXA, 8CAA, 8BDR, 8DI, 8BBI, 8KI, 8DAT, 8AB, 8ADY, 8ATX, 8AMS, 8CDD, 8BWY, 8CE, 8DIL.

Dist. No. 2.—Counties: Otago, Montmorency, Kalkaska, Crawford, Oscoda, Missaukee, Roscommon, Ogemaw, Osceola, Clare, Gladwin, Mecosta, Isabella, Midland, Montcalm, Gratiot, Saginaw, Ionia, Clinton, Shiawassee, Barry, Eaton, Ingham, Kalamazoo, Calhoun, Jackson, St. Joseph, Branch, Hillsdale.
 D.S.—M. H. Pancost, 1101 Climax Ave., Lansing, 8ZF
 C.M.—G. Partridge, 521 Nimmons St., SAGINAW, 8BP
 O.R.S.—8DKC, 8CPY, 8QQ, 8BGJ, 8CED, 8JJ, 8BYT, 8CGJ, 8BWS, 8ANZ, 8BYF, 8RGT, 8YN, 8VY.

Dist. No. 3.—Counties: Emmet, Charlevoix, Antrim, Leelanau, Grand Traverse, Benzie, Manistee, Wexford, Mason, Lake, Oceana, Newaygo, Muckwonago, Kent, Ottawa, Allegan, Van Buren, Cass, Berrien.
 C.M.—Chas. E. Holmes, 310 W. Brown St., GRAND RAPIDS, 8ZAG
 O.R.S.—8RCY, 8CP, 8RTL, 8BUC, 8BGO.

Dist. No. 4.—Counties: Ontonagon, Gogebic, Houghton, Iron, Baraga, Marquette, Dickinson, Menominee, Delta, Schoolcraft, Luce, Mackinac, Chippewa, Alger, Keweenaw.
 D.S.—G. C. Blee, 500 Jackson St., Keweenaw, O.R.S.—9BTC, 9DRR, 9CWI, 9RMQ, 9AEN, 9AXN, 9BOH, 9AJU, 9DWV, 9OL, 9CGE, 9CE, 9DWR.

Ohio (Dist. No. 1 to No. 6.)

Dist. No. 1.—Counties: Williams, DeFiance, Paulding, Van Wert, Mercer, Fulton, Henry, Putnam, Allen, Auglaize, Lucas, Wood, Hancock, Hardin, Logan.
 D.S.—E. E. Nichols, 739 Weadock Ave., Lima, 8AA
 C.M.—R. D. Greenwald, 316 E. Tyler St., VAN WERT, 8AZA
 C.M.—D. W. Pinkerton, 3020 Council St., TOLEDO, 8KQ
 O.R.S.—8CIE, 8FU, 8BEJ, 8AA, 8KQ, 8BZQ.

Dist. No. 2.—Counties: Ottawa, Sandusky, Seneca, Wyandott, Marion, Morrow, Crawford, Erie, Huron, Richland, Knox, Lurain, Ashland, Medina, Wayne.
 D.S.—Itead Gebhardt, 38 No. Pleasant St., Norwalk, 8BCE
 C.M.—Chas. C. Whysall, 1173 E. Center St., MARION, 8CMI
 O.R.S.—8BFH, 8LT, 8BXX, 8YAE, 8SM, 8BCE, 8DRM, 8IJ, 8ASV, 8BOZ, 8CMY.

Dist. No. 3.—Counties: Cuyahoga, Summit, Lake, Geauga, Portage, Ashtabula, Trumbull, Mahoning.
 D.S.—P. A. Marsal, 1527 Lakeland Ave., Lakewood, 8AY
 C.M.—J. J. Planty, 710 Warren Ave., NILES, 8ANW
 C.M.—J. D. Bay, 640 W. Jackson St., PAINESVILLE, 8TT
 C.M.—V. D. Gettys, 204 Oak St., WARREN, 8AWY
 C.M.—W. F. Worden, 476 Merriman Rd., AKRON, 8BWA
 C.M.—D. Dominzi, 3097 W. Blvd., CLEVELAND, 8CUR
 C.M.—R. S. Munsell, 191 Center St., ASHTABULA, 8HS
 O.R.S.—8VL, 8EBY, 8RY, 8ADA, 8CZN, 8DAE, 8WY, 8RFQ, 8RWA, 8CYT, 8PD, 8BNH, 8AWX, 8HS, 8BVR.

Dist. No. 4.—Counties: Darke, Preble, Butler, Hamilton, Shelby, Miami, Montgomery, Warren, Claremont, Champaign, Clarke, Greene, Clinton, Brown, Madison, Fayette.
 D.S.—L. E. Furrow, Troy, 8FT
 C.M.—E. P. Getter, R. D. No. 3, DAYTON, 8AIM
 C.M.—R. M. Blair, 218 W. 12th St., CINCINNATI, 8EB
 C.M.—A. R. Harvey, 1029 Christel Ave., MIDDLETOWN, 8AHY
 O.R.S.—8AWN, 8BDO, 8EB, 8CKV, 8CVH, 8BYO, 8AHY, 8ANB, 8CNR, 8DAG, 8AQT, 8UC, 8CVD, 8CND, 8AIZ

Dist. No. 5.—Counties: Delaware, Franklin, Pickaway, Union, Ross, Highland, Adams, Scioto, Pike, Locking, Fairfield, Perry, Hocking, Athens, Vinton, Jackson, Meigs, Gallia, Lawrence.
 D.S.—M. F. McDowell, 612 Mithoff St., Columbus, 8EC
 C.M.—J. G. Martin, 12 E. Innis Ave., COLUMBUS, 8TJ
 O.R.S.—8GZ, 8CJZ, 8AKP, 8BEK, 8BBH, 8BXH, 8AER, 8BYN, 8AJX, 8ZAF.

Dist. No. 6.—Counties: Holmes, Coshocton, Muskingum, Morgan, Washington, Noble, Guernsey, Tuscarawas, Stark, Columbiana, Carroll, Harrison, Jefferson, Belmont, Monroe.
 C.M.—R. W. Waller, CAMBRIDGE, 8DJ
 C.M.—H. L. Ley, CANTON, 8ZV
 O.R.S.—8JU, 8BML, 8CRC, 8AL, 8BKW, 8ZG, 8ABE.

Wisconsin (Dist. No. 1 to No. 5.)

A.D.M.—B. A. Ott, c/o Sezelke & Kohlhaus Mfg. Co., La Crosse 9ZY

Dist. No. 1.—County: Milwaukee.
 D.S.—C. N. Crapo, 1175-2nd St., Milwaukee, 9VD
 C.M.—M. H. Doll, 602-64th Ave., WEST ALLIS, C.M.—I. Strassman, 1064-38th St., MILWAUKEE, 9AHO
 O.R.S.—9CKW, 9AAP, 9CVI, 9OT, 9ATO.

Dist. No. 2.—Counties: Kenosha, Racine, Waukesha, Dodge, Jefferson, Walworth, Rock, Dane, Columbia, Iowa, Grant, Lafayette, Green.
 D.S.—K. C. Maas, 223 Jefferson St., Whitewater, 9AZA
 C.M.—Stan Fisher, 1508 Fleet Ave., RACINE, O.R.S.—9EY, 9XM, 9EGW, 9CPT, 9EAR, 9CHK, 9AZA, 9CWP, 9EGH

Dist. No. 3.—Counties: Ozaukee, Washington, Sheboygan, Fond du Lac, Green Lake, Marquette, Waushara, Winnebago, Calumet, Manitowoc, Kewaunee, Brown, Oneida, Outagamie, Waupaca, Portage, Shawano, Oconto, Door, Marinette, Langlade, Lincoln, Forest, Florence, Vilas.
 D.S.—M. J. Bishop, 133 Merritt St., Oshkosh, 9DHG
 C.M.—E. Platten, 218 N. Oakland Ave., GREEN BAY,

C.M.—M. J. Bishop, 133 Merritt St., OSHKOSH, 9DHG.
 C.M.—H. J. Steffen, 1611 N. 8th St., SHEBOYGAN.
 O.R.S.—9ALJ, 9BQG, 9CJI, 9BCH, 9DCT, 9BVA, 9CZY, 9ARC, 9DHG.

Dist. No. 4—Counties: Crawford, Richland, Sauk, Vernon, LaCrosse, Monroe, Juneau, Adams, Wood, Jackson, Tremeleau, Buffalo, Clark, Eau Clair, Pepin, Pierce, Croix, Dunn, Chippewa, Taylor.

D.S.—A. D. Sanial, 608 S. 4th St., La Crosse, 9AZN
 C.M.—E. Benton, 222 Main St., LA CROSSE, 9CWR
 O.R.S.—9EIL, 9DFA, 9BKC, 9AKY, 9AZN, 9CWR, 9ZY, 9BLF.

Dist. No. 5—Counties: Polk, Barron, Rusk, Price, Sawyer, Washburn, Burnett, Iron, Ashland, Bayfield, Douglass, Apostle Island.

D.S.—H. D. Jones, St. Croix Falls, 9GD
 C.M.—Robert White, SUPERIOR.

DAKOTA DIVISION

Minnesota, North Dakota, South Dakota.

D.M.—N. H. Jensen, Box 394, Sioux Falls, S. D.

Minnesota (Dist. No. 1 to No. 3.)

A.D.M.—D. G. Wallace, 64 N. Penn. Ave., Minneapolis, 9ZT.

Dist. No. 1—Counties: Aitkin, Becker, Beltrami, Carlton, Cass, Clay, Clearwater, Cook, Crow Wing, Douglas, Grant, Hubbard, Itasca, Kanabec, Kittson, Koochiching, Lake Mahanomen, Pennington, Pine, Polk, Red Lake, Marshall, Mille Lacs, Norman, Ottertail, Roseau, St. Louis, Todd, Traverse, Wadena, Wilkin, Morrison.

D.S.—James Hayes, 705 E. 5th St., Duluth, 9GW
 C.M.—W. M. Edmont, 1530 Minnesota Ave., DULUTH, 9ADF
 O.R.S.—9CDV, 9DUQ, 9ADF, 9BAF, 9BAV, 9FH, 9ZC, 9EA, 9GW, 9CMJ, 9ABB, 9EAU, 9BMR.

Dist. No. 2—Counties: Anoka, Benton, Blue Earth, Brown, Carver, Chippewa, Chisago, Cottonwood, Dakota, Dodge, Faribault, Fillmore, Freeborn, Goodhue, Houston, Isanti, Jackson, Kandiyohi, Lac Qui, Parle, Le Sueur, Lincoln, Lyon, McLeod, Martin, Meeker, Mower, Murray, Nicollet, Nobles, Olmstead, Pipestone, Pope, Redwood, Renville, Rice, Rock, Scott, Sibley, Sherburne, Stearns, Steele, Swift, Wabasha, Waseca, Washington, Watona, Wright, Yellow Medicine, Big Stone, Stevens.

D.S.—H. R. Skifter, St. Olaf College, Dept of Physics, Manitou Heights, Northfield, 9YAV.
 C.M.—E. J. Caveny, Main St., LUVERNE, 9CDR
 O.R.S.—9MF, 9BVI, 9DMA, 9BBF, 9CDR, 9YAJ, 9QF.

Dist. No. 3—Counties: Hennepin, Ramsey.

D.S.—M. G. Goldberg, 711 Dayton Ave., St Paul, 9APW
 C.M.—L. C. Smeby, 1504 W. Broadway, MINNEAPOLIS, 9AUL
 C.M.—W. C. Hilgedick, 2191 Knapp St., ST. PAUL, 9AUA
 O.R.S.—9CXP, 9BTT, 9CIP, 9APW, 9AWS, 9IG, 9BTL, 9DGE, 9DAW, 9DGV, 9AUA, 9DAG, 9BKJ, 9ZT, 9AUL.

South Dakota (Dist. No. 1 and No. 2.)

A.D.M.—O. Wheeler, 500 E. Capitol Ave., Pierre, 9AVZ.

Dist. No. 1—Counties: Aurora, Bon Homme, Brule, Buffalo, Clay, Charles Mix, Davison, Douglas, Hanson, Hutchinson, Jeraud, Lake, Lincoln, McCook, Minnehaha, Moody, Miner, Sanborn, Turner, Union, Yankton.

D.S.—Adolph Saha, Salem, 9BOF
 C.M.—F. B. Christopherson, 731 W. 12th St., SIOUX FALLS, 9AIG

O.R.S.—9BOF, 9AIF, 9AYW, 9CXV, 9DKQ, 9YAK, 9CKT.

Dist. No. 2—Counties: Armstrong, Beadle, Bennett, Brookings, Brown, Butte, Campbell, Clark, Codington, Corson, Day, Deul, Dewey, Edmunds, Fall River, Faulk, Grant, Gregory, Haakon, Hamlin, Hand, Hughes, Hyde, Jackson, Jones, Kingsbury, Lawrence, Lyman, Marshall, McPherson, Meade, Potter, Mellette, Pennington, Perkins, Roberts, Shannon, Spink, Stanley, Sully, Todd, Tripp, Washabaugh, Washington, Walworth, Zieback, Harding.

D.S.—Leland Thompson, Winner, 9BRI
 C.M.—A. H. Rosvold, 324 Third Ave., N. W., ABERDEEN, 9ASF
 C.M.—W. W. Elymer, 811 Douglas Ave., VANKTON, 9CXV
 O.R.S.—9CGA, 9YW, 9DWN, 9ADX, 9BRI, 9ASF, 9AVZ, 9CTS.

North Dakota (Dist. No. 1 and No. 2.)

A.D.M.—Bert Wick, 835 Broadway, Fargo, 9AEJ.

Dist. No. 1—Counties: Barnes, Benson, Bottineau, Cass, Cavalier, Eddy, Foster, Grand Forks, Griggs, Nelson, Pierce, Pembina, Ramsey, Ransom, Richland, Rollette, Sargent, Steele, Towner, Traill, Walsh.

D.S.—K. M. Hance, 831-3rd Ave. No., Fargo, 9GK
 C.M.—L. H. Weeks, 123 Broadway, FARGO, 9UH
 C.M.—J. A. Gargrave, ANETA, 9DIF
 O.R.S.—9GK, 9UH, 9AEJ, 9DLF, 9ADZ, 9EBT.

Dist. No. 2—Counties: Adams, Billings, Bowman, Burke, Dickey, Burleigh, Divide, Dunn, Emmons, Golden Valley, Grant, Hettinger, Kidder, La Moure, Logan, McHenry, McIntosh, McKenzie, McLean, Mercer, Morton, Mountrail, Oliver, Renville, Sheridan, Sioux, Slope, Stark, Stutsman, Ward, Wells, Williams.

D.S.—Harold Demmer, Ellendale, 9AHC
 O.R.S.—9FX, 9DOC, 9BFQ, 9ABU, 9AHC.

DELTA DIVISION

Arkansas, Louisiana, Mississippi, Tennessee.

D.M.—W. W. Rodgers, 1106 Union Ave., Memphis, Tenn., 5RZ.

Tennessee (Dist. No. 1 and No. 2.)

A.D.M.—W. C. Hutcheson, Wind Rock, 5DA

Dist. No. 1—Counties: Bedford, Benton, Cannon, Cheatham, Carroll, Chester, Coffee, Crockett, Davidson, Decatur, DeKalb, Dickson, Dyer, Fayette, Franklin, Gibson, Giles, Hardeman, Hardin, Haywood, Henderson, Henry, Hickman, Houston, Humphreys, Lake, Marshall, Maury, Moore, Montgomery, Obion, Perry, Robertson, Shelby, Rutherford, Smith, Stewart, Sumner, Tipton, Trousdale, Wayne, Weakley, Williamson, Wilson, Lawrence, Lewis, Lincoln, Macon, McNairy, Madison.

D.S.—A. L. Cowles, 1101 Vance Ave., Memphis, 6NZ
 C.M.—W. L. Wellford, Jr., 359 McLane Blvd., MEMPHIS,
 C.M.—S. R. Lanier, 1210 Gallatin Rd., NASHVILLE, 5AAB
 O.R.S.—5EK, 5ER, 5RZ, 5NZ, 5ZB, 5MO, 5ALV, 5PV.

Dist. No. 2—Counties: Anderson, Bledsoe, Blount, Bradley, Campbell, Carter, Claiborne, Clay, Cocke, Cumberland, Fentress, Grainger, Greene, Grundy, Hamblen, Hancock, Hamilton, Hawkins, Jackson, Jefferson, Johnson, Knox, Loudon, Marion, Meigs, McMinn, Monroe, Morgan, Overton, Pickett, Polk, Putnam, Rhea, Roane, Scott, Sequatchie, Sevier, Sullivan, Union, Van Buren, Warren, Washington, White.

D.S.—M. B. Painter, 624 Carlisle St., Chattanooga, 5MB

C.M.—S. E. Adcock, 2000 Washington Ave., KNOX-VILLE, 5WO
 C.M.—W. F. Gamble, 239 East Main St., CHAT-TANOOGA,
 O.R.S.—5WS, 5DA, 5MB.

Mississippi (Dist. No. 1 and No. 2.)

A.D.M.—W. L. Kennon, University Post Office, Mississippi, 5YE

Dist. No. 1—Counties: Alcorn, Attala, Bolivar, Calhoun, Carroll, Benton, Chickasaw, Choctaw, Clay, Coahoma, DeSoto, Grenada, Holmes, Humphreys, LaFayette, Lee, Lowndes, Marshall, Monroe, Montgomery, Itawamba, LeFlore, Noxubee, Oktibbaha, Panola, Pontotoc, Prentiss, Quitman, Sunflower, Tallahatchie, Tate, Tippah, Tishomingo, Tunica, Union, Washington, Webster, Winston, Yalobusha.

D.S.—S. D. Wooten, Jr., Coldwater, 5AGG
 O.R.S.—5AGG, 5YE, 6TX, 5AIR, 5NJ.

Dist. No. 2—Counties: Adams, Amite, Claiborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Green, Hancock, Harrison, Hinds, Jackson, Issaquena, Jasper, Jefferson-Davis, Jones, Kemper, Lamar, Leake, Lauderdale, Lawrence, Neshoba, Madison, Marion, Lincoln, Newton, Pearl River, Perry, Pike, Rankin, Scott, Sharkey, Simpson, Smith, Stone, Walthall, Warren, Wayne, Wilkinson, Yazoo.

D.S.—Henriques & Janin, Pass Christian, 5KR
 O.R.S.—5KR.

Arkansas (Dist. No. 1 and No. 2.)

A.D.M.—Dr. L. H. Hunter, 307½ Main St., Little Rock, 5XAB.

Dist. No. 1—Counties: Arkansas, Ashley, Baxter, Bradley, Calhoun, Chicot, Clay, Cleburn, Cleveland, Graighead, Crittenden, Cross, Dallas, Desha, Drew, Fulton, Grant, Green, Independence, Izard, Jackson, Jefferson, Lawrence, Lee, Lincoln, Lonoke, Mississippi, Monroe, Phillips, Poinsett, Prairie, Pulaski, Randolph, Sharp, St. Francis, Stone, White, Woodruff.

D.S.—T. J. M. Daly, 1200 Ninth St., N. Little Rock, 5DQ
 C.M.—H. J. Bell, 1501 Main St., LITTLE ROCK, 5ZR
 O.R.S.—5DQ.

Dist. No. 2—Counties: Benton, Boone, Carroll, Clarke, Conway, Columbia, Crawford, Faulkner, Garland, Franklin, Hempstead, Howard, Hot Springs, Johnson, LaFayette, Little River, Logan, Madison, Marion, Miller, Montgomery, Nevada, Newton, Perry, Pike, Polk, Pope, Ouachita, Searcy, Scott, Saline, Sebastian, Sever, Union, Van Buren, Washington, Yell.

D.S.—B. H. Woodruff, Conway.
 C.M.—Paul Shultz, FT. SMITH, 5ALM

Louisiana (Dist. No. 1 and No. 2.)

A.D.M.—Vincent L. Rosso, Box 415, Plaquemine, 5KC

Dist. No. 1—Counties: Abovailles, Bienville, Bossier, Cad, Caldwell, Carroll, Catahoula, Claiborne, Concordia, DeSoto, Franklin, Grant, Jackson, LaSalle, Lincoln, Madison, Morehouse, Natchitoches, Rapides, Red River, Richland, Sabine, Tensas, Union, Vernon, Wenster, West Carroll, Winn.

C.M.—A. Bateman, SHREVEPORT.
 C.M.—Chas. A. Freitag, NEW ORLEANS, 5UK.

Dist. No. 2—Counties: Acadia, Allen, Ascension, Assumption, Baton Rouge, Beauregard, Calcasieu, Cameron, East Baton Rouge, East Feliciana, Evangeline, Iberville, Jefferson Davis, Iberia, LaFayette, LaFourche, Livingstone, Orleans, Plaquemine, Point Coupee, St. Bernard, St. Charles, St. Helena, St. James, St. John the Baptist, St. Landry,

St. Martin, St. Mary, St. Tammany, Tangipahoa, Terre Bonne, Vermillion, Washington, West Feliciana.

C.M.—A. S. Webre, BATON ROUGE, 5AAT
 O.R.S.—5RH, 5ZAC, 5RC, 5ABA, 5ABH.

MIDWEST DIVISION

Iowa, Kansas, Missouri, Nebraska.
 D.M.—G. S. Turner, Southwestern Bell Tel. Co., Rm. 611, Tel. Bldg., Kansas City, Mo.

Iowa (Dist. No. 1 and No. 2.)

A.D.M.—D. E. Watts, 502 N. Fourth St., Clear Lake, 5ARZ
 R.M.—A. Paone, 606 S. E. First St., Des Moines, 9BSG.

Dist. No. 1—Counties: 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, Decatur.

D.S.—D. L. Bailey, 525 Keenliworth St., Clinton, 9CS
 C.M.—E. F. Havens, 1307 Des Moines St., DES MOINES, 9BIF
 C.M.—C. S. Tunwall, 11th and 1st Ave., N., FT. DODGE, 9UL
 C.M.—R. H. Williamson, 715 S. Iowa Ave., EAGLE GROVE, 9AHH
 O.R.S.—9CS, 9AEQ, 9ZA, 9RVL, 9DXC, 9RGL, 9AOU, 9AHH, 9ATN, 9BSG, 9CLQ, 9BCF, 9DAH, 9UL, 9BSZ, 9BIF, 9BRS, 9FK.

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

D.S.—M. H. Decker, 310 N. Georgia Ave., Mason City, 9DKY
 C.M.—J. E. Decker, 119 Second St., S. E., MASON CITY, 9AMI
 C.M.—P. Lovett, R No. 1 Jersey Ridge Rd., DAVENPORT, 9BGT
 O.R.S.—9CHN, 9EDR, 9BGH, 9ARZ, 9YA, 9DOE, 9AMI, 9DKY, 9BFG, 9CXP, 9BTK, 9AMU, 9BZL.

Kansas (Dist. No. 1 and No. 2.)

A.D.M.—L. J. Simms, 218 S. Sedgwick St., Wichita, 9CWC
 R.M.—Clifford Peters, Tonganoxie, 9DTA

Dist. No. 1—Counties: Cheyenne, Sherman, Wallace, Rawlins, Thomas, Logan, Decatur, Sheridan, Cove, Marion, Graham, Trezo, Phillips, Rooks, Ellis, Smith, Osborne, Russell, Jewell, Mitchell, Lincoln, Ellsworth, Republic, Cloud, Kitowa, Saline, Washington, Clay, Dickinson, Marshall, Riley, Geary, Morris, Nemaha, Brown, Pottawatomie, Wabousee, Jackson, Shawnee, Donphan, Atchison, Jefferson, Leavenworth, Douglas, Wyandotte, Johnson.

D.S.—E. Beardmore, Clasco, 9AEY
 C.M.—A. E. Meditz, 623 Sandusky Ave., KANSAS CITY, 9CKM
 O.R.S.—9DEF, 9CCV, 9BHN, 9CKM, 9DTA, 9AOG, 9EET, 9AOD, 9CZW, 9CKM.

Dist. No. 2—Counties: Greeley, Hamilton, Stanton, Morton, Wichita, Kearny, Grant, Stevens, Scott, Finney, Haskell, Seward, Lane, Gray, Meade, Ness, Hodgemen, Ford, Clark, Rush, Pawnee, Edward, Kiowa.

Comanche, Barton, Stafford, Harper, McPherson, Harvey, Sedgwick, Sumner, Marion, Butler, Cowley, Chase, Lyon, Chautaugua, Greenwood, Elk, Osage, Coffey, Woodson, Wilson, Montgomery, Franklin, Anderson, Allen, Noosho, Miami, Labette, Linn, Bourbon, Crawford, Cherokee.

D.S.—Clifford Rogers, 226 East 6th St., Hutchinson, 9ABV
 C.M.—V. Roberts, 1241 Perry Ave., WICHITA, 9CCZ
 O.R.S.—9CWC, 9CCZ, 9AIM, 9DUN, 9BZZ, 9CJE, 9ABV, 9DUG.

Missouri (Dist. No. 1 and No. 2.)

A.D.M.—Dr. C. L. Klenk, 420 Metropolitan Bldg., St. Louis, 9AAU.

Dist. No. 1—Counties: Schuyler, Scotland, Clarke, Adair, Knox, Lewis, Macon, Shelby, Marion, Randolph, Monroe, Ralls, Andrain, Pike, Boone, Calloway, Montgomery, Lincoln, Warren, St. Charles, Moniteau, Cole, Miller, Osage, Maries, Gasconade, Franklin, St. Louis, Jefferson, Camden, Laclede, Polaski, Phelps, Crawford, Washington, St. Francois, Ste. Genevieve, Perry, Wright, Texas, Dent, Shannon, Iron, Reynolds, Wayne, Madison, Balingier, Cape Girardeau, Douglas, Ozark, Howell, Oregon, Carter, Ripley, Butler, Stoddard, Scott, Dunklin, New Madrid, Mississippi.

D.S.—Paul Chamberlin, 735 Hazel St., Maplewood, 9DZY
 C.M.—W. F. Schoening, 6010 Gravois Ave., ST. LOUIS, 9DXN
 O.R.S.—9ACB, 9DAE, 9BLG, 9DZY, 9BDS, 9AON, 9YM, 9DWK, 9DXN, 9EKF, 9AOJ, 9CVO, 9AWT, 9EFC, 9ALX, 9AAU.

Dist. No. 2—Counties: Atchison, Nodaway, Polk, Andrew, Platt, Buchanan, Worth, Gentry, KeKolb, Clinton, Clay, Jackson, Cass, Bates, Vernon, Barton, Jasper, Newton, McDonald, Harrison, Daviess, Ray, Caldwell, Lafayette, Johnson, Henry, St. Clair, Cedar, Dade, Lawrence, Berry, Mercer, Putnam, Grundy, Sullivan, Livingston, Lynn, Carroll, Charlton, Seline, Howard, Pettis, Cooper, Benton, Morgan, Hickory, Polk, Dallas, Greene, Webster, Christian, Stone, Taney.

D.S.—Boyd Laizure, 5544 Highland Ave., Kansas City, 9RR
 C.M.—Boyd Laizure, 5544 Highland Ave., KANSAS CITY, 9RR
 C.M.—Duncan Cox, 1027 Messanie St., ST. JOSEPH, 9ANO
 C.M.—H. Schnur, Eastmoreland Pl., JOPLIN, 9CHEJ
 O.R.S.—9FM, 9RR, 9RKK, 9BMN, 9AYL, 9ANO, 9CES, 9DCW, 9AUK, 9CHEJ, 9CTG.

Nebraska (Dist. No. 1 and No. 2.)

A.D.M.—J. G. O'Rourke, 3064 South 32nd St., Omaha, 9HT
 R.M.—R. E. Norene, 2404 Crown Point Ave., Omaha, 9CPB

Dist. No. 1—Counties: Sioux, Dawes, Box Butte, Sheridan, Cherry, Grant, Arthur, Hooker, McPherson, Thomas, Logan, Keyapaha, Brown, Rock, Blaine, Loup, Custer, Boyd, Holt, Garfield, Valley, Buffalo, Sherman, Wheeler, Greeley, Howard, Knox, Antelope, Boone, Nance, Cedar, Wayne, Dixon, Dakota, Thurston, Pierce, Madison, Stanton, Cumming, Burt, Platte, Colfax, Dodge, Saryp, Washington, Douglas.

D.S.—Lon Chansky, 2141 South 35th St., Omaha, 9ATC
 C.M.—P. H. Quinby, Benson Gardens, OMAHA, 9DXY
 C.M.—P. C. Rohwer, 2041 "K" St. Lincoln, 9AYS
 O.R.S.—9DXY, 9VE, 9ASO, 9DSM, 9AYS, 9CPB.

Dist. No. 2—Counties: Scotts Bluff, Banner, Kimbal, Morrill, Deuell, Cheyenne, Garden, Deith, Perkins, Chase, Dundy, Lincoln,

Hitchcock, Frontier, Red Willow, Dawson, Gosper, Furnas, Phelps, Harlan, Kearney, Franklin, Hall, Adams, Webster, Merrie, Hayes, Hamilton, Clay, Nuckolls, Polk, York, Filmore, Thayer, Butler, Sward, Seline, Jefferson, Saunders, Lancaster, Gage, Cass, Otoe, Johnson, Pawnee, Richardson, Nemaha.

D.S.—P. Palmer, 3145 "S" St., Lincoln, 9DNC
 O.R.S.—9DNC, 9AHV, 9BXT.
 * (R.M.) Route Manager.

NEW ENGLAND DIVISION

Connecticut, Maine, New Hampshire, Massachusetts, Rhode Island, Vermont.

D.M.—I. Vermilya, 23 N. Water St., New Bedford, Mass., 1ZE
 E.A.—Helen R. Xavier, 355 County St., New Bedford, Mass.

Connecticut (Dist. No. 1 to No. 8.)

A.D.M.—J. L. Reinartz, 371 Hartford Rd., So. Manchester, 1QP.

Dist. No. 1—County: Fairfield.

D.S.—H. E. Nichols, 531 Pequonnock St., Bridgeport, 1BM
 O.R.S.—1AJP, 1BYM, 1CJA, 1AYZ, 1ADJ.

Dist. No. 2—County: New Haven.

D.S.—A. Lawson, 10 Dikeman St., Waterbury, 1UJ
 C.M.—A. Lawson, 10 Dikeman St., WATERBURY, 1UJ
 O.R.S.—1BMS, 1CJZ, 1TL, 1AWB, 1CGV, 1UJ, 1FY.

Dist. No. 3—County: Hartford.

O.R.S.—1CGZ, 1BAG, 1BTU, 1AB, 1CBS, 1BHQ, 1APC, 1WC, 1VK, 1CKP, 1MY, 1BIY, 1BOQ, 1BGF, 1QP, 1AW.

Dist. No. 4—County: Litchfield.

O.R.S.—1OV, 1QO.

Dist. No. 5—County: Middlesex.

O.R.S.—1KV.

Dist. No. 6—County: Tolland.

Dist. No. 7—County: Windham.

Dist. No. 8—County: New London.

O.R.S.—1AYU, 1AWI, 1FD, 1CR.

Maine (Dist. No. 1 to No. 6.)

A.D.M.—L. H. Hilton, 20 Wood St., Lewiston, 1BRQ

Dist. No. 1—Counties: Oxford, Androscoggin.

D.S.—Perley Woodman, 63 School St., Auburn, 1BQW
 O.R.S.—1CTP, 1BQW.

Dist. No. 2—Counties: Cumberland, York.

D.S.—P. S. Hill, Jr., 334 Main St., Saco, 1BAS
 O.R.S.—1BAS, 1CKQ, 1BQL.

Dist. No. 3—Counties: Penobscot, Piscataquis, Aroostook.

D.S.—F. E. Handy, 414 H. H. Hall, U. of M., Orono, 1BDI
 O.R.S.—1BDI.

Dist. No. 4—Counties: Sagadahoe, Lincoln, Knox.

D.S.—J. M. Pomeroy, Jr., 75½ Court St., Bath, Me., 1ACO
 O.R.S.—1UL, 1BZS, 1ACO, 1BSJ.

Dist. No. 5—Counties: Washington, Hancock.

D.S.—W. R. Dresser, Main St., Calais, 1VT
 O.R.S.—1VT, 1CDO.

Dist. No. 6—Counties: Franklin, Somerset, Waldo, Kennebec.

D.S.—Robert Parker, 6 N. Belfast St., Augusta, 1VT.

Eastern Massachusetts (Dists. No. 1 and No. 2.)
A.D.M.—P. F. Robinson, 149 Hollis Ave., Braintree, 1CK.

Dist. No. 1—Counties: Essex, Middlesex.
D.S.—A. V. Johnson, 137 Lawton Ave., Lynn, 1DY
C.M.—P. F. Robinson, 149 Hollis Ave., BOSTON, Braintree, 1CK
O.R.S.—1DY, 1CPI, 1LL, 1BFA, 1CBJ, 1AAC, 1CJR, 1BDU, 1SK, 1CNI, 1SN, 1LK, 1AGS, 1ER, 1CIT.

Dist. No. 2—Counties: Norfolk, Bristol, Barnstable, Dukes.
D.S.—P. F. Robinson, 149 Hollis Ave., Braintree, 1CK
O.R.S.—1ANA, 1MD, 1COT, 1XK, 1ZE, 1RR, 1BBM, 1OR, 1AIR, 1AQY, 1BMF.

Western Massachusetts (Dists. No. 3 to No. 7.)
A.D.M.—A. S. McLean, 585 Armory St., Springfield, 1JQ
E.A.—Helen D. Daniels, 288 Main St., Springfield.

Dist. No. 3—County: Berkshire.
D.S.—F. D. White, 54 Oxford St., Pittsfield, 1ARF

Dist. No. 4—County: Hampden.
D.S.—R. A. Nystrom, 336 Elm St., West Springfield, 1IL
C.M.—R. F. Weller, 86 Broad St., WESTFIELD, 1BLN
O.R.S.—1AWW, 1AOJ, 1BVR, 1BSJ.

Dist. No. 5—County: Hampshire.
D.S.—F. H. Bloom, 682 East St., Holyoke, 1CMK
C.M.—R. Hebert, NORTHAMPTON, 1CHJ
O.R.S.—1CGR.

Dist. No. 6—County: Franklin.
D.S.—S. H. Nichols, 22 Union St., Greenfield, 1BSZ

Dist. No. 7—County: Worcester.
D.S.—Lee A. Bates, 3 Blodgett Pl., Worcester, 1GY
O.R.S.—1JV, 1RV, 1ADN, 1AQM.

New Hampshire (Dists. No. 1 to No. 6.)
A.D.M.—H. R. McLane, Laconia, 1CM

Dist. No. 1—Counties: Coos, Grafton, Carroll.
D.S.—L. E. Sherman, Plymouth, 1BZP
O.R.S.—1BZP.

Dist. No. 2—Counties: Sullivan, Merrimack.
D.S.—G. A. Hall, Roscawen, 1CSS
O.R.S.—1CSS, 1ATJ.

Dist. No. 3—Counties: Cheshire, Hillsboro.
D.S.—Wm. Smith, 72 Oak St., Manchester, C.M.—B. H. Stevens, 118 Brook St., MANCHESTER, 1MC
O.R.S.—1GL, 1MC.

Dist. No. 4—County: Belknap.
D.S.—H. R. McLane, Laconia, 1CM
C.M.—Clifton Kemp, Garden St., CONCORD, 1BNR
O.R.S.—1BNK, 1CQL.

Dist. No. 5—Counties: Strafford, Rockingham.
D.S.—Neal Dow, 17 Lincoln St., Exeter, 1CQJ
O.R.S.—1CQJ, 1AEQ.

Rhode Island (Dists. No. 1 to No. 3.)
A.D.M.—D. B. Fancher, 86 Franklin St., Westerly, 1BVB.

Dist. No. 1—County: Providence.
D.S.—F. S. Huddy, 204 Bowen St., Providence, 1II
C.M.—N. B. Stackpole, 139 Pratt St., PROVIDENCE, 1OW
O.R.S.—1AMD, 1ABC, 1CSW, 1APG, 1BSD, 1BES, 1OW, 1ET, 1AQU, 1AXR, 1GV, 1II, 1AWE.

Dist. No. 2—Counties: Kent, Washington.
D.S.—D. B. Fancher, 86 Franklin St., Westerly, 1BVB
O.R.S.—1AML, 1ANX, 1CBP, 1BVB.

Dist. No. 3—Counties: Bristol, Newport.
D.S.—G. N. Mathewson, 39 Rhode Island Ave., Newport, 1BQD
C.M.—G. N. Mathewson, 39 Rhode Island Ave., NEWPORT, 1BQD
O.R.S.—1BHK, 1BQD, 1ALZ.

ONTARIO DIVISION

D.M.—A. H. K. Russell, 11 Pinewood Ave., Toronto, Ont., Canada

Northern Ontario District
D.S.—W. N. Sutton, 223 S. Archibald St., Fort William, 3NI
C.M.—A. M. Hale, 166 Kohler St., SAULT STE MARIE, 3BG
O.R.S.—3NI, 3BG, 3SL.

Western Ontario District
D.S.—H. L. Byerley, 154 Rankin Blvd., Sandwich, C.M.—Wm. Carter, 512 Niagara St., WINDSOR, 3DH
C.M.—L. W. Sproule, 115 S. Mitton St., SARNIA, 3AD
O.R.S.—3GN, 3NB.
C.M.—Harold Jackson, 183 King St. E., CHATHAM, 3KO
O.R.S.—3LB, 3AEO.
C.M.—Frank Moyer, 9 Charles St. N., ST. THOMAS, 3FA
O.R.S.—3UD.
C.M.—C. H. Langford, 258 Cheapside St., LONDON, 3XN
O.R.S.—3LW, 3UJ, 3ADN, 3ACY.
C.M.—P. T. Fleisher, Thames St. N., INGERSOLL, 3ADT
O.R.S.—3KG.
C.M.—G. W. Newland, LEAMINGTON, 3GB
O.R.S.—3VW.

Central Ontario District.
D.S.—Niagara District, S. F. Haggood, 276 Lundy's Lane, Niagara Falls, 3TL
C.M.—W. Choat, 241 Robert St., TORONTO, 3CO
O.R.S.—3GK, 3GE, 3FO, 3DE, 3OH, 3ML, 3IN, 3OJ, 3ADJ, 3YW, 3JI, 3JK, 3PG, 3ZS, 3JT, 3EY, 3BV, 3YJ, 3AL, 3BA, 3ADA, 3ZT, 3EL, 3RV, 3GI.
C.M.—H. S. Gowan, 120 King St. W., KITCHENER, 3DS
O.R.S.—3BQ, 3YH, 3WG, 3AA, 3SP, 3AP, 3OY, 3IF, 3HT, 3JL, 3KP, 3KA, 3BZ, 3ACJ, 3MY, 3MM, 3XX, 3BS, 3TL.

Eastern Ontario District.
D.S.—O. Donnelly, 118 Wellington St., Kingston, 3HE
C.M.—J. P. Henderson, 88 Rosemont Ave., OTTAWA, 3AF
O.R.S.—9CC, 3MP, 3HE, 3IL, 3NF.

PACIFIC DIVISION

Arizona, California, Nevada.
D.M.—J. Vance Wise, Walnut Grove, Calif., 8ZX

Arizona (All one District)
A.D.M.—H. L. Gooding, Box, 176, Douglas, 6ZZ
C.M.—E. A. Nielsen, 115 So. 21st Ave., PHOENIX, 6BBH
O.R.S.—6ZZ, 6BRH.

California (Dists. No. 1 to No. 8.)
A.D.M.—E. C. Garrette, Coluso, 6CC

Dist. No. 1—Counties: San Diego, Orange, San Bernardino, Imperial, Riverside.
D.S.—L. Picker, San Ysidro, 6ZH
C.M.—W. J. Beran, 217 Beech St., SAN DIEGO, 6AGR
O.R.S.—6AGR, 6AGP, 6ZH, 6ZB.

Dist. No. 2—Counties: Los Angeles, Kern, Ventura, Santa Barbara, San Loui, Obispo, Kings, Tulare.
D.S.—H. A. Duvall and O. Esler, 4963 Wadsworth St., Los Angeles, 6EN
C.M.—D. Gardner, 515 El Centro St., S. PASADENA, 6OD

C.M.—C. F. Filkstead, 2010-6th Ave., LOS ANGELES, 6CU
 C.M.—A. B. Lopez, 720 Barbara St., SANTA BARBARA, 6AAK
 O.R.S.—6AAK, 6OD, 6CU, 6ALP, 6ALU, 6EN, 6ALK.

Dist. No. 3—Counties: Fresno, Ingo, Mono, Madera, Marispa, Tuolumne, Alpine.
 D.S.—R. H. Potts, Riverbank, 6AME
 C.M.—M. P. Potts, FRESNO, 6AVV
 O.R.S.—6AVV, 6BIH.

Dist. No. 4—Countries: San Mateo, Santa Cruz, Santa Clara, Stanislaus, Merced, San Benito, Monterey.
 D.S.—A. A. Hunt, 122 Market St., Los Gatos, 6VX
 C.M.—F. J. Quement, 51 Pleasant St., SAN JOSE, 6NX
 O.R.S.—6CEI, 6NX, 6TU, 6VX, 6ACM, 6BPL.

Dist. No. 5—Counties: San Francisco, Marine, Mendocino, Sonoma.
 D.S.—H. Molinari, 653 Union St., San Francisco, 6AWT
 C.M.—A. Martini, 3948-26th St., SAN FRANCISCO, 6CHL
 O.R.S.—6ZD

Dist. No. 6—Counties: Alameda, Napa, Solano, Contra Costa.
 D.S.—E. A. Poage, 143-15th St., Richmond, 6HP
 C.M.—C. Steffen, 1615 Arch St., BERKELEY, 6EX
 C.M.—P. W. Dann, 562-36th St., OAKLAND, 6BFL
 O.R.S.—6AOR, 6HP, 6BFL, 6QV, 6BIQ.

Dist. No. 7—Counties: Sacramento, San Joaquin, Sutter, Eldorado, Placer, Yolo, Sierra, Nevada, Yuba, Calaveras, Amador.
 D.S.—Ernest Staats, 2318 "P" St., Sacramento, 6GF
 C.M.—Edward Anderson, 1905 "L" St., SACRAMENTO, 6GR
 C.M.—R. A. Adams, 2060 E. Main St., STOCKTON, 6KM
 O.R.S.—6GR, 6GF, 6ABX, 6PH, 6AK.

Dist. No. 8—Counties: Del Norte, Humboldt, Siskiyou, Trinity, Glenn, Lake, Colusa, Shasta, Tehama, Modoc, Lassen, Plumas, Butte.
 D.S.—G. H. Lavender, Willows, 6LU
 O.R.S.—6TC, 6CC.

Nevada: (All one district.)
 A.D.M.—G. M. Lewis, 211 West St., Reno, 6QR
 C.M.—R. L. Ray, 91 Court St., RENO, 6AJR
 O.R.S.—6AJR, 6BIP.

ROANOKE DIVISION

North Carolina, Virginia, West Virginia.
 D.M.—W. T. Gravely, 854 Main St., Danville, Va. 3BZ
 E.A.—A. S. Clarke, 393 Pine St., Danville, Va. 3AEV

North Carolina (Dists. No. 1 to No. 4.)
 A.D.M.—T. M. Simpson, Peoples Natl. Bank, Winston.

Dist. No. 1—Counties: Ashe, Allegany, Surry, Stokes, Wilkes, Rockingham, Watauga, Yadkin, Forsythe, Guilford, Randolph, Iredell, Davie, Alamance, Caswell.
 D.S.—R. R. Linville, 13th St., Winston-Salem, 4CX
 C.M.—R. N. Day, Spring St., SALEM, 4NV
 O.R.S.—4LD, 4FA, 4EN, 4NV, 4DQ, 4DC, 4GX.

Dist. No. 2—Counties: Mitchell, Avery, Caldwell, Alexander, Catawba, Rutherford, Haywood, Burke, Cherokee, Clay, Cleveland, Graham, Henderson, Jackson, Lincoln, McDowell, Macon, Madison, Polk, Rutherford, Transylvania, Swain, Yancey.
 D.S.—E. A. Jackson, Jr., Box 1008, Ashville, 4GH
 O.R.S.—4DS, 4GH, 4MW, 4MI.

Dist. No. 3—Counties: Davidson, Rowan, Stanley, Mecklenburg, Cabarrus, Mont-

gomery, Union, Anson, Richmond, Scotland, Gaston, Hope, Moore, Cumberland, Robeson.
 D.S.—J. H. Robertson, c/o W. C. Public Service Co., Salisbury, 4ID
 O.R.S.—4ID.

Dist. No. 4—Counties: Beaufort, Bertie, Bladen, Brunswick, Camden, Carteret, Chatham, Chowan, Columbus, Craven, Dare, Currituck, Duplin, Durham, Edgecombe, Franklin, Gates, Greene, Granville, Halifax, Harnett, Hertford, Hyde, Johnston, Jones, Lee, Lenoir, Martin, Nash, New Hanover, Northampton, Onslow, Orange, Pamlico, Pender, Pasquotank, Perquimans, Person, Pitt, Tyrrell, Vance, Wake, Warren, Washington, Wayne, Wilson, Samson.

D.S.—G. S. Smith, 107 N. Sixth St., Wilmington, C.M.—D. McR. Parsley, Box 113, WILMINGTON, 4FT
 O.R.S.—4FT, 4BX, 4EA, 4NT, 4MP.

Virginia (Dists. No. 1 to No. 10.)
 A.D.M.—J. F. Wohlford, 118 Cambridge Ave., Roanoke, 3CA.

Dist. No. 1—Counties: Princess Anne, Norfolk, Isle of Wight, Nansemond, Curry, Warwick, Elizabeth City, York, Northampton, Accomac.
 D.S.—H. Kreskin, 1044 Highland Ave., Norfolk, 3BNE
 O.R.S.—3BVC, 3BLG, 3ADJ, 3MK, 3ACE, 3BVB, 3ATZ.

Dist. No. 2—Counties: Southampton, Greensville, Brunswick, Mecklenburg, Sussex, Lunenburg, Nottoway, Dinwiddie, Prince George, Chesterfield.
 D.S.—Raymond J. Carr, 617 Union Ave., Petersburg, 3HMN
 C.M.—R. E. Decker, 555 Halifax St., PETERSBURG, 3SG
 O.R.S.—3ABS, 3ATB, 3BCH.

Dist. No. 3—Counties: Henrico, Charles City, James City, New Kent, Gloucester, Mathews, Middlesex, King and Queen, King William, Hanover.
 D.S.—W. C. O'Brien, Jr., 706 W. Carey St., Richmond, 3MO
 O.R.S.—3BQX, 3MO, 3BVL, 3AJG, 3BIJ, 3JY.

Dist. No. 4—Counties: Charlotte, Prince Edward, Amelia, Cumberland, Powhatan, Goochland, Caroline, Spotsylvania, Essex, Louisa.
 D.S.—O. M. Selph, Westhampton Station, Richmond, 3TJ
 O.R.S.—3NF, 3TJ, 3CEL.

Dist. No. 5—Counties: Northumberland, Richmond, Westmoreland, King George, Stafford, Prince William, Fauquier, Loudoun, Fairfax, Arlington, Lancaster.
 D.S.—D. W. Lewis, 3 S. Court St., Clarendon, 3IW
 O.R.S.—3SK, 3IW, 3BUY, 3BOF, 3CDY.

Dist. No. 6—Counties: Albemarle, Fluvanna, Clarke, Warren, Rappahannock, Gupeper, Greene, Madison, Orange, Alleghany.
 D.S.—F. T. Bradley, Crozet, 3BHL
 O.R.S.—3ALB, 3BHL, 3CBZ, 3HU, 3BFE.

Dist. No. 7—Counties: Frederick, Shenandoah, Page, Rockingham, Highland, Augusta, Nelson, Bath, Rockbridge, Craig.
 D.S.—H. L. Keller, 127 Fayette St., Staunton, 3ASP
 O.R.S.—3ZAA, 3ASP.

Dist. No. 8—Counties: Halifax, Pittsylvania, Henry, Franklin, Campbell, Bedford, Appomattox, Botetourt, Buckingham, Amherst.
 D.S.—C. M. Owen, Box 119, South Boston, 3APR
 O.R.S.—3BZ, 3APR, 3AEV.

Dist. No. 9—Counties: Patrick, Carroll, Grayson, Floyd, Roanoke, Montgomery, Pulaski, Wythe, Smyth.

D.S.—C. C. Higgins, Galax, 3HL
O.R.S.—3RF, 3HL, 3BIY, 3CA, 3BKX, 3BHS,
3AIR, 3CU.

Dist. No. 10—Counties: Lee, Wise, Scott,
Bland, Buchanan, Dickerson, Giles, Russell,
Tazewell, Washington.

D.S.—S. J. Gundry, Stonega, 3AOV
O.R.S.—3AOV

West Virginia (Dist. No. 1 to 6.)

A.D.M.—J. L. Bock, Main St., Farmington, 8AUE

Dist. No. 1—Counties: Hancock, Brooke,
Ohio, Marshall, Wetzell, Tyler, Doddridge,
Lewis, Harrison, Taylor, Preston, Monon-
galia, Marion.

D.S.—E. C. Jones, Jr., 522 Fairmont Ave., Fair-
mont, 8SP

C.M.—E. W. Weimer, 42 Poplar Ave., WHEEL-
ING, 8BSY-8ZW

O.R.S.—8SP, 8AUE, 8AQV, 8AFD, 8CHO, 8BQG,
8ZW, 8BTD, 8AMX, 8AQL, 8ASE, 8CGR, 8CHI,
8DES, 8DFM, 8BSY, 8BPU.

Dist. No. 2—Counties: Grant, Hardy, Mineral,
Hampshire, Morgan, Berkeley, Jefferson.

Dist. No. 3—Counties: Randolph, Harboure,
Tucker, Pendleton, Pocahontas, Webster, Upshur.
D.S.—Burr Stainaker, 210 Graham St., Elkins,
8CAY

O.R.S.—8CAY, 8DFP.

Dist. No. 4—Counties: Greenbrier, Nicholas,
Fayette, Raleigh, Summers, Monroe, Mercer,
McDowell, Wyoming.

D.S.—E. L. Murrill, Lewisburg, 8AMD
O.R.S.—8AMD.

Dist. No. 5—Counties: Kanawha, Clay, Put-
nam, Mason, Cabell, Wayne, Lincoln, Boone,
Logan, Mingo.

D.S.—G. L. Rhoads, St. Albans, 8AVW
O.R.S.—8AVW, 8BDB, 8BKE, 8ATC, 8AIP, 8ATP,
8CKM, 8CQH.

Dist. No. 6—Counties: Wood, Jackson, Roane,
Calhoun, Gilmer, Wirt, Richie, Pleasant,
Braxton.

D.S.—H. S. Morris, 1025 Mary St., Parkersburg,
8BDA
O.R.S.—8BDA.

ROCKY MOUNTAIN DIVISION

Colorado, Utah, Wyoming.

D.M.—N. R. Hood, 1022 S. Ash St., Casper, Wyo.,
7ZO

Colorado (Dist. No. 1 and No. 2.)

A.D.M.—J. L. Turre, c/o Fitzsimmons Hospital,
Denver, 9COW.

Dist. No. 1—Counties: Adams, Alamosa,
Arapahoe, Archuleta, Boulder, Chaffee,
Cheyenne, Clear Lake, Conejos, Costilla,
Delta, Denver, Dolores, Douglas, Eagle,
Elbert, El Paso, Fremont, Garfield, Gilpin,
Grand, Gunnison, Hinsdale, Jackson, Jeff-
erson, Kit Carson, Lake, LaPlata, Larimer,
Lincoln, Logan, Mesa, Mineral, Moffat,
Montezuma, Morgan, Montrose, Ouray,
Park, Phillips, Pitkin, Rio Blanco, Rio
Grande, Route, Saguache, San Juan, San
Miguel, Sedgwick, Summit, Teller, Wash-
ington, Weld, Yuma.

D.S.—P. M. Segal, Equitable Bldg., Denver, 9EEA
C.M.—D. L. Hathaway, 1575 Penn St., DENVER,
9AMB

O.R.S.—9COW, 9EEA, 9DHI, 9CFY, 9BUN, 9CAA,
9AMB, 9DTM, 9CCJ, 9BXA, 9BJ, 9RVO, 9XAQ,
9FV, 9BXM, 9QL, 9DTE, 9EKH, 9AZG.

Dist. No. 2—Counties: Baca, Bent, Crowley,
Custer, Huerfano, Kiowa, Las Animas,
Otero, Powers, Pueblo.

D.S.—M. O. Davis, 805 Carson Ave., La Junta,
9CDE
O.R.S.—9CDE, 9EAE.

Utah (Dist. No. 1 and No. 2.)

A.D.M.—H. C. Wilson, c/o The Desert News,
Salt Lake City, 6ZM

Dist. No. 1—Counties: Boxelder, Cache, Rich,
Weber, Morgan, Davis, Salt Lake, Summit
Toole.

D.S.—Art Johnson, P. O. Box 772, Salt Lake City,
6ZT

C.M.—H. Christensen, PROVO, 6ARU

C.M.—R. Flygare, 2421 Jefferson Ave., OGDEN,
6RE

C.M.—G. J. Quillman, 2264 Lincoln Ave., OGDEN,
6AEZ

O.R.S.—6APL, 6ZT, 6ZA, 6BLH, 6AEZ, 6RM,
6AFD, 6BOE, 6AWH, 6BUH, 6ZM, 6ZAM, 6RE.

Dist. No. 2—Counties: Wasatch, Duchesne,
Utah, Juab, San Pete, Carbon, Midlard,
Sevier, Emery, Grand, San Juan, Wayas,
Garfield, Piute, Iron, Washington, Kane.

D.S.—L. Seegmiller, Richfield, 6BKE

O.R.S.—6BKE, 6ATH, 6ATQ.

Wyoming (Dist. No. 1 to 2.)

A.D.M.—F. N. Mitchell, Box 575, Greybull, 7LU.

Dist. No. 1—Counties: Park, Big Horn, Sheri-
dan, Hot Springs, Washaki, Johnson, Natrona,
Niobrara, Campbell, Crook, Weston, Converse,
Niobrara.

O.R.S.—7LU, 7DH, 7AFW, 7ZV, 7ZO.

Dist. No. 2—Counties: Lincoln, Uinta, Fre-
mont, Sweetwater, Carbon, Albany, Platta,
Gushee, Laramie.

D.S.—C. H. Linsley, 809 University St., Larmie,
7GK

O.R.S.—7GK.

WEST GULF DIVISION

Oklahoma, Texas, New Mexico, (Mexico,
temporary.)

D.M.—F. M. Corlett, 2515 Catherine St., Dallas,
Texas, 5ZC.

New Mexico (Dist. No. 1 to No. 4.)

A.D.M.—L. Falconi, Box 421, Roswell, 6ZA

Dist. No. 1—Counties: Eddy, Chaves, Roose-
velt, Curry, Lincoln, Otero.

O.R.S.—5ZA.

Dist. No. 2—Counties: Torrance, Guadalupe,
Quay, Santa Fe, San Miguel, Mora, Union,
Colfax, Taos.

Dist. No. 3—Counties: Donna Anna, Socorro,
Sierra, Luna, Grant.

Dist. No. 4—Counties: Rio Arriba, Sandoval,
Bernallillo, Valencia, McKinley, San Juan.

Oklahoma (Dist. No. 1 to No. 4.)

A.D.M.—Chas. E. Whartenby, 211 News Bldg.,
Enid, 5ZM.

Dist. No. 1—Counties: Cimarron, Texas,
Beaver, Harper, Woods, Alfalfa, Grant, Kay,
Pawnee, Noble, Garfield, Major, Woodward,
Ellis, Roger-Mills, Dewey, Custer, Blain,
King Fisher, Canadian, Okla, Logan, Lin-
coln, Payne.

D.S.—H. G. Garman, Cloworth Apartments, Enid,
5ANF

C.M.—E. F. McMain, 427 E. Nelson St., OKLA-
HOMA CITY, 5KK

O.R.S.—5ZM, 5LB, 5ZZ, 5ZAT, 5KE.

Dist. No. 2—Counties: Osage, Nation, Wash-
ington, Nowata, Craig, Ottawa, Delaware,
Mayes, Rogers, Tulsa, Wagoner, Cherokee,
Adair, Sequoyah, Muckogee, McIntosh,
Okmulgee, Okfuskee, Creek.

D.S.—C. M. Selby, 225 So. 14th St., Muskogee,
5BM

O.R.S.—5RM, 5XBF, 5SG.

Dist. No. 3—Counties: Seminole, Hughes, Pittsburg, Haskell, DeFlore, Latimer, McCurtain, Choctaw, Pushmataha, Bryan, Atoka, Marshall, Johnson, Coal, Pontotoc.

O.R.S.—5AFU.

Dist. No. 4—Counties: Pottawatomie, Cleveland, Garvin, Murray, Carter, Love, Jefferson, Stephens, Grady, Caddo, Comanche, Cotton, Tillman, Jackson, Kiowa, Washita, Beckham, Greer, Harmon, McClain.

D.S.—D. H. Boyette, 111 N. 7th St., Lawton, 5DS
O.R.S.—5VM, 5TJ, 5DS, 5ZG, 5AGR.

Northern Texas (Dists No. 1 to No. 5.)

A.D.M.—R. L. Clinkscales, 3918 Hamilton St., Dallas, 5IE.

Dist. No. 1—Counties: Cooke, Denton, Tarrant, Dallas, Collin, Grayson, Fannin, Hunt, Kaufman, Van Zandt, Rains, Wood, Hopkins, Delta, Lamar, Red River, Franklin, Titus, Morris, Camp, Upshur, Bowie, Cass, Marion.

D.S.—Dale Hales, 2826 Anderson St., Greenville, 5ACQ

C.M.—Orville Yeary, Box 986, TARRANT COUNTY, FORT WORTH, 5QI

C.M.—B. S. Shields, 3514 Wellborne St., DALLAS, 5AJJ

O.R.S.—5KO, 5AHT, 5NY, 5IX, 5AER, 5EC, 5IS, 5AL, 5SF, 5DI, 5JL, 5DW, 5ACQ, 5NW, 5FX, 5GN, 5ALL, 5TU, 5ZC, 5TH, 5VA, 5QI, 5AHC, 5HY, 5AIC, 5AJJ, 5UD.

Dist. No. 2—Counties: Johnson, Hill, McClennan, Bell, Falls, Limestone, Navarro, Ellis, Henderson, Anderson, Freestone, Cherokee, Smith, Gregg, Ruck, Nacogdoches, Shelby, Panola, Harrison.

D.S.—W. B. Forrest, Jr., 502 Royal St., Waxahatchie, 5AJT
O.R.S.—5FA, 5AJT, 5FC, 5GA, 5UY, 5AFH.

Dist. No. 3—Counties: Hardeman, Foard, Knox, Haskell, Jones, Shackelford, Throckmorton, Baylor, Wilbarger, Wichita, Archer, Young, Stephens, Palo, Pinto, Jack, Clay, Montague, Wise, Parker.

D.S.—J. R. Martin, 1517-12th St., Wichita Falls, 5UO

O.R.S.—5LL, 5ZADA, 5UO.

Dist. No. 4—Counties: Taylor, Runnells, Coleman, Callahan, Eastland, Brown, Mills, Comanche, Erath, Hood, Hamilton, Coryell, Bosque, Lampasas.

D.S.—C. B. Baxter, Dublin, 5XAJ
O.R.S.—5RW, 5XAJ, 5NS.

Dist.—No. 5—Counties: Dallam, Sherman, Hansford, Ochiltree, Lipscomb, Hemphill, Roberts, Hutchinson, Moore, Hartley, Oldham, Potter, Carson, Gray, Wheeler, Deaf, Smith, Randall, Armstrong, Donley, Collingworth, Farmer, Castro, Swisher, Briscoe, Hall, Childress, Cottle, Motley, Floyd, Lamb, Raily, Cochran, Hockley, Lubbock, Crosby, Dickens, King, Stonewall, Kent, Garza, Lynn, Terry, Yoakum, Gains, Dawson, Borden, Scurry, Fisher, Nolon, Coke, Howard, Mitchell, Martin, Andrews.

D.S.—J. T. Martin, 805 East 4th Ave., Amarillo, 5ZH

O.R.S.—5ZH.

Southern Texas (Dists. No. 6 to No. 9.)

A.D.M.—E. A. Sahn, Box 569, New Braunfels, 5YK.

Dist. No. 6—Counties: Robertson, Leon, Houston, Angelina, San Augustine, Sabine, Newton, Jasper, Trier, Polk, Trinity, San Jacinto, Walker, Madison, Grimes, Brazos, Waller, Montgomery, Liberty, Hardin, Orange, Jefferson, Chambers, Harris, Galveston, Brazoria, Fort Bend.

D.S.—H. C. Sherrod, 1627 Ave "Z", Galveston, 5VY

C.M.—L. Peine, 1506 Rosalie Ave., HOUSTON, 5AE

O.R.S.—5ACR, 5VY, 5IM, 5JM, 5NN, 5XAD, 5BA, 5NK, 5XAB, 5AE, 5ZX, 5XV.

Dist. No. 7—Counties: Burnet, Williamson, Milam, Travis, Lee, Burleson, Washington, Austin, Fayette, Bastrop, Hays, Comal, Guadalupe, Caldwell, Gonzales, Lavaca, Colorado, Wharton, Jackson, Matagorda, Calhoun, Victoria, DeWitt, Colied, Wilson, Karnes, Bee, San Patricio, Refugio.

D.S.—W. H. Tilley, 4112 Ave. "F", Austin, 5ZU
O.R.S.—5ALR, 5JT, 5RN, 5KP, 5ZAI, 5TM, 5GR, 5YK.

Dist. No. 8—Counties: Ector, Midland, Glasscock, Sterling, Tom Green, Concho, McCulloch, San Saba, Llano, Mason, Menard, Schleicher, Reagan, Upton, Crockett, Irion, Crane, Pecos, Brewster, Terrell, Val Verde, Sutton, Edwards, Real, Kinney, Maverick, Dimmit, Zavala, Uvalde, Bandera, Kerr, Kimble, Kendall, Gillespie, Blanco, Bexar, Medina, Frio, LaSalle, Webb, Zapata, Atascosa, McMullen, Live Oak, Duvul, Dunn, Jim, Wells, Neuces, Kleberg, Kenedy, Books, Jim Hogg, Starr, Hidalgo, Willacy, Cameron.

D.S.—L. D. Wall, 216 Pereida St., San Antonio, 5ZAE

C.M.—J. L. Tyler, 943 Garden St., SAN ANTONIO, 5ES

O.R.S.—5AEW, 5JF, 5SS, 5MT, 5KG, 5ADI, 5MT, 5ZAE, 5ES, 5VO, 5RR, 5GE.

Dist. No. 9—Counties: El Paso, Culberson, Jeff Davis, Presidio, Reeves, Loving, Ward, Winkler.

D.S.—E. R. McCracken, 2117 Grant Ave., El Paso, 5ADB

C.M.—LeRoy Hill, 809 N. Oregon Ave., EL PASO, 5ZAD

O.R.S.—5JZ, 5DE, 5ZAD, 5RW, 5ADB.

NEW ZEALAND

(Concluded from page 30)

beginning with numerals (we know of 2s, 3s and 5s there). The amateurs of New Zealand recently conducted tests with the New South Welshmen and Victorians across the Tasman Sea, a distance of 1500 miles, and good communication was established in spite of the fact that many of the Australian stations, being located in Sydney and Melbourne near government stations, were restricted to an input of 10 or 12 watts. We can't do that in this country!

The Australasian Radio Relay League (another A.R.R.L.) has recently been formed, with headquarters in Sydney, and cooperative work between the two A.R. R.L.'s is now in process, looking to the establishment of two-way communication between our two continents as a result of the splendid success of the T/P Tests.

Another reason why we like New Zealand is that it is an offence punishable by a fine of £10 to operate a single-circuit tuner in that country. Boy, run page our Uncle Samuel quick!



INTERNATIONAL Amateur Radio

Australasian Radio Relay League Formed

A meeting of the radio amateurs having transmitting licenses was held in Sydney recently at which the Australasian Radio Relay League (A.R.R.L.) was formed. The organization was started under the auspices of the Wireless Institute of Australia (a technical body similar to the I.R.E. in this country) and its object is to organize a system of radio relay communication throughout the entire length and breadth of Australia and New Zealand. It is not the intention of the League to confine its operations to Australia and New Zealand, and once the organization is working smoothly the experimenters who have promoted it will try to arrange a system of relay communication between Australia and England, either via New Zealand and America or else via the North Coast of Australia and India.

Amateur radio is forging right ahead and rapid advances are being made. Mr. Bell of New Zealand, the picture of whose station appears in this issue, has outlined conditions over there in a very clear manner. "In New Zealand we have hardly got going yet," he says. "There are only about five of us transmitting, all with inputs below 50 watts, which is our legal limit. Our official wave lengths run from 140 meters, for beginners, up to 180 meters. I do not think there is much chance of our reaching the U.S.A. on fifty watts for some time, especially as receiving conditions with you are inferior to ours, although we are already working with Australian amateurs. In Australia amateur w/t (wireless telegraphy) is ahead of New Zealand in that they are freely issuing permits for transmission but as far as broadcasting goes they are well behind us, in fact there is practically nothing doing over there. The amateurs work mostly around 400 meters and if they are within five miles of a government radio station, are permitted only ten watts *input*. Even so, we have heard several of them over here in New Zealand on key and even voice. The distance is about 1500 miles. If Australian amateurs are a sufficient distance from a government station they are allowed 250 watts *input* and with this

power should soon be able to talk with the U.S.A.

"I am enclosing a list of calls heard to date and from time to time will send supplementary lists containing any fresh ones heard from now on. I have asked other New Zealand amateurs to do the same. It is too big a contract to write to all the Americans we hear, and at the same time it is up to all of us to let you Americans know when your signals are reaching out 6000 miles or more. Here's hoping that we will be able to talk with you over the air soon."

Australians Report Transpacific Tests

A preliminary report covering the recent *Transpacific Tests* has been received at QST factory, via the *Radio Journal*, from Mr. H. K. Love, chairman of the T-P test committee of the Wireless Institute of Australia. It tells us a great deal about the Australian end of the tests and includes a copy of the logs of stations 3JU, 3BQ, and 3BM, of Melbourne and vicinity. This log appears in the Calls Heard department of this issue.

"In all, twenty-three stations were heard. There are three third-district stations reported and if these reports are correct, the DX is wonderful, as it is nothing short of 10,000 miles from the U.S. third district to Melbourne. * * * * * There is no doubt that for steady consistency, 6CGW was by far the best. He came in as regular as a clock. For good strength and readable signals, 6JD had them all beaten. His strength at times was enormous.

"There is a range of mountains over which signals from the U.S. must pass before reaching Melbourne. New South Wales experimenters would have a big advantage over those in Victoria, it would seem, but so far they have not reported anything. Although South Australia amateurs did not officially join in the listening, it is reported that one of them in Adelaide had logged a station, 6JD, on one tube, an AV-24. This is surely something wonderful."

A few words as to the apparatus used by these three Australian amateurs in receiving the signals from the United States:

"3BQ, Maxwell Howden, was the winner of the Victorian prize for the best reception during the tests. His set consisted of two Phillips "R" valves as radio amplifiers and a soft valve as a detector. He plugged in a stage of reflex audio when conditions would allow. 3JU, Messrs. Hiam and Hull, who were second, used four stages of radio, using Mullard valves and an old two-filament 'tron as a detector. Audio amplification was found to be useless on long distance work."

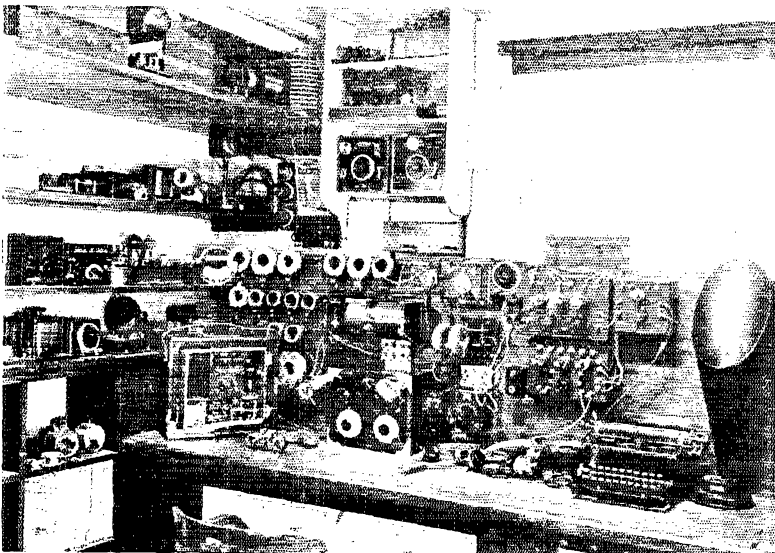
Nothing was especially built for the tests at 3BM, the station of Mr. H. K.

of your men, in the next tests it will be more like 123."

—H. Kingsley Love,
For Transpacific Test Committee.

Hollanders Preparing for Winter Tests

The Netherlands Society for Radiotelegraphy, the Dutch amateur organization, has formed a special committee to deal with all tests undertaken by its members during the coming season. It is hoped that, through this committee, Dutch amateurs will play an important part in the coming winter's Transatlantic Tests.



THE BEST AMATEUR RECEIVING STATION IN THE WHOLE WORLD!
The station of Mr. F. Dillon Bell, Shag Valley Sta., Waihemo, Otago, New Zealand, undoubtedly holds the world's record for the reception of amateur signals. Previous to July 2nd he heard over 87 different U.S. and Canadian amateurs; all over 6,000 miles distant! On the evening of July 1st, in two hours listening, he heard signals from EVERY DISTRICT IN THE U.S.! A set using two stages of radio, detector, and two stages of audio amplification is used; all apparatus evidently of British make.

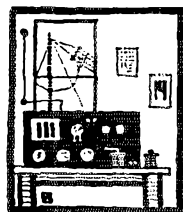
Love, the idea being to endeavor to get signals from the U.S. on an ordinary 3-tube set using two stages of tuned radio-frequency amplification and a detector. "The circuit employed is given herewith. The circuits used at 3JU and 3BQ were similar, except that BQ used a stage of reflex at times, and 3JU used four stages of radio instead of two as shown."

"There were other stations who got something, but not enough to be of use. In our opinion the transpacific tests have proven the greatest success on record. We hope that we will make this an annual event and we feel sure that, while we have done remarkably well to have heard 23

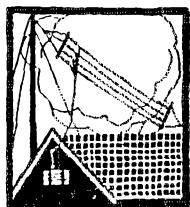
Transmission is not yet permitted in Holland so the chief interest of the Dutch amateurs is in receiving. Nevertheless, steps are being taken to obtain permission from the government to have at least one good station on the air during the tests. We sincerely hope that this permission will be granted and that we will have the opportunity of hearing a Dutch station this winter.

France Has New Radio Laws

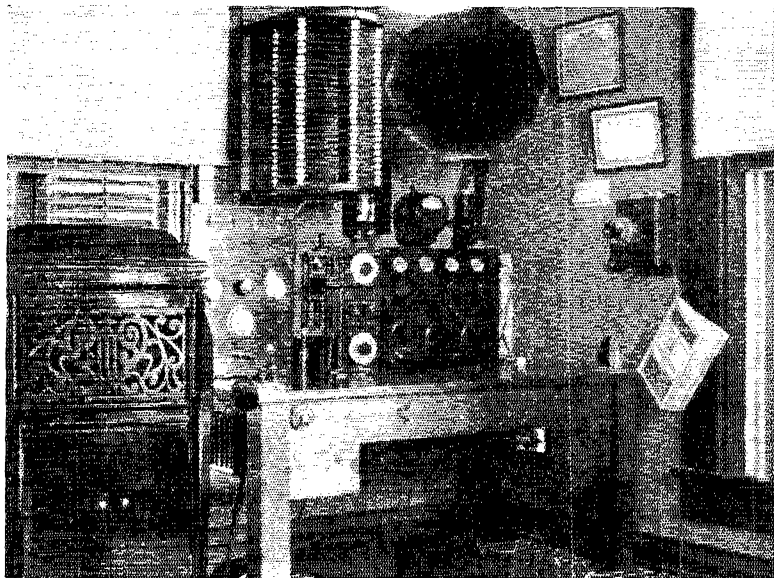
The French Postal administration has just promulgated a new decree regarding radio, many of the provisions of which concern the transmitting amateur. A band
(Concluded on page 51)



Amateur Radio Stations



5ZX — A Storage-Battery-Operated Station



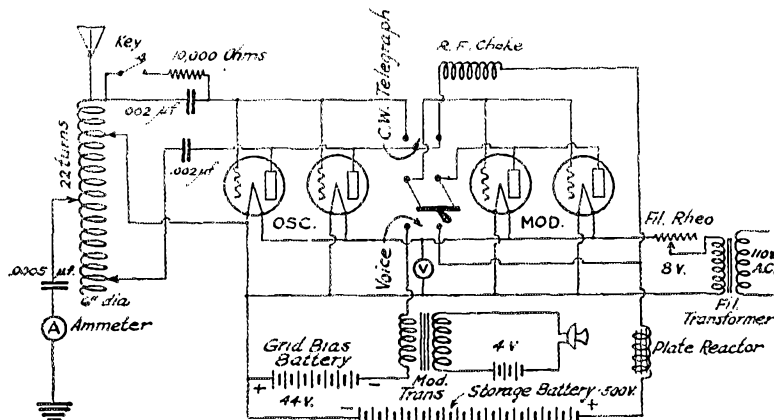
5ZX as a C.W. station made its debut in September, 1921, just after A. P. Daniel, the owner, returned from the First National Convention at Chicago. At the Convention he was among the lucky ones who brought back home a few souvenir prizes; an Acme detector unit and a Murdock variometer. Arriving home, the first use of the instruments that presented itself was to try out a very simple one-tube fone. A Quaker Oats box fulfilled the requirements and became the form for the inductance. A few turns of annunciator wire were wound upon it and a Murdock 43 plate variable condenser was placed inside. For power supply the A.C. source had no appeal to the builder, so he obtained five dozen test tubes and some sheet lead and constructed a "high voltage" battery of the storage type. *QST* published photographs of the simple set and of the home-made power unit in the issue of December, 1921.*

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

The real merit of this small fone set, and the writer's opinion for the continued popularity of the transmitter at 5ZX, is the fact that at no time has there ever been any other than absolutely *pure D.C.* used for power. Mr. T. A. Willard of Cleveland, Ohio, became interested through the mention in *QST* and corresponded with 5ZX regarding the advantages of a storage battery for plate supply. Soon 5ZX was the proud possessor of 256 cells of Willard storage battery developing a voltage of 536 volts. By the time this battery arrived, the transmitter had expanded into a set using two 5-watt oscillators and two 5-watt modulators with a switch for changing over to four 5-watt oscillators for relay work. A home-built Tungar rectifier is used for charging the high voltage battery and a lamp bank of 6 carbon-filament 32-candle-power lamps is used as the regulating resistance. By means of a simple arrangement, the eight crates of storage cells are cut-in in multiple when being charged.

It has been found that a charge of about 48 hours every month is sufficient to keep the battery in perfect condition. The cells never gas excessively and it is not necessary to remove the vent plugs when charging. Flexible connectors with clips are used to assemble the battery in series again when the charging period is finished. A charg-

ten-foot section of ordinary 3-inch plain downspouting, with tailor-made sleeves of the same galvanized material, 30 inches long, into which each section fits snugly. Stove bolts are passed through the center of each sleeve before assembling, and to these the No. 14 guy wires are fastened. Many visitors at the station have declared



WIRING OF THE TRANSMITTER AT 5ZX-WCAK

ing rate of 1/4 ampere is used, although when starting a higher rate is satisfactory and shortens the charging time with no bad effects.

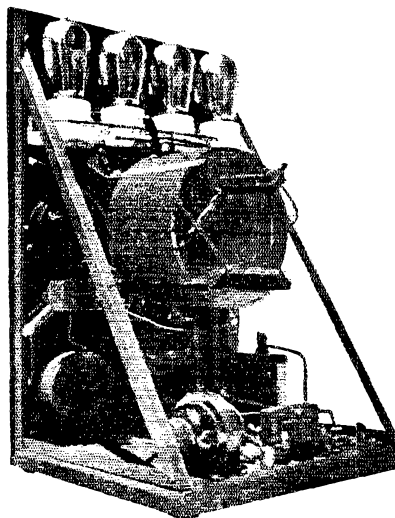
The transmitter instruments, as can be seen in the illustrations, are assembled on a panel 12 by 18 inches and a baseboard 12 by 12 inches. A Weston 0-1000 voltmeter, a Weston 0-1.5 thermo-ammeter, and a Jewell filament voltmeter are the only things on the front of the panel, with the exception of a small D.P.D.T. switch for quick change from fone to telegraph. A single rheostat controls the filaments of the tubes. An old Marconi loading inductance was used for long waves under the special license before the new regulations entered into effect.

The antenna system consists of a 24-inch cage, 75-foot top, with a 55-foot lead-in, both cages having six wires of No. 14 tinned stranded copper. A well is used for a ground connection; also every available waterpipe and piece of metal in the vicinity. 5ZX would much prefer a counterpoise but, because of several nearby buildings and the irregular placing of the masts, a counterpoise has so far been impractical. The usual antenna current is 1.5 amperes on 200 meters.

Possibly no one feature of the station has attracted so much attention as the "tin mast." The mast stands 62 feet high with the appearance of a single pipe without a joint. It was constructed in 1919 at a cost of \$17.00 and is made up of six

it to be the best appearing mast they have ever seen.

The only difficulty noticed when using storage battery for power is the fact that the fellow at the other end is not careful



enough in his tuning and, more times than often, jumps over the keen blade of 5ZX's wave. Although the work done by this station has been entirely satisfactory, if

the operator could only be a night-owl 5ZX would have some more records. The voice of 5ZX is much better known than the C.W. signals because a daily schedule has been

transmitted for the Houston Radio Club. This has been reported twice in Canada. The maximum distance reported on C.W. is 1610 miles; on voice 1360 miles.

8AWP, Syracuse, N. Y.



8AWP is a "HE" station, of which S. Woodworth, A.D.M. for Western New York, is the "main guy."

There are two transmitters at 8AWP, as can be seen in the photograph. The large panel on the operating table has five 50-watt tubes behind it while the other set, spread out on the table to the right, utilizes one 250-watt UV-204 tube in the Hartley circuit.

The latter set is the one that has accomplished most of the records held by the station. It was this transmitter that was heard in England on the first night of last winter's transatlantic tests and has been copied by ship operators off the coast of Chile, seven degrees north of the equator and 120 degrees west longitude. 8AWP is heard consistently on the west coast and in the Hawaiian Islands. The motor-generator for this big set is located in the basement. It consists of a 2-H.P. induction motor belted to what used to be a 6/10-K.W. Telefunken motor-generator set. The motor of the Telefunken unit acts as a generator and excites the fields of the alternator which delivers approximately 300 volts at 500 cycles. The 500-cycle current is led to the operating room and is stepped up to 6,000 volts by the Westinghouse pole trans-

former on the table in the right of the picture. The current is then fed to the plate of the UV-204 tube at this voltage. The antenna current with this outfit is from 10 to 14 amperes, depending upon the supply voltage.

The panel transmitter on the left is arranged so that the five UV-203 tubes can be connected, two as oscillators, two as modulators, and one as a voice amplifier for phone work; or, they can all be connected in parallel for C.W. transmission. The antenna current is about 6 amperes on phone and 3 amperes on C.W. Very good results have been obtained on voice as the station has been reported heard, using this method of transmission, 2300 miles distant at sea, and many times within a smaller radius.

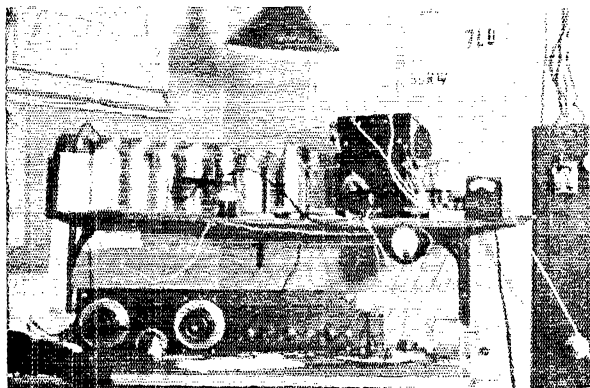
The antenna system at this husky station consists of a six-wire flat-top inverted-L supported at one end by a 65-foot steel tower in the rear of the house and at the other by a metal pole on the roof. A six-wire counterpoise ten feet high completes the radiating system.

A Paragon RA-10 with a General Electric detector and two-stage audio amplifier is the main receiving equipment. A four-stage radio-frequency amplifier sits on top

of the Paragon set but Woodworth did not tell us how it works, so we can only guess.

8AWP, as one of the Eighth District's best, has been heard in all sections of the

country and has worked both coasts many times. This winter Mr. Woodworth is looking forward to still better results.



8HJ, Elmira, N. Y.

Receiver: Home-made regenerative with 2 stage audio amplifier built similar to a Grebe CR-9.

Transmitter: Ten-watt set—reversed feedback circuit.

Radiating System: Antenna—6-wire cage, 18 inches in diameter. Height at ends, 50 and 25 feet. Counterpoise—5 wires ten feet high.

DX: C.W. sigs reported in all districts and in Porto Rico and Panama. All districts copied at SHJ, 6XAD has been worked

6BUM, Ukiah, Cal.

There is nothing bum about 6BUM except the call. Ever since the old spark days when 60H and 6AGF held forth, Ukiah has always had some good stations on the air. 6BUM, as one of the first ten stations to be heard in Australia during the recent tests, has done its part to uphold this reputation.

Lynn Wessels, the owner and operator, gives the following brief description of the station. The antenna at 6BUM is an inverted L, 60 feet long and 50 feet high. A counterpoise of ten wires is suspended directly under the antenna and ten feet above the ground. Two 50-watt tubes are used, oscillating in parallel in the



conventional Hartley circuit. A 1,000 volt Esco motor-generator supplies plate power. The antenna current at the time of the tests was 6.3 amperes. The receiver is a Grebe CR-8 with a two-stage amplifier and Baldies.

SIXTH DISTRICT CONVENTION!

Just as we were sliding this form on the press, some hot news reached us and we have junked a beautiful cartoon on this page to tell about it. The news is that the

San Francisco Radio Club (Affiliated) announces its Fourth Annual Convention in San Francisco on October 13, 1923. Representatives from amateur clubs thruout the Sixth District will meet for the purpose of formulating working plans for the coming year. The place is California Hall, Polk and Turk Sts., San Francisco. As a feature of entertainment, a real live amateur Radio Show will be held at California Hall on the evenings of Oct. 11, 12, and 13. The Convention meets at 2 P.M. on the 13th; and that night, Saturday, at 8 o'clock, there will be a big amateur banquet. For further details write at once to the Acting Secretary,

H. Tattenham, 316 Richland Ave., San Francisco

Radio Communications by the Amateurs

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



French Work on 45 Meters

Nice, France.

Editor, QST:

After reading about the 100 meter experiments in the July QST I realize that you might be interested in knowing what has been done lately in France in studying the very short waves.

The Central Department of Military Telegraphs has been transmitting regularly for some time past on 45 meters. The transmitter is located near Paris and is using C.W. The amateurs were asked to listen for the signals of this station (call letters "0045") and report. We all were delighted to have this opportunity of proving officially the usefulness of amateurism.

Some rather unusual hook-ups were recommended for reception of these very short waves. Personally I wondered why an ordinary method of reception, such as we amateurs are used to handle daily, would not do, and I started building the necessary coils. I was rather lucky in this work as these coils, although not calculated, were of the proper size at the very first attempt.

The set is an ordinary three coil set. The antenna coil is a single layer 5 centimeters (roughly 2 inches) in diameter wound with six turns. I found that there was no need of an aerial condenser or any kind of tuning of this circuit, and that the largest aerial available (my transmitting aerial whose fundamental is 220 meters) gave the strongest signals. This coil is simply resting on the grid coil which is a pancake of ten turns, inside diameter 3.5 centimeters (1 3/8 inches). The plate coil is similar to the aerial coil but consists of ten turns. It is more or less tightly coupled to the other two coils. The grid and plate coils are shunted by variable condensers of .00075 mf. maximum capacity. Their setting for the 45 meter wave is about ten degrees.

Down in Nice, 700 kilometers (435 miles) south of Paris, on this single valve receiver, signals from "0045" are readable five meters (about 16 feet) from the phones in broad daylight, and fifteen meters (about 50 feet) from the phones at night. There is very little QRN and no QSS. Nothing can be said about the transmitter now but I have all reasons to think that if it were working on 200 meters or more

with the same power it would be absolutely inaudible in Nice by daylight on a single valve.

Hope this may be of interest and wish, like all of you, that our respective governments would not take the very short waves away from us now that we amateurs have shown their value! Best 73's and hope to work many of you next winter.

Leon Delay (F8AB).

Some Hints on Spark Coil I.C.W.

West Philadelphia, Pa.

Editor, QST:

Here is some more dope for the spark coil I.C.W. gang. Many users of this type of transmitter have trouble in maintaining a good note from the vibrator on their coils. To remedy this condition I mounted an R.C.A. 34-segment chopper wheel on the shaft of a six-volt toy motor and used the chopper in place of the vibrator on the coil. The greater the speed of the motor the greater was the antenna current.

A condenser of about 2 microfarads must be connected across the wheel or the spark at the brushes will be very heavy and little or no current will be delivered by the secondary of the coil; which is a regulation Ford coil. With a one-microfarad condenser across the contacts the plate current on one five-watt tube was 15 mils, while with two microfarads across the contacts the current was 25 mils, which is about the highest the coil will supply.

Allan R. Muncey, 3ADI.

The Neutrodyne on 200

St. Andrews, N. B.

Editor, QST:

I have been using a neutrodyne set for amateur work for some time and find it quite superior to a straight regenerative set. For amateur signals a regenerative neutrodyne set with plate variometer is easy to handle, sensitive, and selective. This set has brought in more DX this summer, in spite of QRN, than a regenerative receiver did last winter. During two weeks a total of about two hundred amateur stations over 500 miles distant were heard, of which thirty-nine were over 1000 miles away. Last year under similar conditions with a Reinartz tuner less than one tenth of the number of stations were heard and none at any great distance.

By making the coil in the grid circuit of the first amplifier of the same number of turns as the secondary windings of the other neutroformers, and using the lower quarter of this coil as the antenna coil, good results are obtained. I can see no reason why the tuning condensers cannot be geared or coupled together on one shaft thus reducing the receiver to one tuning control and one oscillation control! I believe this receiver will become very popular for amateur reception in the course of time.

T. A. Smith, (U.S.) 2CSA.

What Does "Five Watts" Mean?

Woodhaven, Long Island.

Editor, QST:

I cannot understand why so many fellows insist that they are using five watts when they don't know what five watts mean. If they push 1100 volts and 100 milliamperes through a tube which was sold as a five-watter they certainly are not using only five watts. And then again, if these fellows are heard 5,000 miles, a claim of 1,000 miles per watt is not justified. In the old spark days we never measured watts-per-mile in that fashion. We measured it by our transformer input. Where do we get that 1,000-miles-per-watt stuff now that we have changed to C.W.?

If a fellow asks you how much power you are using, don't tell him a "five-watter". It means nothing. Tell him your plate circuit input in watts. I know at station 2MB there is an 18-watt input and a five-watt output of pure C.W. If I ever get out 18,000 miles, I'll tell the world that 1000 miles per watt was really and truly accomplished. However, so far I haven't heard from Heaven or Hades, so I'm doubtful about these fellows who claim they have worked 1,000 miles per watt. Just the same, I'd be tickled to get a report on 2MB's signals at any distance greater than 100 miles.

—Morris Preston, 2MB.

Hi!

Landsdowne, Pa.

Dear Eddy:

I may, after consideration, send you \$0.20 in paper marks for which please send me one (1) omnigraph as per your ad on cover of August QST. 73.

S. R. Warren, Jr.

INTERNATIONAL AMATEUR NEWS

(Concluded from page 45)

of wave lengths of from 180 to 200 meters has been assigned them and the only types of waves authorized are keyed continuous waves or continuous waves modulated by speech or musical sounds. The use of damped waves, or the feeding of the plate circuit of the tube with non-rectified or

insufficiently filtered current, is not permitted.

Argentinian Tests in View

Better get a Spanish dictionary and commence studying, OM, if you are to be one of the first to communicate with Argentinian amateurs in the near future. It has already been told on page 64 of the July QST* how stations of North American amateurs were heard in Argentina on several different occasions. This feat in reception has aroused a great interest down there and they are eagerly looking forward to holding some two-way tests.

We learn that amateur radio in this South American republic is quite different in many ways from amateur radio as we know it. Radio regulations in Argentina virtually do not exist, although the government has a commission studying the matter with a view to proposing some regulations. At present the only requirement in operating a transmitting station is that you apply for permission and sign a statement saying that you will not transmit on wave lengths above 600 meters and interfere with government or commercial stations. In practice even this is not always done, however. It would seem that a great deal of confusion would result on account of such unrestricted privileges; but this is not so, as the Argentinian amateurs are quite appreciative of their liberties and operate their stations in an orderly manner.

The *Radio Club Argentino*, which was formed scarcely two years ago, now has a membership throughout the republic of over seven hundred. Of these, there are approximately fifty who have tube sets on the air regularly of from 50 to 200 watts on wave lengths from 250 to 500 meters. There are also many others from 5 to 20 watts. Communication over distances up to 1500 miles is carried on quite often. Contrary to the situation in this country, the majority of the Argentinian amateurs prefer to work on fone and only a small percentage of them know the code. This condition is unfortunate as it will undoubtedly handicap them a good deal in the tests. Because no call letters have been assigned by the government, stations are known by the serial number of their membership in the *Radio Club Argentino*. For instance Mr. A. H. H. Christensen, who so kindly gave us this information on radio conditions in his country, was the twenty-third person to join the radio club. He is therefore known over the air as "23."

The secretary of the *Radio Club Argentino*, Sr. Eduardo F. Jacky, has been communicated with and it is hoped that something definite regarding the proposed tests can be announced next month.

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

Strays



This Actually Happened

Ham, (trying to get license for 150-200 meters): "— and my filter has a thirty-henry choke just like the one described in the last QST."

Assistant Inspector: "Thirty henry choke? No, you haven't; the Radio Corp'n doesn't make such a thing!"

Overheard at the Radio Club

First Ham: "Say, that ten-watt set you sold me is no good. It doesn't get out at all."

Second Ham: "'Sfunny. I heard you calling the moon the other night."

First Ham: "Yeab, but I didn't get any answer."

Second Ham: "Well, no one lives on the moon, you bum!"

A message delivered is worth ten on the hook.

Coming through Moscow, Idaho, the other day, we saw 7JF's antenna at half mast. Guess another five-watter has departed this life!

Who Is She?

Several of the newspapers tell us that Iana has been talking to Mix on WNP. Perhaps they mean Mr. R. B. Bourne, 1ANA.

According to astronomers, there will be an abundance of sun spots during 1925 and 1926. This will cause magnetic storms on the earth and frequent aurora, affecting radio and causing much freak transmission and reception.

—Popular Wireless (London).

Before you reprove the other fellow for not answering your cards be sure your own cards that are going out contain your full and correct address.

Would it not be fine if all of the radio hams attending colleges had a national radio college fraternity, with a good ham station at each chapter house so as to maintain communication between the various universities and colleges? Several of the fellows out West have the idea under way and desire to hear from all those in-

terested with a view towards making the movement national. Address you cooperative suggestions to Wm. D. Wood, Canadian 9BD, Barron Hotel, Vancouver, B. C.

The following, from an article urging cooperation between the amateurs, appearing in a recent *Wireless World and Radio Review (London)*, just about hits the nail on the head:

"The experimenter should not lose sight of the fact that amongst users of wireless he may find that he is a minority, and unless a minority is well organized and determined it must eventually become subservient to the majority."

Rules Relating to Portable Sets Taken Into Canada

The Commissioner of Customs and Excise for Canada has advised that radio receiving sets may be imported by non-residents of Canada for temporary use, not exceeding six months, by depositing with the Collector of Customs at the port of entry a sum equal to the duty and sales tax (about 26% of the total value of set), subject to refund of the deposit when the set is taken back to the United States. If the set is taken out through a different port than the port of entry, it will be necessary to have the Customs officials at the port of exit certify on the memorandum of tax deposit the fact that the set is being taken back to the States; the memorandum is then mailed to the original port of entry and the Collector of Customs will mail a refund check.

The set is subject to a license fee of one dollar, for which a regular government license is issued. It may be obtained from the Department of Marine and Fisheries, Ottawa, or from the postmasters of the leading cities of Canada.

The only variation to the necessity of paying a temporary import tax is where the receiving set is actually attached to an automobile operated by the visitor to Canada; in this case the set is allowed to go through duty-free, but a permit should be obtained from the customs collector as well as the receiving license from the proper government bureau.

Comrades of the Key

When the "quiet hour" passes
 And the BCL's in masses
 Are turning off their sets to go to sleep,
 The Amateurs get busy
 And the air becomes quite dizzy
 As twenty thousand tubes begin to "peep."

But none can make a record
 In that QRM so checkered,
 As Amateurs first rush upon the nite—
 The DX guy waits longer
 When his signals will be stronger
 And fifteen thousand tubes have ceased to
 pipe.

The Glory of Transmittin',
 Just like the angels flittin',
 Is something only Amateurs can cite;
 For to pound a key with feeling,
 As the ammeter goes reeling,
 Is certainly a glorious delight.

There's something rich and splendid
 In the friendship, never ended,
 Existing with the comrades of the key.
 They may never see each other
 But each is still a brother
 In this A.R.R.L. fraternity.

—H. H. Lippincott, 2DH.

My Five Watts

(To the tune of "My Bonnie Lies Over the Ocean.")

Last night I turned on too much battery;
 I mixed up the A and the B.
 Last night I turned on too much battery:
 Oh, bring back my five watts to me!

Bring back, Oh bring back, Oh bring back
 my five watts to me, to me;
 Bring back, Oh bring back, Oh bring back
 my five watts to me.

(If ten watts is substituted for five watts,
 song should be sung slower and more sadly.)
 —IABP.

The Department of Commerce advises that if a station holding a special amateur license desires to transmit with any form of transmitter other than one emitting straight C.W., a regular amateur license should be applied for in addition to their special license. Another call and the wave lengths from 175 to 200 meters will be assigned for this other transmitter.

For the information of all of the fellows who wrote us regarding it, the QRA of AF-2 is Camp Eustis, Va., and AC-2 is another army station at Phillips Field, Aberdeen, Md. AC-2 has been testing with the Bureau of Standards. They have a fifty-watt telegraph set and a five-watt phone. James H. Burns, Sgt., A.S., is the Operator-in-Charge at AC-2 and would like to hear from those who have heard him.

Wanted: More good lists of Calls Heard over distances of 1000 miles or greater.

Some of the fellows are using W.E. 50-watters with good results. Let QST headquarters have a report on their performance, O.M.s, so we can help out the fellows who are having trouble in getting these tubes to operating properly.

A poor porcelain insulator may be made good by boiling it in paraffin. The beauty of it is that the worse the insulator is before boiling, the better it will be after boiling.

Information is urgently requested as to whether anyone knows of an occasion where an antenna was actually struck or damaged by lightning. In answering please tell whether you saw it happen; whether you got the information first hand or by hearsay, and give a full account of the time, place, and results.

New QRA's

For your convenience a new section known as "New QRA's" will appear next to the classified ads near the back of the magazine beginning with the next issue. For a straight charge of 50¢ your name, new address and new call will be printed. No other information, such as "pse QSL by card" and such can be accepted, except at the regular rate of 6¢ a word, in which case it will appear elsewhere in the classified ads.

Requests to publish new calls and addresses are received almost daily and it is impossible to print all of them without making a nominal charge to cover the cost of printing.

We came near losing three good hams when 4FG, 4LI and 4EB got smashed up in an auto accident. They're getting along nicely, though, and are probably all back on the air by now.

J. V. Wise, manager of the Pacific Division, just told us that he has been a married man since May twelfth, spending the summer at Lake Tahoe, Calif. Congratulations, OM!

QZT certainly has been doing excellent work in Minneapolis. Using a 250-watter with 11 amperes in his sky wire he does real DX despite the summer heat, and works both coasts as regularly as in winter. He's in line for the Hoover Cup, we'd say.

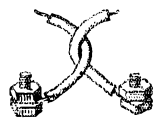
Kruse just put this on my desk:

"Please—oh, please run another stray in QST razzing the gang for this rotten 'thermo-couple ampere' stuff.

"There are only two kinds of amperes: absolute amperes and ordinary international amperes. There is no such thing

as a 'thermo-couple ampere' any more than there is such a thing as a 'Weston volt' or a 'General Electric watt'.

Another thing, neither do we 'radiate amperes'. We get a current in the antenna and actually radiate in the form of electromagnetic waves only a part of the energy in the antenna. Let's talk 'antenna amperes' instead of radiation."



Good condensers for neutralizing the capacity coupling in a radio frequency amplifier, using the neutrodyne principle, may be made by twisting together a few inches of rubber-covered fixture wire from which the outside silk covering has been removed. The number of twists determines the capacity.

Mr. W. C. C. Duncan, Canadian 9AW, has resigned as Canadian General Manager. He has been succeeded by Mr. A. H. K. Russell, Canadian 9AL, of 11 Pinewood Ave., Toronto. Mr. Russell is eminently well qualified for this position, having been for long a leading figure in Canadian amateur radio, and for several years Manager of the Ontario Division, A.R.R.L. The C.G.M. has general supervision of A.R.R.L. activities in the Dominion and will be glad to hear from members on any matters affecting the welfare of Canadian amateur radio.

The headquarters staff of the A.R.R.L. has recently been augmented by the presence of Mr. A. A. Hebert, our treasurer and the watch-dog of our finances. Mr. Hebert comes primarily as a traveling secretary or field contact man, and will be "on the road" a good part of his time, visiting the Affiliated Clubs, attending conventions, spreading the A.R.R.L. gospel, lending a helping hand here and there, helping to tie us better into one close-knit fraternity. While not out traveling he, as our treasurer, will have charge of credits and collections at our headquarters office.

On the Air

Msg fm 7SC to 3JJ: "Your sigs QSA am sending card.—sg. 7SC."

In reply: "#1 fm 3JJ to 7SC: Tax for report on sigs. Never mind about card, the walls of my shack are all full.—sg. 3JJ."

Beginning with the August issue, the *Modulator*, published by the Second District Executive Council at New York City, had its name changed to *Amateur Radio*. It will be the policy to build *Amateur Radio* as the live-wire house-organ of the Second Radio District, a ham publication to keep

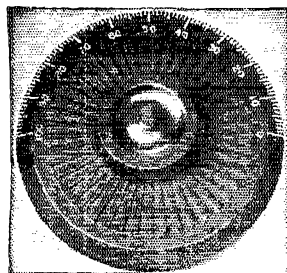
the Second District on the map. Here's wishing its publishers the best of success!

"According to advices from the Department of Commerce at Washington, D.C., the A.R.R.L. do not like the silent period for amateurs from 7:30 to 10:30 p.m. These protesting amateurs claim it would prevent them giving valuable assistance in cases of storms, floods and wrecks. While it does undoubtedly discourage a few amateurs from continuing their experiments, this is offset in a large measure by the large number of enthusiastic radio fans who nightly listen in and spread the gospel of radio to others. Having had experience with these pests who used to clog up the ether with their amateurish efforts, it is quite a relief to have the evening programs come in uninterrupted."

—From July issue of "Radio Topics," the one-time amateur magazine.

The Ohio Brass Co's. 5-inch "X" insulator, Drg. #26331, the porcelain insulator that came through victorious in the recent tests of amateur antenna insulators (See pg. 24 May, 1923 QST*), has been in great demand. Both to inform the membership and to relieve our incoming mail basket, we give herewith a list of the places where these insulators may be obtained: The Graham-Reynolds Electric Co., Third and Wall Sts., Los Angeles, Calif.; H. G. Holabird, 451 East Third St., Los Angeles, Calif.; Fobes Supply Co., Fifth and Howard Sts., San Francisco, Calif.; Hallock and Watson, 192 Park St., Portland, Ore.; F. J. Murphy (8ML), 4837 Rockwood Rd., Cleveland, Ohio; Baldwin-Stewart Electric Co., 210 Pearl Street, Hartford, Conn.

A dial with a ribbed surface is very advantageous when making fine adjustments as the effect is that of a knob several inches in diameter. Such a dial has been

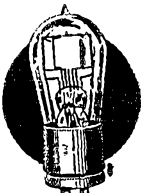


recently placed on the market by the American Hard Rubber Co., of 11 Mercer Street, New York, as the latest addition to the line of *Rudion* parts. The dial is one of the few that actually runs true. The large-

brass insert, made for $\frac{1}{4}$ inch shaft, is provided with a well fitted brass bushing so that a $\frac{1}{8}$ shaft may also be used. The dial is made in two sizes, three and four inches in diameter. Both from the standpoint of attractiveness and utility this dial is highly satisfactory.

"The story of the Ever-Ready dry cell in radio" is one of a number of attractive new booklets of the National Carbon Co., Thompson Ave. and Orton St., Long Island City, New York. It contains a goodly supply of information on the use of dry cells as A, B, and C batteries, giving methods of connecting them, life, and type of cells for every radio purpose.

**Electric Light
Bulbs**



Better lay in a supply of these. It's watching bargains like these that saves on your house hold budget.

10, 25, 40 watt.....	30c
50 and 60 watt.....	35c
75 watt.....	55c
100 watt.....	70c

BAILEY'S ON MAIN

This actually happened. It was so good that we made a picture of it.

Twinkle, twinkle little star,
Up among the clouds so far,
Could you tell us—do you know—
Just where all our radiograms go?
H.G.D.

The Atlanta gang are starting up a noise-raising throng to be known as the "East Gulf Syncopators." There have been many applications for the tryout to be held on the air next Wednesday night at midnight C.S.T. All instruments must be tuned to 200 meters flat and 4JK will give the signal to commence. Everyone will then blow note "L" (That's what it'll sound like, anyway) two times, and then start playing "Yes, We Have No Bananas," at ten words a minute. Observing stations are to report all discord and interference from BCL sets. 4MB will play the phonograph but must not call CQ. This will be a good try-out and should either develop some good talent or else lose a couple of licenses.

—The Atlanta Journal.

Why is it that when your noble fifty watter goes to the land of eternal radiation, and you dig out your old five watter, you raise about twice as many stations as you did on the fifty?

—The Atlanta Journal.

"The Dial" published by the Junction City Radio Club (affiliated) of Junction City, Oregon is financed in an unusual way. Publication of this interesting paper is paid for by the merchants of the town who advertise in its pages. In return, the club members distribute "The Dial" to every inhabited house in the town, thereby not only bringing the name of the advertisers before every citizen but also giving them the latest A.R.R.L. bulletins and other radio news including the doings of the local club.

U. S. Civil Service Examination

The United States Civil Service Commission announces the following open competitive examinations:

Radio Engineer, \$4,000 to \$5,000 a year.
Associate Radio Eng'r, \$3,000 to \$4,000 a year.

Assistant Radio Eng'r \$2,000 to \$3,000 a year.

Applications will be rated as received until October 30th. The examinations are to fill vacancies in the positions named, or in positions requiring similar qualifications, in the Federal classified service throughout the United States.

The duties are to conduct or superintend the development, design, construction, installation, standardization, and writing of specifications, for practical and special apparatus and methods of radio communication; such apparatus to include sets for land use for more or less permanent stations, also for portable land stations, and for airplane and ship sets, and similar lines of work.

Competitors will not be required to report for examination at any place, but will be rated on the following subjects: Education and preliminary experience, 30%; special experience and fitness, 40%; publications, reports, or thesis, to be filed with application, 30%.

Full information and application blanks may be obtained from the United States Civil Service Commission, Washington, D.C., or the secretary of the board of U.S. civil-service examiners at the post office or customhouse in any city.

1BTU has named his 800 volt storage battery "Spark Plug." Whassamatter? No kick?

Many hams are on 200 sharp, but 20M is on "180 Broad," according to 8COX. They also say that H. C. Bidwell is the broadest in Washington. Hi!

(Continued on page 64)

The Junior Operator

THE VACUUM TUBE IN AMATEUR WORK

The Fifth of a Series of Articles of Helpfulness and Practical Value to Those Just Entering the Amateur Radio Game
By H. F. Mason, Department Editor.

IN the old pre-war days of the spark transmitter and the crystal detector we were doing record work if we managed to communicate by radio over a distance of a thousand miles with a two-kilowatt set. In these days of vacuum tube transmitters and vacuum tube receivers the same amateurs are casually communicating over many thousands of miles with much less power. No one thing has contributed more to this advance in amateur radio than the advent of the three-electrode vacuum tube. Several of these devices are now in daily use in every amateur station, so it is to the interest of the progressive amateur to find out all he can about vacuum tubes and to keep up to date on the latest practice.

The three-electrode vacuum tube is primarily a device in which a stream of electrons, emitted by a heated filament, is controlled by the potential of an auxiliary electrode, called the grid. The exact manner in which this is accomplished is told in the first part of the present article, while the remainder is devoted to an explanation of the use of the vacuum tube in its three principal roles: as an amplifier, an oscillator, and a detector. The reader is advised to review the first section of the article on page 59 of the August issue, dealing with electron emission and the flow of electric current, before beginning his study of the three-electrode tube.

In the above reference it was shown how a large current through a conductor would cause the molecules of the conductor to become highly agitated and heat the conductor to redness or melt it entirely. Any heated body throws off electrons in the same manner that a white-hot piece of iron gives off sparkling scintillations, excepting of course that the electrons are far too small to be seen. The purpose of the filament in a vacuum tube is to provide a source from which there is a steady emission of electrons. The filament is enclosed in a vacuum to prevent its burning away due to the oxygen in the air combining with it, and also to aid the giving off of electrons.

Speaking in terms of polarity, each elec-

tron is a particle of negative electricity. When the filament is cold and no electrons are being emitted, the negative electrons are exactly neutralized by the positive nucleuses of the atoms making up the material. This was explained in a previous article. When the negative part of the atom is removed by the emission of the negative electrons, the remaining charge on the filament is positive. This positive charge immediately tends to attract back to the filament the electrons that have just left it with the result that the movement of electrons is much like that of the drops of water in a fountain, as they are thrown into the air, then pulled back by gravity.

Refer now to Figure 1. A is a battery the sole purpose of which is to heat the filament of the tube so it will give off negative electrons. The battery B is connected between the plate and filament and keeps the plate at a positive potential with respect to the filament. The function of the C battery will be explained later.

Neglecting the effect of the grid, for the time being, assume that the emission of electrons from the filament has been started by its being heated. Near the filament is the plate which is positively charged by the B battery. Because of its positive charge, some of the negative electrons coming from the filament will be attracted to the plate and will constitute an electron flow from the filament to the plate. Using the ordinary conception, this stream of electrons will provide a path for the plate current, which will flow from plate to filament. The value of the plate current may be increased by raising the plate voltage or by increasing the flow of electrons. The latter can be accomplished by heating the filament more or by constructing it of a material that when heated will more easily emit electrons in large numbers. The above phenomenon of current flow between a heated filament and a cold plate is called the Edison effect and was the first discovery leading to the development of the vacuum tube.

Let us now ascertain the effect of the-

grid. In Fig. 1 the battery C is connected with a reversing switch so that the grid may be made negative or positive with respect to the filament by throwing the switch. When the switch is thrown to the right the grid will have a negative charge, or a negative bias as it is sometimes called. This negative grid charge will oppose the negative electrons that are coming from the heated filament and will act as a barrier, preventing them from passing through the grid and going to the plate. If the negative grid entirely shuts off the flow of electrons to the plate, no plate current can flow because it is the stream of electrons from filament to plate that forms a conducting path for the plate current. If the grid is only enough negative to prevent some of the electrons from passing through to the plate, the plate current will merely be somewhat reduced, depending upon the strength of this negative grid charge. When the reversing switch is thrown to the right so the grid will have a positive charge, an opposite thing will occur. Instead of the grid opposing the flow of electrons to the plate it will aid the plate in attracting the electrons from the vicinity of the filament and the plate current will be increased over its ordinary value.

In Figure 2, the action of the grid voltage in decreasing or increasing the plate current is shown in the form of a curve, called the grid-voltage-plate-current characteristic curve of the tube. Characteristic curves are useful in connection with the study of the action of different tubes and their comparison, as hardly any two tubes have the same shape of curve. Along the bottom line A-B are shown grid voltages, and along the left-hand line A-C are shown the corresponding plate currents. For instance, when the grid voltage is zero the plate current will be 2.5 milliamperes; or, when the grid is 8 volts negative, the plate current will have been reduced .25 milliampere. Al-

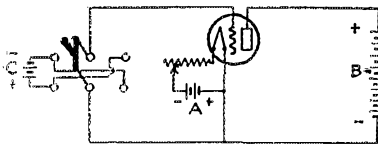


FIG 1

though the general shape of the curve is the same for different plate voltages or filament currents, its position changes somewhat.

The Vacuum Tube as an Amplifier

As shown in the above paragraphs, the grid voltage acts as a trigger in controlling the plate current. It is in this manner that the vacuum tube acts as an amplifier, for the small variations in grid

voltage appear in magnified form as variations of plate current.

Fig. 3 shows the fundamental circuits of an amplifier. F is the grid or input circuit and G is the plate or output circuit. Returning to Fig. 2, the action of a radio frequency amplifier is there depicted graphically. The "wiggly" line at the bottom of the drawing represents the variations of voltage in the grid circuit caused by the incoming signal. In the case in question the grid voltage is thus caused to swing between the limits of two volts negative, and zero. Transferred to the plate

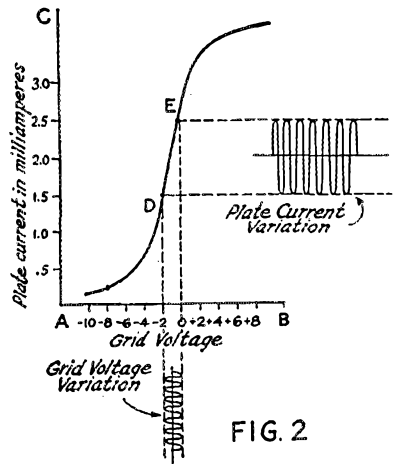


FIG. 2

circuit this causes the plate current to vary between 1.5 and 2.5 milliamperes, representing quite an amplification.

In Fig. 2 the normal grid voltage (in other words the C battery voltage) is one volt negative. The value of the C battery potential determined the part of the characteristic curve on which the tube is worked. In the Figure we say the tube is working on the straight part of the curve: the part from D to E. This is a condition that must be met before amplification without distortion can be obtained and is the reason why the correct C battery adjustment in an amplifier designed for broadcast reception is so desirable. Distortion in an amplifier for amateur or code use is not objectionable as it does not interfere with reading the signals. In many amplifiers the correct normal grid voltage is secured, not with a C battery, but by applying to the grid a part of the voltage of the filament lighting battery.

The steepness of the straight part of the characteristic curve, as from D to E, is a measure of the value of the tube as an amplifier. The steeper the curve, the greater will be the variation in plate current for a given variation in grid voltage, and hence the greater will be the resulting amplification.

Amplifiers may be divided into two general classes according to whether they are used for radio- or audio-frequency. In either case the principle of operation and the circuits are practically the same, the only differences being those natural differences arising when dealing with currents the frequencies of which are widely different.

Because of the limited space, it has only been possible to give the bare fundamentals concerning the use of the vacuum tube as an amplifier. For more complete information the following articles which have appeared recently in *QST* are recommended: "Radio Frequency Amplification at Amateur Wave Lengths," by K. B. Warner, pg. 7, Sept. 1922 *QST**; "Multistage Amplifiers," by M. C. Batsel, pg. 25, Oct. 1922 *QST**; and "Vacuum Tube Amplification," by S. E. Anderson, pg. 15, Jan. 1923 *QST*.*

The Vacuum Tube Oscillator

It is in this role that the three-electrode vacuum tube finds its greatest utility in amateur radio. The use of C.W. trans-

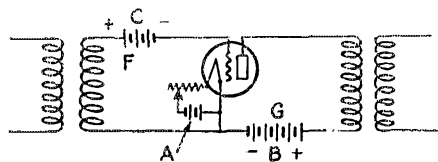


FIG. 3

mission by means of oscillating vacuum tubes is wholly responsible for the success of amateur stations in transmitting over extremely long distances. By using an oscillating vacuum tube at the receiving end, the benefits of that method of transmission are even more fully realized.

As pointed out in the explanation of the use of the vacuum tube as an amplifier, an alternating voltage in the grid circuit is reproduced, in magnified form, as a variation of the plate current. The alternating voltage in the grid circuit may be caused to exist there in several ways. In a radio-frequency amplifier, as used with a receiver, it is the received oscillations in the antenna circuit that are transferred to the grid circuit. In an audio amplifier the changes in the detector plate current are transferred to the amplifier grid circuit. Lastly, in an oscillating vacuum tube it is the variations in the plate current in that same tube that are fed back to the grid, causing an alternating-current voltage to exist in the grid circuit.

This needs further explanation. Fig. 4 is the fundamental circuit. L_1 is the grid coil, L_2 is the plate coil, and the combination L_3 and C_1 constitutes a load circuit

which is the antenna circuit if the oscillating tube is used as a C.W. transmitter. It has been shown under the discussion of the vacuum tube as an amplifier how the grid acts as the "control electrode" in setting into motion the energy contained in the B battery. Some of this alternating energy is fed back into the grid circuit because of the inductive coupling between L_2 and L_1 . This alternating energy in the grid circuit causes the variations in the plate current to become still more amplified. The limit of amplification is reached when the grid voltage swings the whole

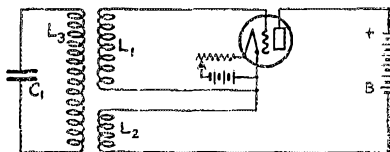


FIG. 4

length of the characteristic curve (refer to Fig. 2) for at the ends of the curve any increase in grid voltage will have very little or no effect in increasing the plate current. Let us say that one watt is all that is required in the grid circuit to work the tube to capacity, and to set into motion ten watts of energy in the plate circuit. If this is true we can, by suitable coupling between the circuits, divide the ten watts in the plate circuit so that nine watts can be used in the load or antenna circuit while the remaining watt is transferred to the grid circuit to be used in sustaining the oscillations.

The above is, briefly, the action of an oscillating tube. As next month's installment of this series will deal with tube transmitters, we shall learn more about the practical points concerning oscillating tubes at that time.

Action of the Tube as a Detector

Before a 200-meter signal, which has a frequency of 1,500,000 cycles per second,

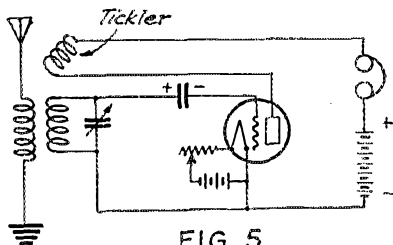


FIG. 5

can be detected and made audible in the phones it must be broken into groups of oscillations that will occur at a rate within the limits of audio frequencies, say 1,000

(Concluded on page 63)

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

Calls Heard



HEARD DURING AUGUST Unless Otherwise Specified

When preparing a list for QST, please observe the following rules:

1. List the calls on a separate sheet of paper; do not embody them in a letter.
2. Arrange the calls as they will appear in QST: across the page, numerically by districts, alphabetically in each district, Canadian and foreign calls listed separately, state whether spark of C.W., and give period of time covered by the list.
3. Forms close on the fifth of the month preceding the date of issue of QST. Make your lists cover the period from the first of one month to the first of the next if possible, but don't let your list come in late.
4. List only calls over 1,000 miles distant.

U.S. EDT in Punte Alegre, Cuba

1ANX, 1CGR, 1JV, 2OM, 2RRR, 2RQZ, 3JJ, 3DM, 3RRS, 3ASP, 3ROB, 3ZM, 3AIS, 3HH, 3AJG, 4KV, 4MR, 4EQ, 4NA, 4DO, 4IO-Spk., 4HS, 4RX, 4RC, 4HZ, 4NT, 4EA, 4MR, 4KV, 4DB, 4H, 4DT, 4GL, 5AJJ, 5AIF, 5KC, 5BK, 5NZ, 5FV, 5OT, 5QI, 5HW, 5GN, 5QM(?) , 5MN, 5ZBA, 5LL, 5VY, 5NN, 5VA-Spk., 5FX, 5ALK, 7ZO, 7ZN, 7ZU, 8AVD, 8ATA, 8RH, 8AIB, 8AND, 8ZW, 8ZZ, 9AVZ, 9DWN, 9ADZ, 9AAU, 9EHL, 9COJ, 9BRI, Mexican BX.

Address cards to EDT, 2500 Maple Ave., Dallas, Texas.

Ex 1NW aboard SS Otarama. (1 step)

June 19—500 mi. West of Peru
2EL, 2RFU, 2ARP, 5ACF, 5AAD, 5PX, 5ZAV (one), 5EQ, 5ZAK, 5FD, 5ACD, 5TC, 5VO, 5AHD, 5ARD, 5BE, 5ZAV, 9AAM, 9ATO, 9SS.

July 2—4700 mi. S.W. Los Angeles
5GA, 5BBC, 5FM.
July 3—5000 mi. S.W. Los Angeles
5CBU, 5BOB, 5RVQ, 9ZT (vy QSA).
July 4—5300 mi. S.W. Los Angeles
6AUU, 6BJQ, 6CGW, 6ATU, 6AUU.
July 5—5700 mi. S.W. Los Angeles
6AUI, 6BUN, 6OAI, 6CGX, (vy QSA), 7UN, (vy QSA).

July 16, in port, Brisbane, Australia
9ZT.

Cadiz, Spain

C.W.: July 27, (75th Meridian time) 10:35 P.M. 2FP working, 10:40, (QRM de EAC) "—de 2FP nr 1 Bklyn NY to 9AAW Chicago-- Will write 4mw-- (QRM ECA) 73 DS." Signs easily readable, 10:45 "9ZZ de 2FP GE OM QTC?"

July 29, off Gibraltar: 1CM, 1PA, 8NB, QSL to Midshipman A. Offutt, Rm 3421 Bancroft Hall, U.S.N.A., Annapolis, Md.

Aux. Sch. Bowdoin, WNP

(Every district except the seventh)

C.W.: July 3, Sydney, C. Breton I., Nova Scotia: (1FM), (1UJ), 1ZE, 1BQK, (2CEI), 2CQZ, 2CIM, 3BUP, 3CFJ, Can. (1AR), 1DD, 2BN.

July 4 and 5, Off Bonne Bay, Nfld.: 1ER, (1FB), 1JV, 1KC, (1RV), (1ZE), 1AJP, 1AKL, 1BSJ, 1CPI, 1CRE, 2HW, 2QF, 2WR, 2ANM, 2AWH, 2BXP, 2CBC, 2CGB, 2CHG, 2CPZ, 2CQZ, 2CZQ, 3NF, 3BFU, 3BNU, 3BUY, 4GL, 8ER, 8NR, 8UP, 8ZZ, 8BPM, 8BRK, 8DFI, 9BRK, Can. 1AR, 3XX.

July 6, Bradore Bay, Labrador: 1ANA, 1CMP, 1CNI, 1CPI, 2UI, (2CQZ), 2BER, 5NJ, 8BOA.

July 8 to 10, Henley Hbr., Labrador: 1ZE, (1ANA), 1BES, 1CRW, 1CDO, 2EL, 3BFU, 4FT, 4BQ, Can. (1AR).

July 11, Battle Hbr., Labrador: 1JV, 1OW, 1ZE, 1ABM, 1CDO, 1CPI, 1CPN, 2OM, 2BSC, 4FT, 4BY, 8AVR, 8AQO, Can. (1AR), 3AF, Henley Hbr. and Battle Hbr. are entirely surrounded by rocky cliffs hundreds of feet high.

July 14, 15, and 17, Greedy, Labrador: 1EZ, 1LK, 1ABS, 1AJX, 1AIQ, 1AMF, (1ANA), 1AQM, 1BES, 1CMP, 1CRE, 2FS, 2AWE, 2BYC, 2CPZ, 5ZAV, 8BJV, 8BGL, 8BFH, 8BNH, 8OKO, 8CFP, 8CSJ, 8CUR, 9DLT, Can. (1AR), 1DD, 2BN, 2CG, 2ZS.

July 18, Indian Hbr., Labrador: 1OW, 1ABS, 1BES, 2CUI, Can. 1AR.

July 19, C. Harrison, Labrador: 1HS, 1JV, 1KW, 1OW, (1ANA), 1ABS, 2CPA, 2CBC, 2BRC, 2BYC, 2HW.

July 23, Hopedale, Labrador: 1ANA, 2IC, 2ARY, 2BYC, 2ROY, 4GL, 3CEI, Can. 2BE.

July 25, Jack Lane's Bay, Labrador: 1DB, 1BKQ, (1ANA).

July 25-26: (1ANA), 3RML, 1AV, 8LJ, 8AVD, Can. 2CG.

July 27-27, 250 miles S.W. Godthaab, Greenland: 1FM, 1RV, 1GDM, 2FS, 2AGL, 8ZZ, 8HNO, 4RI, 8BDA, 8CUR, 9UC, 9XAQ, 9AWG, 9HK, Can. 2KO.

July 27-28, 50 miles S.W. Godthaab, Greenland: (1ANA), 3TB, 6PL, 6MR, 8GT, 9APE, 9CVC, 9AAU, 9AXU, 9AVZ, 9DFW, 9AAW, 9DCT, 9AWG, 9BUN, 9MF, 9CGA, Can. 3XN, 3DS, 9BC.

July 28-29, Godthaab, Greenland: 1ANA, 1ABS, 1BQK, 1CMP, 1CRE, 3BNU, 8HV, 3CED, 9LZ, 9BZL, 9ZZW, Can. 1DD.

S.S. Myriam

C.W.: July 5, 3050 miles W. San Francisco: 6GX, 6ACM (QSA), 6AGN, 6AOL, 6BCL, 6BEZ, 6BFL, 6BNT, 6BUN, 7AG, 7UU, 7GO, 7AGE, 7AGU, 9ACM.

July 6, 3280 miles W. S.F.: 6GF, 6KA, 6ACM, 6ACO, 6AFO, 6ALY, 6ASJ, 6ASR, 6AVV, 6BEZ, 6BGY, 6BQL, 6CCU, 6CGW, 6CMR, 6CVD, 7AG, 7AU, 7DH, 7GO, 7GP, 7IW, 7SF, 7ADP.

July 7 and 8, 3500 miles W. S.F.: 6GF, 6KA, 6BLV, 6BUN, 7BJ, 7NS, 7OH, 7ZN, 7ADP, 7AFN, 9BJQ, 9CAA, 6KA and 7ADP readable 20 feet from phones.

July 8 and 9, 3710 miles W. S.F.: 6CU, 6GR, 6AUU, 6AOR, 6BFL, 6BFL, 6BQL, 6BUN, 6BUO, 7GO, 7ARQ, 6BIP, (QSA sending A.R.R.L. broadcast.)

July 9 and 10, 3939 miles W. S.F.: QRN bad, 6AWT, 6BCL.

July 10 and 11, 4130 miles W. S.F.: 6AUI, 6AVV, 6BCL, 6BJQ, 6CMR, 7AFN.

July 12, 4850 miles W. S.F.: 200 miles E. Yokohama: 6GR, 6ALK, 6ASR, 6AWT, 6BQL, 6BQY, 6CEB, 6CKR, 7AHI, Strongest were 6AWT, 6GR, and 6CKR. 6KA not on that nite. Many stations heard before sunset too weak to copy.

July 18, 4650 miles W. S.F., 80 miles S. Yokohama, QRN rather bad: 6GR, 6KA, 6ASB, 6CMR, Sun sits here at 1 A.M. San Francisco time. 6KA most QSA tonight.
 Please QSL to A. Vasseur, 53 rue de Chabrol, PARIS 10, France.

S.S. Caronia

C.W.: July 2, 1000 miles E. New York: 1FM, 1RG, 1BES, 1CCZ, 1CMP, 1CPN, 1ZE, 2AGB, 2AJA, 2BSC, 2CPD, 2BXR, 2DH, 3ZM, Can. 1AR.
 July 3, 1500 miles E. N.Y.: 1FB, 1FM, 1ARG, 2AYV, 2CEI, 2BCL, WNP, Can. 1AR.
 July 4, 1900 miles E. N.Y.: 1KC, 1ZE, WNP, Can. 1AR.

Returning aboard S.S. Scythia Aug. 11, 2200 miles E. N.Y.: 1BVB.
 Aug. 12, 1800 miles E. N.Y.: 1AJJ, 1CMX, 3BIF, 8CSJ.
 Aug. 13, 1400 miles E. N.Y.: 2ACG, 2AFP, 3GE, 3BC, 3AMQ, Can. 1AR.
 Aug. 14, 1000 miles E. N.Y.: 1ACU, 1CBM, 1UJ, 2AWH, 2CXL, 4KC, 3BCL, Can. 1AR, 2CG.
 Aug. 15, 850 miles E. N.Y.: 3ARD, 3BCL, 3NR, 3CVX, 3UE.

Aerolia Sr. set used thruout with no amplification.

Can. 2CG, Montreal, Quebec

C.W.: 4FA, 4FT, 4GX, 4LJ, 4MI, 4EL, 4IH, 4NU, 4PW, 4UG, 4ZG, 4ZY, 9AAW, 9AJH, 9AVP, 9AWG, 9AYH, 9AZX, 9BMU, 9CAH, 9CHE, 9DXN.

Can. 1AR, Clarke City, Quebec

(300 miles North of St. Johns, N.B.)

C.W.: 1XE, 1XP, 2WR, 2CEI, 8AXX.

U.S. 8DF at Sheenboro, Quebec

(200 miles North of Ottawa)

C.W.: 1ER, 1GL, 1IV (dalite), 1JV, 1KH (dalite), 1RR, 1WR (dalite), 1ABY, 1ARF (dalite), 1AUR, 1BBO, 1BCG, 1BCU (dalite), 1CPO, 2CE, 1IU, 2CM (fones), 2CUU, 2CZQ, 3VO, 3GZ, 3HV, 3IJ, 3TC, 3VQ, 3ZZ, 3ATM, 3BDA, 3BJS, 3CCR, 3CKN, 3CTN, 3DKC, 3DUU, 3ZAE, 3RHQ, 3DCE, 3EHS.

Aerolia Sr. 50 foot under antenna.

1DQ, J. D. MacGregor, Jr., P. O. Box 327, Greenwich, Conn.

C.W.: 4CH, 4EB, 4FA, 4FT, 4YA, 5ZP, 5GA, 5GP, 5ACQ, 5ADG, 6ZZ, 6BVG, 6ZZ, 8APT, 9UC, 9ZT, 9ZN, 9ALX, 9BK, 9BMU, 9BRK, 9DGV, 9DDJ, 9EKF.

Canadian: 2BN, 2CG, (3ADA), 3ADN, 3CO.

1AMI, Southington, Conn.

C.W.: 4AYZ, 4CB, 4EP, 4EQ, 4EX, 4EZ, 4GX, 4HS, 4KC, 4KU, 4MR, 4ME, 4RK, 5AIF, 5AFQ, 5AM, 5IM, 5IU, 5IZ, 5PB, 5UK, 5VY, 6BJ, 6BNT, 6KAD, 6VM, 6ZZ, 7Y, 7ZU, 8AAU, 9AHR, 9AJW, 9AKE, 9APE, 9APS, 9AOS, 9ARC, 9ALX, 9APW, 9ARH, 9ARY, 9AUD, 9AUS, 9AWB, 9AWK, 9AXX, 9AZ, 9AZT, 9AZX, 9BDH, 9BFI, 9BGX, 9BGY, 9BK, 9BMU, 9BQA, 9BQQ, 9BQY, 9BRK, 9BTT, 9RUF, 9BUU, 9BWF, 9BYE, 9CCQ, 9CDR, 9CIP, 9CLM, 9CSN, 9CZS, 9DBJ, 9DDN, 9DHG, 9DPW, 9DQE, 9DQU, 9DRO, 9DRR, 9DVG, 9DWK, 9DXC, 9DYN, 9DYZ, 9EDO, 9EFL, 9EPZ, 9EGX, 9EKF, 9EKY, 9ESI, 9EST, 9EZ, 9IG, 9KR, 9KU, 9LO, 9LT, 9MC, 9MM, 9OP, 9QR, 9RC, 9TA, 9OC, 9UR, 9UZ, 9ZT, 9ZY.

Can.: 2CE, 3MR, 3OJ, 3NU.

1AWE, Providence, R. I.

C.W.: 4AI, 4BJ, 4CS, 4DN, 4DX, 4EB, 4EP, 4EQ, 4GL, 4HS, 4LJ, 4MR, 5AE, 5AEC, 5AFG, 5AGJ, 5AKW, 5AMW, 5EK, 5GM, 5GP, 5HI, 5NF, 5SK, 5UK, 5VY, 5D, 5ZF, 6AAU, 9AAW, 9ACL, 9AFL, 9AHJ, 9AHR, 9AHZ, 9AIM, 9ALB, 9AM, 9APE, 9APS, 9APW, 9AQA, 9ARC, 9ARK, 9ASE, 9ASU, 9AUA, 9AUD, 9AUS, 9AWK, 9AWU, 9AXX, 9AYL, 9AZA, 9AZZ, 9RAF, 9BAC, 9BAZ, 9BDB, 9BEH, 9BEI, 9BGY, 9BHE, 9BHI, 9BHL, 9BHQ, 9BHZ, 9BMU, 9BNO, 9BQ, 9BQY, 9BRK, 9BSC, 9BSH, 9BTT, 9BVP, 9YE, 9ZL, 9CAO, 9CCZ, 9CFK, 9CHC, 9CIP, 9CLN, 9CUL, 9CVI, 9CXH, 9DCE, 9DCR, 9DEK, 9DHG, 9DHN, 9DLW, 9DMF, 9DQU,

9DRO, 9DRR, 9DSW, 9DWN, 9EAD, 9EBA, 9EDO, 9EFZ, 9EGH, 9EHR, 9EHS, 9EJA, 9BK, 9RP, 9CP, 9CR, 9EM, 9ES, 9HK, 9IG, 9MA, 9MC, 9MM, 9NU, 9OG, 9OT, 9PW, 9TA, 9UC, 9UR, 9UZ, 9VB, 9ZT, 9ZY.

1BBO, Lenox, Mass.

C.W.: 4FS, 4HZ, 6GP, 5IL, 5KC, 5KW, 5LL, (6NJ), 5NN, 5NS, 5UN, 5VY, 5YE, 5ZAX, 6KA, (9AAQ), 9AEC, 9AHZ, 9AIM, 9AVC, 9BAF, (9BBW), 9CGX, 9BKO, 9BQA, 9BIS, 9BSG, (9BZI), 9CAA, 9CAJ, (9CCS), 9CHC, 9DAW, 9DIB, 9DOE, 9DYL, 9EHN, 9HK, 9IG, (9PN), 9ZT.

1CNA, Hudson, Mass.

C.W.: 4BY, 4DL, 4DE, 4EH, 4FT, 4FZ, 4MB, 4GL, 4TV, 5DA, 5HL, 5PR, 5AGJ, 5AJJ, 5ARC, 5ZD, 9BK, 9EL, 9PN, 9UC, 9UH, 9ALB, 9AMT, 9ARC, 9ARH, 9ARZ, 9AUI, 9AWK, 9AXX, 9BAK, 9BGY, 9BMB, 9BMX, 9BWF, 9CIP, 9CVS, 9DCE, 9DGR, 9DJU, 9DMP, 9DRQ, 9DQW, 9EDO, 9ZT, 9ZY.

Can.: 1AR, 2CG, 3IV, 9BV.

Fone: 3BIJ, 4FT, 5KG, 5AWP.

2KF, Irvington, N. J. (Aug. 31 to Sept. 3)

4BY-4EB, 4EQ, 4EZ, 4FT, 4GL, 4HW, 4KU, 5ABT, 5ABW, 5ACW, 5EK, 5FV, 5KG, 5MO, 5SK, 5XAD, 5ZA, 5ZAE, 6ARB, 6AWT, 6BIC, 6BNT, 6JD, 6KA, 6KM, 6RM, 7OP, 7GP, 7LU, 7ZO, 7ZZ, 9AIM, 9AMB, 9AQO, 9AWF, 9AWG, 9BAF, 9BRK, 9BWE, 9CCS, 9CCZ, 9CHG, 9DEK, 9DLE, 9DHQ, 9DYN, 9EAK, 9EF, 9EGK, 9MC, 9YU, ARMY-AD7.

Mexican: BX, FGI.

2BIR, Nutley, N. J.

C.W.: 4BK, 4BY, (4CS), 4DB, 4DX, (4ER), 4EP, 4FA, 4FT, 4GL, 4GX, 4HZ, 4KB, 4KC, 4KU, (4LJ), 4MB, 4QP, 5AAB, 5AGJ, 5AMH, 5EK, 5GA, 5GM, 5GP, 5MN, 5QF, 5VA, 9AAL, 9AAU, 9AAW, 9AIC, 9AIM, (9AJH), (9ALB), 9ALX, 9APS, 9ARC, 9ARD, 9AUS, 9AUY, 9AVG, 9AVJ, 9AWG, (9AWK), 9AXX, (9AXZ), 9BDB, 9BDH, (9BMU), 9BPV, 9BQQ, 9BRK, 9BTD, 9BTT, 9BVP, 9RVZ, 9BWF, 9BXC, 9CEE, 9CFK, 9CFO, 9CGT, 9CGU, 9CIP, 9CHE, 9CPB, 9CTG, 9CVS, 9CXH, (9DEK), 9DHP, 9DIS, 9DIK, 9DGE, 9DRO, 9DYL, 9DYN, 9DZI, 9DZY, 9EBP, 9EJA, 9ELB, 9ELD, 9EXP, 9HK, 9IG, 9MM, 9QR, (9UC), 9VR, 9ZT, 9ZY.

2CGZ and 2CEG (on vacation) Nicolin, Maine.

C.W.: 4BY, 4CS, 4DN, 4DO, 4EB, 4FT, 4GK, 4GL, 4GX, 4HR, 4HS, 4KU, 4LJ, 4MB, 4NX, 4QF, 5ABY, 5ADO, 5AMU, 5AFQ, 5AJJ, 5AKN, 5AMA, 5AMG, 5AMH, 5EK, 5FC, 5FP, 5GF, 5GM, 5GP, 5HL, 5IN, 5KP, 5MN, 5NJ, 5NN, 5NS, 5NZ, 5OW, 5PH, 5SK, 5UO, 5VA, 5VY, 5XW, 6AWT, 6BBU, 6BIC, 6CBU, 6GF, 6UO, 9AAL, 9AAU, 9AAV, 9AAW, 9ACK, 9ACZ, 9AFS, 9AHJ, 9AHZ, 9AIC, 9AIM, 9AJH, 9ALB, 9ALW, 9ALY, 9ALX, 9AMI, 9AMS, 9APE, 9APS, 9APW, 9ARA, 9ARC, 9AUA, 9AUS, 9AVC, 9AVP, 9AVZ, 9AWA, 9AWG, 9AWK, 9AXX, 9AYL, 9AZZ, 9BAF, 9BAN, 9BBG, 9BBR, 9BDB, 9BDS, 9BEH, 9BGY, 9BHI, 9BHQ, 9BIE, 9BIS, 9BJK, 9BK, 9BKK, 9BKR, 9BRU, 9BNS, 9BQ, 9BQY, 9BRK, 9BRX, 9BSG, 9BTT, 9BUZ, 9BWF, 9BYE, 9BYT, 9CAH, 9CAJ, 9CC, 9CCS, 9CCZ, 9CEE, 9CFK, 9CGU, 9CHO, 9CIP, 9CIP, 9CLN, 9CNB, 9CPW, 9CTV, 9CVC, 9CVS, 9CXH, 9CZS, 9DAW, 9DEK, 9DGI, 9DCR, 9DCW, 9DGE, 9DGV, 9DHG, 9DHO, 9DHP, 9DIS, 9DJR, 9DK, 9DLI, 9DLE, 9DOE, 9DQA, 9DRN, 9DRO, 9DRR, 9DSL, 9DYN, 9DZY, 9EAD, 9EBP, 9EFZ, 9EHJ, 9EHN, 9EL, 9EIS, 9EKF, 9EKY, 9EKZ, 9ELB, 9ELD, 9ES, 9GD, 9HV, 9IG, 9IH, 9IU, 9KE, 9LT, 9MM, 9NU, 9OT, 9SE, 9TA, 9UC, 9UH, 9ZG, 9ZT, 9ZY, 9NS, 9D.

Who says signals don't carry over 1000 miles in Summer?

2CJR, Brooklyn, N. Y.

C.W.: 4FS, 5GF, (5RL), 5UY, 5AMH, 6BSA, 6CRU, 9CR, 9AAU, 9ACU, 9AEC, 9AHZ, 9AJH, 9AJJ, 9APE, 9APG, 9AWG, 9AWK, 9AVC, 9AZX, (9BAF), 9BFI, 9BGX, 9BHH, 9BHI, 9BLI, 9BMU, (9BRK), 9BTT, 9CAH, 9CAT, (9CLN), 9CSN,

9CTR, 9CTV, 9CXH, 9DEK, 9DGE, 9DLF, 9DOE, 9DRO, 9DQA, 9DZN, 9DZY, 9EAR, 9EKF, (9EKY) 9ELB, 9ELD.

3CHG

E. R. Gabel, 412 Merideth St., Kennett Sq., Pa. (Last two weeks of August.)

C.W.: 5EK, (5GP), (5KC), 5PB, 5WR, 5AGJ, 5AMH, 9IG, 9MC, 9NU, (9UC), 9AAU, 9AAV, 9AHQ, 9AHR, 9AJH, 9AQD, (9AWG), 9BAZ, (9BIS), 9BLG, 9BMU, 9BQQ, 9BQY, 9BRR, (9BXC), 9CAA, 9CED, 9CIP, 9CVS, (9CWF), 9CWS, 9DDN, 9DGV, 9DLI, 9DMJ, 9DQU, 9EDO, (9EKY), (9ZT), 9ZY.

3BVA, 40 S. Beaver St., York, Penna.

C.W.: (5AC), 5DA, 5EK, 5GM, (5GA), (5GP), (5HL), 5IN, 5JF, (5KC), 5LL, 5MA, 5MO, 5NN, 5NI, 5NN, 5NS, 5NV, 5PB, 5PH, 5QL, 5RB, (5RL), 5UK, 5UO, 5VY, 5WR, 5XV, 5AG, 5ABT, 5AEC, 5AGJ, 5AJE, 5AKN, 5ACM, 5AIR, 5AMA, 5AMH, 5ZAS, 6ADM, 6AFL, 6AWT, 6BBH, 6BIC, 6BYG, 6JD, 9CR, 9EL, (9HK), (9MP), (9MM), 9NU, (9FW), (9QR), (9UC), 9UZ, 9VM, (9ZT), 9ZY, 9AAC, (9AAL), 9AAU, 9AAV, (9AAW), 9ACL, 9ADX, (9AIC), 9AIE, 9AIM, (9AJH), 9ALB, 9AMB, 9AOU, (9APS), 9APW, 9AQD, 9ARC, 9ARZ, (9AUS), 9AVC, 9AWG, 9AYX, 9AXX, 9RAF, (9HAN), (9BAZ), (9BBR), 9BCB, 9BDS, 9BEG, (9BEZ), 9BJK, (9BKK), (9BKJ), 9BKO, 9BLG, (9BMU), (9BRK), 9BRX, (9BVZ), 9BYT, 9BXE, (9BWF), 9CAJ, (9CAA), 9CCS, 9CDB, (9CFK), 9CHO, 9CIP, (9CTR), 9CTS, 9CTT, (9CXH), (9CWF), 9DGS, 9DAF, (9DCJ), 9DCW, (9DEK), 9DDN, 9DGE, (9DHP), 9DIS, 9DLI, (9DOE), 9DQA, 9DGF, 9DRR, 9DVA, 9DVE, 9DXN, (9DZY), 9ALB, 9EBP, (9EVE), (9EFZ), (9EGH), 9EHN, 9EIS, (9EKY), (9ELB). Can.: C.W.: 1AR, 2BN, (3BP), (3DS), 3GE, (3GN), (3HE), 3KG, (3ND), 3OH, 3TY, (3KN), 3ADN.

4BL on vacation at Indian Rocks, Fla. (Aug. 17-31)

C.W.: 1ACU, 1ASP, 1ALJ, 1BCG, 2AFP, 2AGB, 5AKN, 5IN, 5JF, 5RB, 5UL, 5UO, 5VA, 5ZAV, 6AWT, 6RVG, 6TV, 8APT, 8BDH, 8BNO, 8GZ, 8ZZ, 9AAL, 9AHJ, 9AMB, 9APU, 9APV, 9AWG, 9AWK, 9BBW, 9BHN, 9BKK, 9BQC, 9BQQ, 9BRK, 9CAN, 9CCS, 9CVS, 9DDN, 9DJB, 9CK, 9DU, 9ZT. I.C.W.: 1CKP, 8VQ. Phone: 5VY.

All reception was done on a one wire antenna 100' long and 12' high with one UV200.

4FG, Athens, Ga. (Sept. 3, only)

C.W.: 1ABR, 1ABS, 1ADN, 1AEZ, 1BWJ, 1CMP, 1CTV, 1FM, 1IL, 2RB (fone), 5GM, 5KV, 5JF, 5ADO, 5AJB, 5ARB, 6TV, 7ZD-7IU, 9AVC, 9BAB (QRA?), 9BQY, 9CCZ, 9CWF, 9DCE, 9ELD (QRA?), 9VE. Canadian: 3NI.

5GP, 1025 Fairmount Ave., Anniston, Ala.

C.W.: (1ACU), 1BCC, 1CDM, 1CKP I.C.W., (2AWA), 2AWF, 2FP I.C.W. (3BGC), (3BUC), (3WYA), (3CHG), 3DH, 3IL, (3ZO), 6AWT, 6BBH, 5BVG, 6CMR, 6KA, (6TV), 5AIO, (6AZO), 9BDH, (8BHF), 8BLH, (8VQ) I.C.W. 8VY, (8ZZ), 9AFL, (9AMB), 9AWK, (9BMU), 9BMX, (9CAA), 9CVC, (9DDN), 9DGE, (9DHG), (9DIS), (9DLI), 9RW, (9ZT).

5LG, Cloudcroft, N.M. (July and August.)

C.W.: 4FT, 6AFH, 6AHU, (6AJD), (6AOU), (6ARB), (6BCB), (6BMG), 6BUY, (6BWP), (6CGD), (6CR), 6CMR, 6GR, (6TU), (6TV), 7AGV, 7BJ, 7C, 7LN, 7WM, 7ZF, (7ZN), 7ZV, 8BDU, 8J, 8VY, 9AAU, 9AIM, 9AVZ, 9BFP, 9BSH, 9BXL, 9EKY, 9ZT. QSL to A. K. Tatum, State College, N.M.

6AFT, ex 5AIF, 7526 1/2 Figueroa, L. A., Calif.

C.W.: 9BB, 5AKY, 5LG, 5ZA (phone), 5AG, 1BL, 7LY, 7LN, 7LY, 7NY, 7QJ, 7TO, 7WM, 7ZD, 7ZF, 7ZN, 7ZV, 8CL, 9AMB, 9BJK, 9BSQ, 9BUN, 9BXX, 9CAA, 9CVC.

Radio 6ARU, Price, Utah

C.W.: 2BNG, 2BNZ, 2CQZ, 3AJG, 5EL, 5FZ, 5GJ, 5GO, (5JF), 5JJ, 5KL, 5KW, (5LG), 5LL, 5LR, 5NN, 5NS, 5UO, 5UP, 5VA, (5ACQ), 5ADO, 5AEC, 5AGE, 5AHD, 5AHL, 5AHY, (5AIJ), 5AIU, (5AJB), 5AMI, (5AMU), 5ZAV, 7BJ, 7GO, 7JE, 7IY, 7GP, 7LU, 7QA, 7QY, 7SZ, 7WM, (7WP), 7ZF, (7ZL), 7ZN, 7ZV, 7ADM, 7ADP, 7AHL, 7AKT, 7AKV, 7ES, 7NY, 7VY, 7WY, 7ADA, 7APT, 7AWF, 7AZO, 7BDA, 7QA, 7UH, (7ZT), (9DT), 9AAU, 9ACO, (9ACX), 9AQK, 9AEC, 9AHZ, (9AIM), (9AMB), 9APE, 9AVA, 9AWG, 9AYL, 9AZX, (9BAN), 9BDI, 9BFL, (9BJK), 9BKO, 9BLH, 9BLT, 9BQN, 9BRI, 9BSQ, 9BUN, 9BVO, 9BAF, 9BCQ, 9BDH Spk., 9BIS, (9CAA), (9CAJ), (9CCS), 9CCZ, 9CDE, 9CFY, (9CGA), (9CVC), (9CWF), (9DGE), 9DHI, 9DLI, (9DLT), (9DPF), 9DQE, 9DRV, 9EAB, 9EAE, 9EFZ, 9EKY, 9FRD.

6CJQ, Venice, California

5ADB, 5ADO, 5AGE, 5AIU, 5AKY, 5JF, 5LG, 5KG, 5MN, 5UO, 5ZH, 7AEN, 7IO, 7IT, 7LN, 7ZF, 7ZL, 7ZN, 7ZO, 7ZV, 8HV, 9AMB, 9BJK, 9BRI, 9BUN, 9CAA, 9CEU, 9CFJ, 9CVC, 9DL, 9EAB, 9IG, 9ZL, 9ZT, 9DTE.

6BVG, Los Angeles, Calif. (Aug. 4 to 20th)

C.W.: 3EB, (5ADO), 5AKY, (5AHD), (5LQ), 5KW, 7ABS, sixes too numerous, 7AFO, 7AGE.

ROYAL W. HOWARD, 7IR, PUBLICITY MANAGER, NORTHWESTERN DIVISION A.R.R.I., SENT IN THESE "OCCUPATION" SUGGESTIONS AND "GOODY" FALLS FROM EUGENE, OREGON

7AGS, 7AKT, 7BR, (7BJ), (7GP), 7GO, 7IY, 7LY, 7LN, 7NN, (7QO), (7ZP), 7ZD ex 7ZU, 7ZN, 7ZV, 7WM, 8ZZ, 9AAV, 9AWG, 9APV, (9AMB), 9BJK, 9BCH, 9BXQ, (9CAA), 9CCL, 9CVC, 9DLI, 9DTE, 9DTH, 9EKY, 9EAE, (9ZT), Can. (5GO).

6CEU, 113 Uulani St., Hilo, Hawaii

C.W.: 1BCG, 2FP, 3YO, 4AKI, 5AKY, 5XAJ, 5VO, 5AIU, 5HZ, 5KE, 5ZA, 5AIF, 5GO, 5AGN, 5ZAV, 5ZAK, 5AHD, 5PX, 5FX, 6AMA, 6AE, 5FZ, 5PT, 6MN, 6MC, 5KW, 5AIG, 6NS, 6ATY, 6AKN, 6NN, 6GA, 6BJQ, 6ARB, 6PL, 6CGD, 6ATY, 6CKR, 6CMX, 6CMR, 6LV, 6RLV, 6MH, 6APW, 6BVC, 6CPZ, 6BQ, 6ZE, 6RFY, 6CBL, 6BCL, 6BPZ, 6BUY, 6BLV, 6BMD, 6BRF, 6C, 6CBL, 6BVE, 6CZ, 6AVR, 6BRU, 6KI, 6CAJ, 6BRG, 6BVS, 6ZZ, 6ZH, 6ASJ, 6AWX, 6BEZ, 6BGF, 6BWP, 6CGW, 6BS, 6CU, 6RAW, 6AUX, 6ARK, 6ALK, 6AJS, 6CES, 6HVE, 6BEO, 6BJI, 6AAK, 6AQU, 6NX, 6AJP, 6ROU, 6BNT, 6BON, 6AOL, 6BOD, 6AWT, 6CHL, 6BRI, 6CFQ, 6AOQ, 6EB, 6RM, 6RPE, 6RM, 6BHH, 6AUR, 6ANG, 6KA, 6FF, 6AOP, 6TC, 6ZR, 6CNC, 6BSG, 6WZ, 6HP, 6ATZ, 6AUI, 6CEL, 6EC, 6CCU, 6BVS, 6CUN, 6CHV, 6AOL, 6ATC, 7AF, 7SF, 7ADP, 7TQ, 7NP, 7BJ, 7OH, 7NL, 7ADR, 7KS, 7AFN, 7LR, 7LNN, 7IY, 7NN, 7GO, 7AHL, 7LH, 7ZV, 7GP, 7LN, 7WM, 8BOZ, 9CMK, 9ATN, 9QF, 9ARZ, 9CRR, 9BHD, 9CBY, 9AUL, 9CJJ, 9ARZ, 9CKS, 9AIM, 9VE, 9ZT, 9APE, 9ABV, 9AMB, 9BAN.

M. J. Brown, Wailuku, Maui, Night of July 19th. C.W.: 6AO, 6AV, 6CP, 6BJQ, 6BPR, 6DPR, 6CHL, 6GR, 6BG, 6ABR, 7IW, 7IV.

7IY, Gaghon, Wash.

C.W.: 1BCC, 1JM, 2CDE, 2FP, 3SU, 3ABE, Can.

3XN, 3JJ, 4EB, 4FT, 4BY, 4CS, 4KU, 5AMA, 5AKK, 5AGJ, 5AEK, 5AF, 5ARC, 5ANL, 5AHD, 5AGR, 5FV, 5FX, 5GA, 5HZ, 5LG, 5MN, 5PH, 5PX, 5VY, 5NS, 5NN, 5FK, 5MC, 5MA, 5RL, 5NZ, 5YP, 5ZA, 5ZAV, 5ZAK, 5UK, 5APN, 5AMP, 5AQO, 5ABE, 8AMM, 8APY, 8AXN, 8AWP, 8AIO, 8BCL, 8BCP, 8BYT, 8BUZ, 8BZC, 8BFZ, 8BAN, 8BFH, 8BBI, 8CAV, 8CUG, 8CK, 8CAZ, 8CEI, 8CYX, 8DAT, 8IJ, 8IP, 8HV, 8VY, 8ZD, 8ZW, 8RZ, 9ABU, 9ARZ, 9APW, 9AAU, 9AUA, 9AUU, 9ARG, 9ATU, 9AXX, 9APE, 9AVU, 9ARC, (9AMB), 9AIM, 9AAW, 9AOS, 9AVZ, 9AHZ, 9AVP, 9AUS, 9AWK, 9AHJ, 9HUN, 9BRI, 9BVO, 9BTL, 9BKJ, 9BSG, 9BK, 9BGV, 9BEZ, 9BTT, (9BXQ), 9BJX, 9BAF, 9BKY, 9BRK, 9BQE, 9BQQ, 9BQY, 9BMU, 9BAN, 9BFI, 9BJK, 9BHL, (9CAA), 9CFY, 9CPU, 9CVV, 9CFI, 9CZG, 9CVC, 9CLL, 9CDV, 9CCZ, 9CAJ, 9CIP, 9CE, 9CUS, 9CUC, 9CJS, 9CVO, 9CGA, 9DWN, 9DFW, 9DJR, 9DQW, 9DAW, 9DHS, 9DOM, 9DOF, 9DGH, 9DGV, 9DOE, 9DRO, 9DTE, 9DGE, 9DRV, 9EKF, 9EBT, 9MC, 9GD, 9MF, 9HW, 9IJ, 9PN, 9UH, 9IP, 9ZT, 9ZL.

1500 Foot Beverage Wire Used.

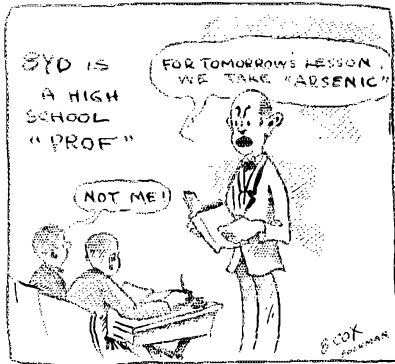
7VF, 419 N, 12th St., St. Corvallis, Oreg.
C.W.: 4DN, 5GA, 5MN, 5ZAS, 5ZAW, 5VY, 9AIC, 9AMB, 9AXX, 9BJK, 9BQQ, 9BUN, 9CVS, 9EI, 9EKF, 9ZT.

M. W. Malone, 1185 Detroit Ave., Portland, Oregon
C.W.: 5AEC, 5IN, 5JF, 5MN, 5NS, 5AIO, 5VY, 9AAB, 9ACK, 9AHQ, 9AIM, 9AMB, 9AUA, 9AXX, 9BJK, 9BMU, 9BQQ, 9BRK, 9CAA, 9CVC, 9DAW, 9DHP, 9DLF, 9DLI, 9UC, 9ZT.

SADA, Cleveland, O.
C.W.: 4HZ, (4CS), 5GA, (5GP), 5KC, 5LL, 5NN, 5NS, 5PB, 5PH, 5QF, (5AMH), 6X, 6VG, 6CBU, 6CFI, 6GP, 7LU, 7RB, (9BXM), 9CAA, 9CVC.

8AGO, Pittsburgh, Pa.
C.W.: 5GM, 5GP, 5NI, 5NS, 5AMH, 7ZN, 9AWA, 9BTT, 9CZG.
Dashlet: 4IV, 4RIV, 4RRI, 4CMX, 2AWH, (2BEX), 2BRB, 2RFE, 2RYG, (2CKD), (3AH), 3RC, 3HH, 3IA, 3W, 3FR, 3AAK, 3AUV, 3AWH, (3RGG), 3RNU, (3BVA), (3BVL), (3CUD), (3CIA), 3T, 3GX, (3RBF), (3RIQ), (3BWX), (3CTN), (3DDX), (3DKM), other 3's too numerous, 3AHH.
Canadian: (3AA), 3XN.

9DCW, Maplewood, Mo.
C.W.: 1ACT, 1AP, 1RW, 1DDM, 1CKP, 2BRC.



2DEY, 3AUW, 3BFU, 3BVA, 3CDU, 3JJ, 3KM, 3TJ, 3WF, 4BK, 4RX, 4BY, 4CS, 4DN, 4DO, 4DT, (4GK), 4GL, 4GN, 4HT, 4KU, 4LJ, 4MB.
Can.: 2BN, (3BP), 3DS.
Dalite: 4MB, 5EK, 5GM, 6GN, 5MO, 8BDU, 9BVT, 8CGT, 8ES, (8GZ), 8HV, 9AHQ, 9ALB, 9AMU, 9APS, 9ARC, 9BDS, 9BGX, 9BJR, (9CFK), 9CLZ, 9CP, 9CPW, 9CWC, 9DEK, (9DWK), 9EDO, 9HK, 9TG, 9LD, 9LT, 9LQ, 9SK, 9UC.
Spk.: 9LF.
Can.: 3XN.

9DEK, North Judson, Ind.
C.W.: 5AAG, (5ABT), 5ACQ, (5AEC), 5AFQ, (5AMH), (5AJJ), (5GM), (5GP), (5MO), 5HL, (5KC), 5KW, (5LL), 5MM, 5NE, 5NN, 5NZ, 5OM, 5PF, (5QF), (5QU), 5RL, 5WG, 5ZAS, 6AWT, 6JD, 6CBU, 7ZG.
Canadian: (3OH), (3NI), (3DE), 2BE, 2BN.

9BJT, Streator, Ill.
C.W.: 6CU, 6EA, 6EB, 6EN, 6JD, 6KA, 6TV, 6ZW, 6ZZ, 6ALV, 6ARB, 6ARU, 6AVV, 6AWT, 6BJQ, 6BVG, 6CBU, 6XAD, 6XBC, 7BX, 7BJ, 7LU, 7SC, 7ZD, 7ZU, 7ZV.

9AFR, Lincoln, Nebraska
C.W.: 1BBO, 1BCG, 1BES, 3VO, 3ATB, 4BY, 4GL, 4GX, 6KA, 6BBH, 6BVG, 6CBV, 7IY, 7LN, 7WM, 7ZN, 8AMM.

9CFK, Lewistown, Ill. (Aug. 15-31)
C.W.: 1ER, 1XP, 1AQM, 1BBO, 1BCG, 1BVC, 2ACD, 2AWL, 2AKK, 2BSC, (2BUM), 2CCX, 2COA, 2CUR, 2CQZ, 2RM, 2PD, 2HH, 2WF, 3VO, 3AHP, 3ANW, 3ATB, 3AWH, (3BDO), 3REI, 3BFU, (3BNV), 3BOF, (3BVA), (3BVL), 4AI, (4CG), 4DN, 4EB, 4EH, 4FA, (4HS), 4LJ, 4MB, 4RF, 5AC, 5LL, 5NS, (5PH), 5VY, 6KA.
Can.: 2BN, 2CG, 3BP, 3DS, 3GE, 3IN, 3OH, 3XN.

TRANSPACIFIC TEST LOGS

3JU, Messrs. Hiam and Hull, St. Kilda, Melbourne
May 2, 3rd Dist. Station (call unreadable) repeating letter H; 4th, C.W. on 200 meters repeating work MTTO; 10th 7:25 p.m. 6CGW calling 2AWL; 11th 7:25 6CGW calling 6Q; 13th 6:50 6CGW calling Australia; 7:12 same; 7:25 same; The best part of this evening wasted waiting for 6CGW to send code word; 8:45 5ME? sending msg copied complete; 14th 6CGW sending TJ; 15th 6JD calling Australia sending "ODO also hope you break every record, if this is OK let us hear from you." 7:45 6CGW sending TJ, calling Australia; 8:25 3IRD (doubtful) repeating letter H; 15th 7:45 6JD calling Australia ODO; 8:10 Australia de 6JD hr copy msg cable list of first ten calls across will pay half tolls for radio journal. (These signals readable 25 feet from phones. Perfect copy obtained) 8:50 6PD sending try drop you card tomorrow we want to go with Sun a.m. all hr msg de 6PD; 9:00 6JDD with same msg as at 8:10; 20th 8:15 6CGW sending TJ 8:45 same 9:10 same; 27th 6JD calling Australia ODO; 28th 7:44 3ATL (doubtful) sending 3BVA repeated; 9:10 6CGW calling Australia. Heavy interference from nearby untors prevailed during tests and totally prevented reception on some nights.

3BQ, Maxwell Howden, Box Hill, Melbourne, Australia
May 13th
7:30 P.M.—Mr. Cahun Sen. 450 ---- Broadway
7:43—7PD de TLA ---- for ---- on ---- 17 to nil QTC (faint but quite readable except for QRM)
7:58—8XK de 9URE (quite readable. Note fairly pure.)
7:59—8UPE de 9ARL.

May 14th
6:30 P.M.—Australia Australia ---- de ---- RV (spark QRM. Slight A.C. hum)
7:00—(faint pure C.W. unreadable.)
7:20—Australia (5 times) TJ TJ TJ TJ de 6CGW Australia TJ must ---- nw 6CGW Test Australia TJ 6CGW. (sigs. strong. Very bad hum. 5 other C.W. Stations going.)
7:45—6C---- (just readable until jammed, hum bad.)
8:15—H. H. H. H. Australia (8 times) X. X. X. to Australia de 3IRD 3IRD 3IRD (fairly weak. Static getting worse. Ripple not bad.)

May 15th
7:15 P.M.—Australia (3 times) TJ TJ TJ de 6CGW 6CGW 6CGW. (hum bad. QSA)
7:18—Australia (3 times) CDO CDO CDO. Hope you receive us OK. Let us know will you. CDO CDO CDO CDO de 6JD 6JD 6JD. (QSA. Fairly smooth.)
7:35—J J H de 5AEC 5AEC 5AEC (fairly strong but jammed by spark)

7:40—6JD 6JD 6JD de 6PD 6PD 6PD. (very QSA)

May 17th

7:20 P.M.—Australia (3 times) de 6BVG 6BVG 6BVG (faint and fading)

7:35—----- de 5NO. (very faint)

7:50—Australia (6 times) CDO CDO de 6JD 6JD 6JD pse copy. Cable list of ten calls across. Will pay half toll. Signed—Radio Journal. (This was repeated en masse 3 times at a very fair strength at times but occasionally went right out.)

8:15—Australia (3 times) de 6AVN 6AVN 6AVN. (weak and fading badly)

8:25—Australia (3 times) HOD HOD HOD de 5AEC 5AEC 5AEC. (faint but steady)

8:37—5AEC de 6PD 6PD 6PD OK will try to send him Sunday A.M. any time. (QSA, read through strong local spark.)

8:50—UY UY UY de 6BUN 6BUN 6BUN (faint and fading)

9:00—Australia, CDO de 6JD. Pse copy. Cable list of ten calls across. Will pay half toll. Signed. Radio Journal. de 6JD. Now look for more msg. later. (QSA)

May 20th

7:06 P.M.—TJ TJ TJ test Australia (5 times) de 6CGW (3 times) (fairly faint and very broad)

7:22—TJ TJ TJ Test Australia de 6CGW

7:43—CH CH CH de 9GG 9GG (faint with very bad A.C. hum)

7:45—----- de 6PD (very weak compared to 17th inst.)

7:50—Australia de 6CGW

(Concluded on page 64)

JUNIOR OPERATOR

(Concluded from page 58)

cycles per second, and must then be rectified. The former is done by what is called the *beat method*, which consists of superimposing on the incoming signal, oscillations of a slightly different frequency. When the two frequencies are intermixed the result will be the appearance of groups of oscillations, just as we desire, and there will be as many of these groups per second as there is difference in the two frequencies that caused them. For instance, in order to get an audible note of 1,000 cycles per second from an incoming signal whose frequency is 1,500,000 cycles per second, we superimpose on it oscillations of either 1,501,000 or 1,499,000 cycles per second. These oscillations that are superimposed on the incoming signal are generated by making the detector tube itself oscillate. How one tube can function as an oscillator, detector and amplifier at the same time is told in the following paragraphs.

Figure 5 shows a "standard regenerative circuit." The feedback or regeneration is controlled by the tickler coil which is inductively coupled to the secondary. If the coupling is tight enough the tube will oscillate steadily at a wave length determined by the adjustment of the secondary variable condenser. In receiving a C.W. signal, the frequency of the *local oscillations*, as they are called, is varied until it is 1,000 cycles or so off of the frequency of the incoming signal. The incoming signal is then broken into 1,000 groups of oscillations per second as explained above. The

groups of oscillations forming the beat note appear somewhat as in Fig. 6. Thus far we are speaking of the tube as an oscillator.

The groups of oscillations shown in Fig. 6 are impressed on the grid of the tube. The detecting or rectifying action may be explained as follows: During the brief periods of time when the oscillations within a group have their positive halves impressed upon the grid the plate current will be increased momentarily at each half cycle. These pulses of current will occur at such a rapid rate, however, that their effect on the diaphragm of the phone will be very little. A positive half cycle, in being impressed upon the grid will also charge the

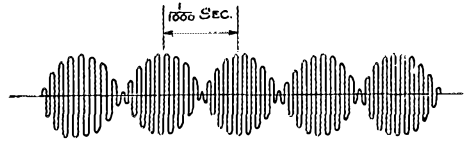


FIG 6

grid condenser with polarity as marked in Fig. 5. Now when a negative half of an oscillation is applied to the grid no current can flow from the filament to the grid and neutralize the charge put in the grid condenser by the preceding positive half oscillation because a negative grid will repel the electrons thrown out by the filament and there will be no path for the current. The result will be a piling up of the grid charges at each oscillation and the grid will become highly negative. Because a negative grid reduces the plate current, there occurs a dip in the plate current that causes a sound in the phones for every group of oscillations. 1,000 groups per second will cause a 1,000-cycle note in the phones.

After each group passes, the charge on the grid condenser must be removed, so the set will be in readiness to act when the next group of oscillations arrives. This is accomplished by connecting a high resistance of from 1 to 5 megohms around the grid condenser or from grid to filament. This is called a grid leak because it allows the grid charge to leak off after each group of oscillations. In soft gassy tubes a grid leak may not be required, in which case the charge leaks off from the grid to the filament inside the tube.

Coupled with the action of a vacuum tube as a detector, it should be remembered that any oscillations or pulses of current that are transferred from the grid to the plate circuit are amplified in the process. This is the reason for the superiority of a non-regenerative vacuum tube detector over a crystal for spark or phone work, for while the latter only detects, the former detects and amplifies simultaneously.

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CALLS HEARD

(Concluded from page 63)

8:00—HU ----- 7AU 7AU (faint C.W. very pure)
8:07—CH CH CH de 9GG
8:37—Australia de 6CGW

May 25th
7:15 P.M.—Australia (3 times) CDO CDO CDO de
6JD 6JD 6JD pse. copy. Your cable received.
Thanks. Sig. Radio Journal, Australia de
6JD hr. msg. pse. copy. Your cable recd.
Thanks. Sig. Radio Journal. V V V QRX
for msg. few min. de 6JD KK (fair strength
but very bad keying, fading slightly, higher
wave length)
8:27—A good --- Los Angeles --- 6JJ --- yo- j ---
for--- (too faint to read through QRM)
8:55—CQ CQ CQ de 6---LLL s--- doctor -----
(jammed by spark, fair strength, bad keying.)

May 27th
7:05 P.M.—Australia de 6CGW
7:14—Australia (3 times) de 6CBI 6CBI 6CBI
Australia de 6CBI 6CBI 6CBI (very pure C.W.
fading but quite readable. No code word)
8:10—Test Australia TJ TJ TJ de 6CGW 6CGW
6CGW (medium strength, fading and jammed.)

3BM, H. K. Love, Ferncroft Ave.,
Melbourne, Australia

May 6th
6:40 P.M.—Station sending M O T T O over and over
again

May 11th
7:25—6CGW calling CQ, sent about 30 times

May 13th
7:10—6CGW calling Australia

May 14th
7:29—6CGW sending "TJ" "TJ" repeated
7:45 (approx)—AN AN VVV O. T. G. RRR OK
OK N.W. OM how Hw do Hw do --- U give
a compensation ---
5RBI—I shouldn't be ---- at all Ostr wen Os up
sorry OK OK really drafting in phones my no
10 about some toone --- an an is better than
mine I I I will call Canada until --- has has
comp comp OM OM --- I am VD --- hw hw
---maw K K --- will get sui --- U about nature
September (doubtful) wusac pretty rotten I
guess too

NOTE, ----- (too fast) ----- 3IRD
The above was wonderful strength but persistently
faded. I don't think 3IRD sent the message. I
hope this station can be traced.

May 17th
7:38— ----- de 3KK 3KK ----- Could not get time
to listen in after this date.

STRAYS

(Continued from page 55)

When 8BYH uses the 1DH circuit the filament transformer gives off a disagreeable odor. Another reason why the 1DH edition of the reversed feedback circuit can be improved.

Another one: Berkner of 9AWM suggests this method of ascertaining the amount of drop in the voltage across the secondary of your plate transformer when the key is pressed: Put a book on the key and grab the transformer terminals. If you wake up with the doctor working your arms up and down, you'll know the voltage didn't drop much.

(Concluded on page 65)

STRAYS

(Concluded from page 64)

In a neutrodyne set it is desirable to connect several variable condensers together mechanically so they may be controlled by one knob. A. P. Southworth of Wakefield, Mass., uses General Radio condensers and mounts them so the small fibre vernier pinion on one condenser meshes with the large gear on the next one, and so on. The rotary plates of the condensers should be connected to the filaments to minimize the capacity coupling between stages, which is increased by this arrangement.

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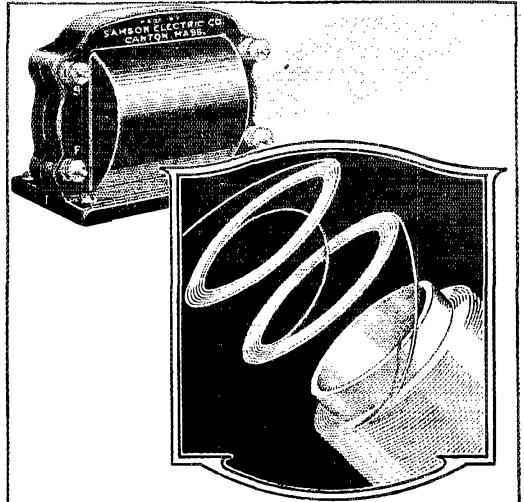
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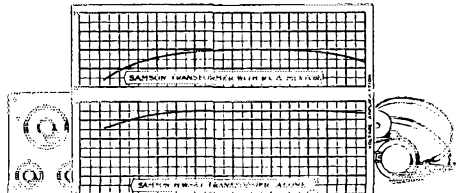
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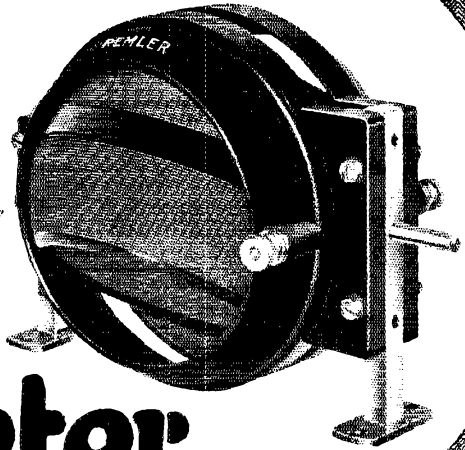
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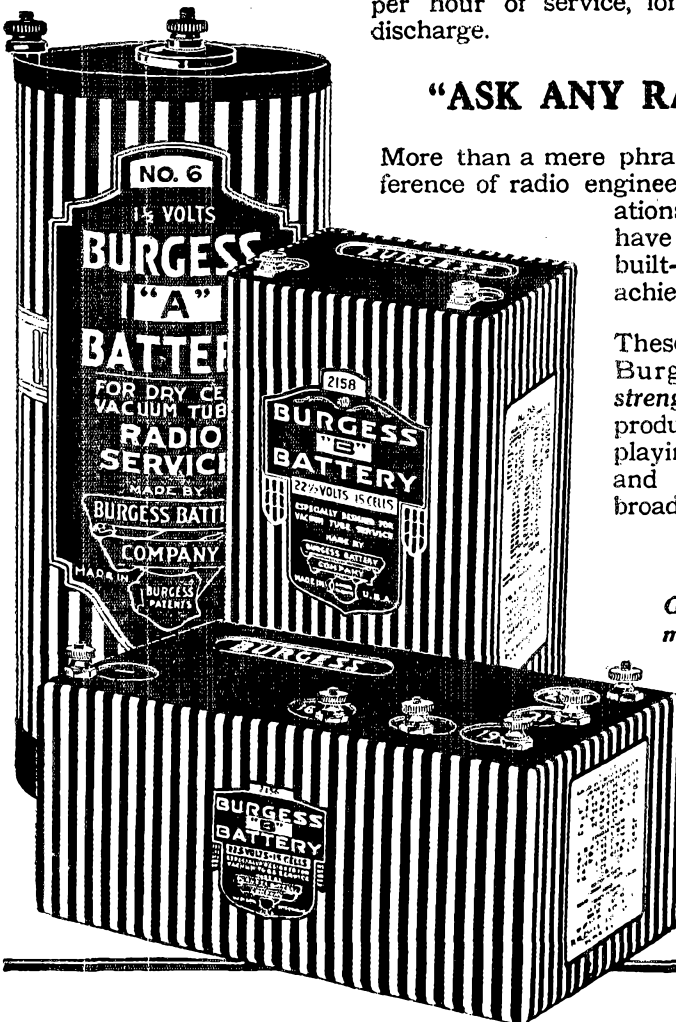
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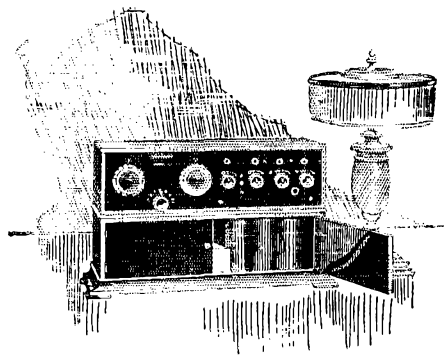
General Offices and Works: Niagara Falls, Ont.
Branches: Toronto, Montreal, Winnipeg, St. John





Abroad at Home with a **CROSLEY MODEL X-J**

PRICE \$65



CROSLEY MODEL XJ

A 4 tube radio frequency set, incorporating one stage of Tuned Radio Frequency Amplification, Detector and two stages of Audio Frequency Amplification, with jack to plug in on three tubes for head phones; new Crosley multistats, universal rheostats for all makes of tubes; new condenser with molded plates; filament switch and other refinements of details. A mahogany battery cabinet which makes the set completely self containing may also be had to fit the Model XJ at a cost of only \$16. See illustration above.
See this beautiful receiver at your dealers.

Wonderful opera from New York, love songs from the tropics, dance music from Chicago; stock quotations, stirring speeches, amusing stories from where you will—all these pleasures and utilities are brought truly, clearly, right to your fireside if you own a Crosley Model XJ Radio Receiver.

This beautiful new Crosley 4 tube Model contains the same units as the famous Crosley Model X, with added refinements of detail which make it even better. At bringing in distant stations, the Model X established many records during the past year. Sebring, Fla. continually heard Honolulu. A man writes from Nassau, British West Indies, "First of all on Friday night, June 29, 1923, I heard Honolulu." He goes on to relate that practically all stations in the United States were brought in clear as a bell.

With the Crosley Model X-J even better receptions are assured. We unhesitatingly claim that it is the best radio receiver ever offered, regardless of price.

For Sale By Good Dealers Everywhere

Write for free catalog which shows the complete Crosley line of instruments and parts. In it you will find just the receiver to suit your needs and pocketbook. Crosley Receivers without batteries, tubes and head phones range in price from the efficient 2 tube Model VI at \$28 to the beautiful Console Model at \$150.

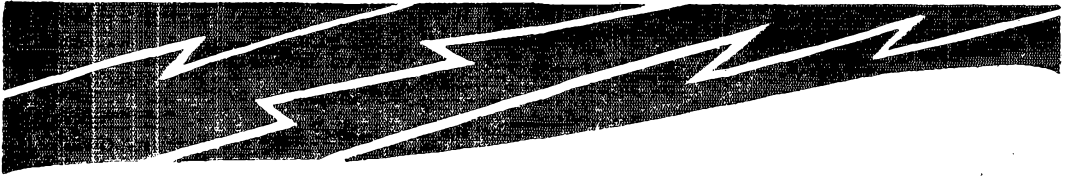
CROSLEY MANUFACTURING CO.

1018 Alfred Street,

Cincinnati, O.

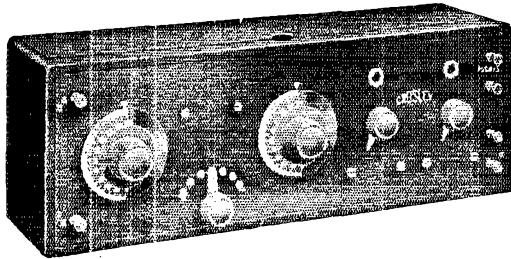
CROSLEY
Better - Cost Less
Radio Products

New York Office, C. B. Cooper, 1803 Tribune Building, 154 Nassau Street, Beckman 2061.
Boston Office, B. H. Smith, 755 Boylston Street, Room 316.
Chicago Office, 1311 Steger Building, 28 E. Jackson Blvd., R. A. Stemm, Mgr.
Philadelphia Office, J. H. Lyte, 65 North 63rd Street.
St. Louis Office, Robert W. Bennett Co., 1326 Syndicate Trust Building.



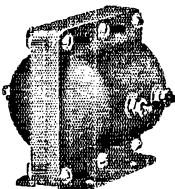
Crosley Radio Parts and Sets Popularity Proves Their Worth

The fact that innumerable favorable comments are received daily from people everywhere who have used Crosley parts and sets with entire satisfaction leads us to believe that you too will find that they will fill your every requirement.



Model VI—Price \$28

This Model contains the stage of tuned radio frequency amplification brought to 100% perfection by the Crosley Company. For its price and size, it gives surprising results in long range reception. Hundreds of testimonials have paid tribute to its efficiency.

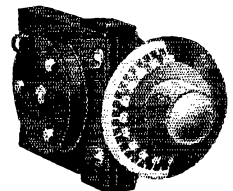


CROSLY
SHELTRAN
TRANSFORMER

Price\$4.00

The Crosley Sheltran is a completely shielded transformer. Embodied in it are all the characteristics so essential to obtain maximum amplification from the modern vacuum tubes used in radio work. Tests have proven the design to be correct to insure maximum efficiency.

The Crosley Radio Frequency Amplifying Tuner consists of an inductance coil and a Crosley book type variable condenser. It can be tuned to any wave length between 200 and 600 meters. When used with non-regenerative sets it will increase the range many times.



CROSLY
AMPLIFYING TUNER
Price\$4.00

CROSLY
BETTER·COST LESS
RADIO

For Sale By Good Dealers Everywhere

CROSLY MANUFACTURING COMPANY

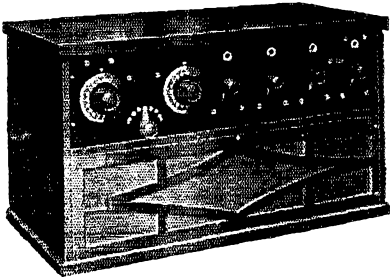
1018 ALFRED STREET,

CINCINNATI, O.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

Three Beautiful Cabinet Models

The Last Word in Crosley Efficiency



CROSLY MODEL XV
(Above)

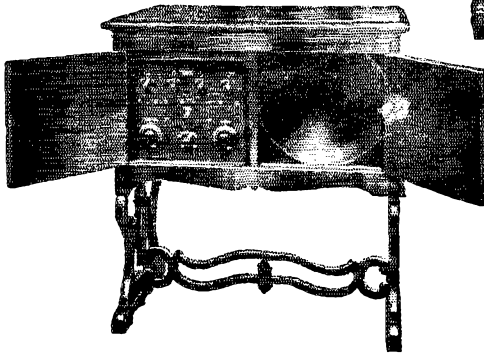
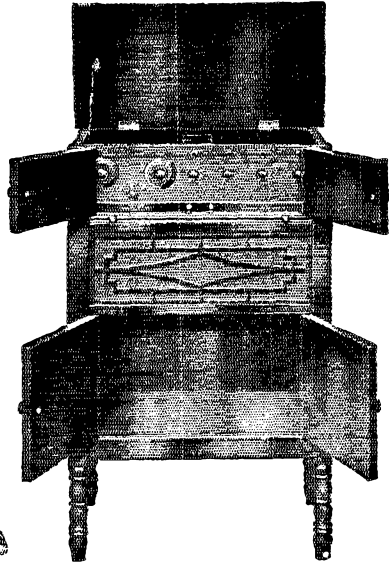
The receiving apparatus in this model is the same as that in our cabinet Model XX. The cabinet contains no place for the batteries, however, placed on a mahogany table or stand, it forms an attractive piece of furniture. Price without tubes, batteries or phones.....\$70.00

CROSLY MODEL XXV
(Below)

We can conscientiously recommend this console model as the most beautiful and efficient model offered today. The receiving apparatus contains the same units as our model X though differently arranged. The cabinet, of mahogany, exceptionally well finished, is arranged to take the model R-3 Magnavox and also contains space for "A" battery, "B" battery and battery charger if desired. Guaranteed to bring in broadcasting stations 1000 miles or more distant so that they may be clearly heard all over the room. Price without tubes, batteries or phones.....\$150.00

CROSLY MODEL XX
(Below)

This attractive model is our model X built into a highly polished mahogany cabinet. A hinged lid, when raised allows the operator access to every part of the receiving apparatus. A sliding board under the receiving apparatus forms a desk for the operator when desired. The lower compartment is made to take care of the batteries and the middle compartment contains a loud speaker which makes it possible for music, speeches, etc. to be heard clearly by everyone in the room. As a beautiful piece of furniture, this model is an addition to any room. Price without tubes, batteries or phones.....\$100.00



CROSLY
Better---Costs Less
RADIO

CROSLY MANUFACTURING CO.
1018 ALFRED STREET, CINCINNATI, O.

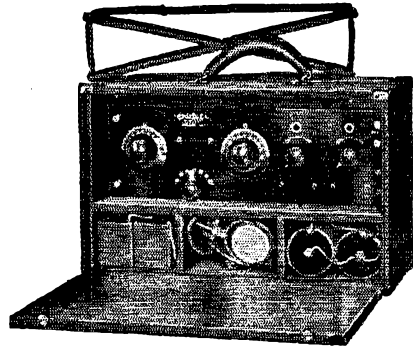
Pleasant Evenings in Camp With a Crosley Portable

No matter how far into the wilds you go on your vacation, you can keep in intimate touch with the outside world and enjoy its pleasures in the evening.

Crosley Portable Radio Outfits have made this possible. Absolutely complete in their compact cases, they may be easily carried and quickly set up.

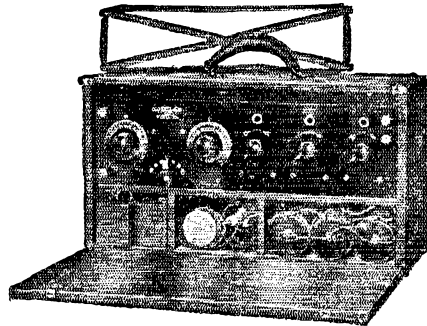
After a hard day's motoring, fishing or canoeing what a pleasure to get out the old pipe, sit before the camp fire and listen to music, plays and innumerable other interesting things. Get a Crosley Portable and take it with you on your vacation. It will afford you the least expensive pleasure you have ever enjoyed.

CROSLEY
Better—Costs Less
RADIO



Crosley Model VI Portable

Consists of detector and one stage of tuned radio frequency amplification. Compact compartments are built into this set for batteries, phones, etc. Thousands of users have testified as to its satisfactory performance. Price without tubes, batteries or phones.....\$40.00



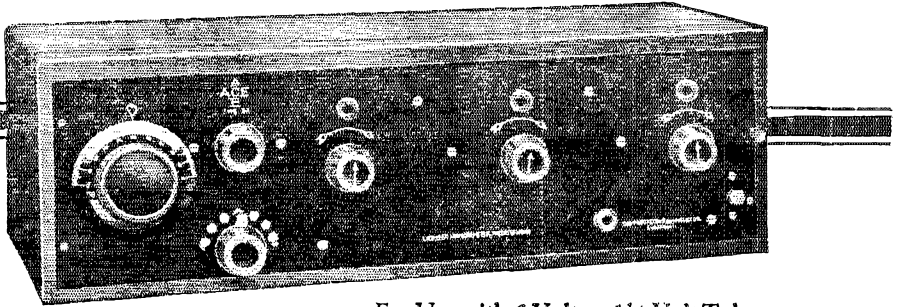
Crosley Model VIII Portable

Consists of one stage of tuned radio frequency amplification, detector and one stage of audio frequency amplification. This set has the same general construction as Model VI Portable, but performs even more efficiently. Price, without tubes, batteries or phones.....\$60.00

Free Catalog on Request

CROSLEY MANUFACTURING CO.
1018 ALFRED STREET, CINCINNATI, O.

**THE
NEW**



*Manufactured under
Armstrong U. S. Patent
No. 1,113,149*

For Use with 6 Volt or 1½ Volt Tubes

ACE

3B

\$50

Three Tube Regenerative Receiver

Many months of research work have developed this new Ace Type 3 B Armstrong Regenerative Radio Receiver to its high state of perfection. It is equal to a combination of the Ace Type V and the Ace two-stage amplifier. For volume and distant reception it outperforms most sets costing a great deal more.

The new Ace Type 3 B has a filament switch which eliminates necessity of turning out rheostats when set is not in use.

You may be listening to a station and turn off the set by throwing the switch—then come back later to same concert without retuning. Has telephone jack between first and second stage of amplification. This is for use of those who desire to use head phones instead of loud speaker. Crosley multistats, universal filament control rheostats for all makes of tubes are also used in the Type 3 B. Sells for \$50.00 but worth much more. Has genuine mahogany cabinet with engraved panel.

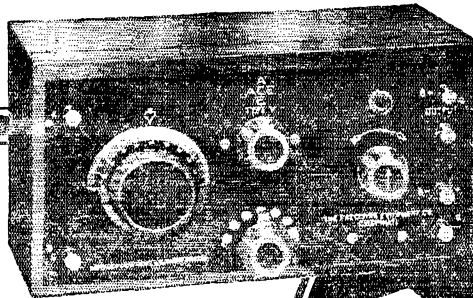
If your dealer cannot supply you, order direct, mentioning his name. Ask for "Simplicity of Radio." Your copy is *Free*.

DEALERS: Write on your letterhead for attractive sales proposition.

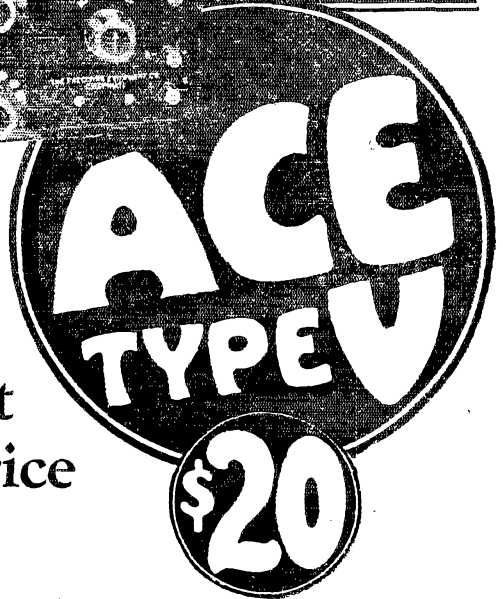
The Precision Equipment Company

Powel Crosley Jr., PRES.

1018 Vandalia Avenue, Cincinnati, Ohio



Licensed under
Armstrong U. S. Patent
No. 1,113,149



A Highly Efficient Set at a Moderate Price

Here is an inexpensive set that receives signals clear and distinct. It is a long range regenerative, radio receiver and under ordinary conditions stations from coast to coast are heard. We have many letters from owners praising the efficiency of the Ace Type V.

The low cost of this set in addition to its remarkable simplicity of operation increases its popularity among radio fans day by day.

A loud speaker can be operated in connection with the Ace Type V by adding an Ace Type 2 B, a new two-stage Audio Frequency Amplifier, which sells for \$20.00. With this addition, music or voice can be heard distinctly all over the room or house.

The modest price of this set makes it possible for everyone to enjoy radio. Don't be without radio entertainment any longer—get an Ace Type V and listen to the world's best musical concerts.

The Precision Equipment Company

Powel Crosley Jr., PRES.

1018 Vandalia Avenue, Cincinnati, Ohio

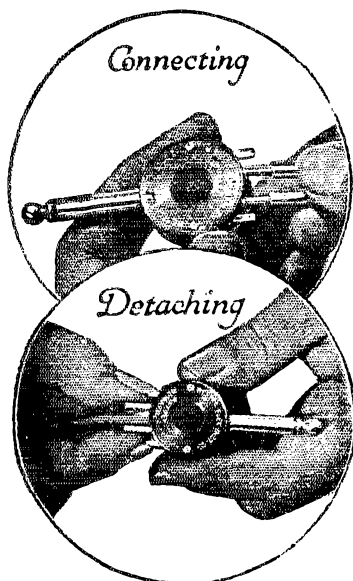
*Armstrong
Regenerative
Receiver*

If your dealer cannot supply you, order direct, mentioning his name. Ask for "Simplicity of Radio." Your copy is *Free*.

DEALERS: Write on your letterhead for attractive sales proposition.

The Perfected Radio Plug

(A SPLENDID SPECIMEN OF WESTON
WORKMANSHIP)



So simple, quick and convenient that every owner of a Radio Set will soon be using nothing else.

Illustration shows how terminals attach by merely shoving them into plug. Lower illustration shows how by pressing the triggers—terminals may be instantly released.

No tools required—no broken fingernails. Perfect contact, always. One plug does the work of several, where quick changes or experimentation is required.

Originally made for the exclusive use of the Weston laboratories in their experimental work. Now, on the market, because this plug was too good to keep from the public.

At all dealers.

If your dealer cannot supply you, send his name, and we will fill your order direct.

WESTON ELECTRICAL INSTRUMENT CO.

158 Weston Ave.,

Newark, N. J.

Electrical
Indicating
Instrument
Authorities
Since 1888

WESTON

STANDARD - The World Over

LOOK

A Long and Skinny Antenna Insulator 18 inches between wire holes one inch in diameter



MADE of the best highly vitrified high tension white glazed porcelain, especially prepared for making these insulators. Low capacity between terminals; a good dielectric with low absorption; will not absorb moisture; tensile strength 1500 lbs.

Greater DX transmission with Sure Fire Antenna Insulators.

In Lots of Six or More

ONE DOLLAR EACH

Express C.O.D.

9DNH SURE FIRE RADIO LABORATORY

Macomb, Ill.

RADION Panels

are
impervious to
moisture

Moisture is a conductor of radio frequency currents. When a panel or part absorbs moisture from the air it causes short circuits between terminals. These short circuits reduce volume and frequently are the cause of distortion.

Tests have proved Radion Panels impervious to moisture. Try them and notice the difference.

Send 15¢ for sample test pieces 2 x 3 inches.

18 Stock Size Panels

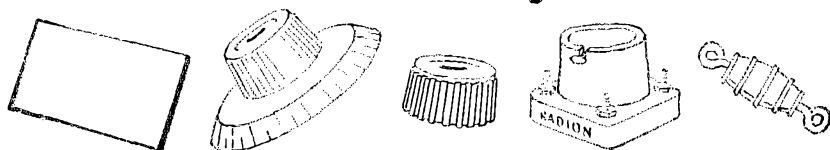
Radion being an insulation material especially made for wireless use, has the lowest phase angle difference, lowest dielectric constant, highest resistivity and supreme moisture, gas and acid repelling properties.

American Hard Rubber Co.

11 Mercer St., New York

RADION

Panels - Dials - Knobs - Sockets - Insulators

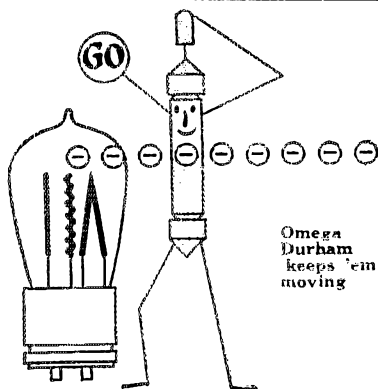


A.R.R.L. traffic can be handled quicker

When a dozen messages are lined up waiting to pass thru the "bottles" on the way to your ears—that's when little Omega Durham and his friend Dubilier act most efficiently as traffic cops. For the one finger control adjusts the point of oscillation with "frog hair" accuracy. And DX gets the right of way over local stuff.

Extra resistances

Changing hook-up sometimes alters grid circuit characteristics. So, get an extra resistance unit—either size, 75¢.



Omega Durham keeps 'em moving

DURHAM Variables + DUBILIER Micadons

No. 101—0.1 to 5 megs.
No. 201A—2 to 10 megs.

.00025 mfd.
.00050 mfd.

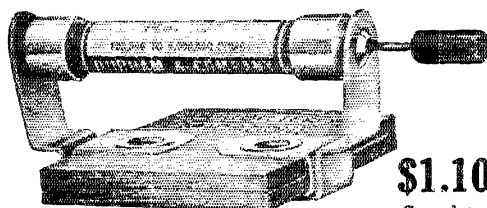
There's a combination for your tubes

Manufactured by

DURHAM & Co.

1936 Market St., Philadelphia

Dealers and Jobbers:—The 40,000 readers of QST would spend their last nickel on good radio parts. And they stick by the store that sells them.



\$1.10

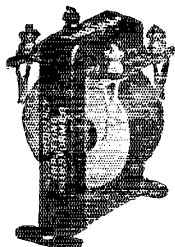
Complete

Satisfaction Guaranteed

Amplification Perfection

with an audio transformer means
PURE TONE QUALITY with
MAXIMUM VOLUME

The AMERTRAN —REG. U.S. PAT. OFF.— AUDIO TRANSFORMER



Price \$7

Ask your electrical dealer, or send carriage charges collect. (Wt. 1 lb.)

Turn ratio, 5:1. Amplification ratio, 30-40 times audibility in the flat part of the curve.

American Transformer Company

Designers and builders of radio transformers for over 22 years.

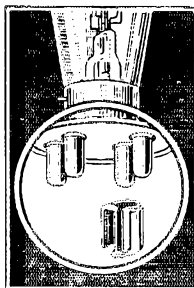
176 Emmet St., Newark, N. J.

is acknowledged by professional radio engineers to be the STANDARD OF EXCELLENCE for audio amplification.

The reason for the popularity of The AMERTRAN among professional radio men is apparent in the Amplification Chart shown in our Circular No. 1005.

PROTECT

The Heart of Your Radio Set



Vacuum Tubes are costly and extremely delicate. B battery or any other excessive current applied for only the fraction of a second to the filament leads will burn out your tubes.

You have probably already had this experience and it is apt to happen again at any time.

A burnt out tube means money lost—the set out of commission—inconvenience to you.

Why Take These Chances When RADECO SAFETY FUSES

will absolutely protect your tubes. Applied in an instant to the filament terminals. Will fit any standard tube or go in any standard socket. Fully guaranteed. 50 cts. each. Sent Postpaid. Delay may be costly. Write now. Specify type of tube used.

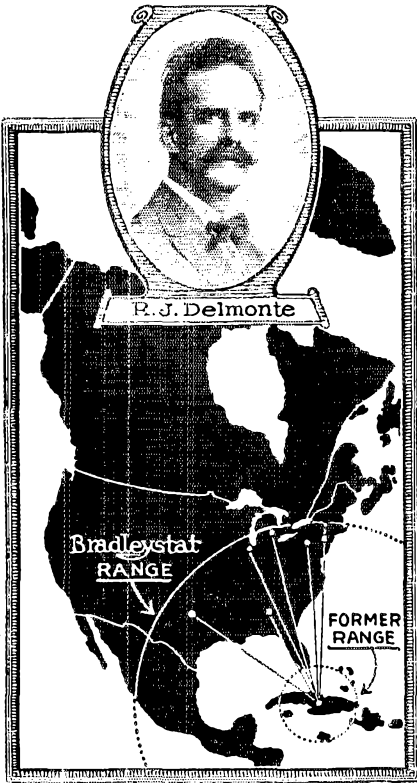
DEPT. 9

RADIO EQUIPMENT COMPANY

630 Washington Street Boston, Mass.

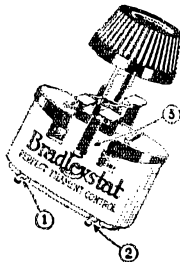
New England's Oldest Exclusive Radio House
Distributors of many other successful Radio Specialties. Dealers:—Write for our proposition and full details.

The Universal Bradleystat subdues static in Cuba!



The Universal Bradleystat provides perfect, stepless, noiseless filament control for every tube on the radio market. Try your tube with the Universal Bradleystat.

Retail Price
\$1.85
P. P. 10c extra



Guaranteed for one year

Remarkable improvement in radio reception follows installation of Bradleystats and amazes experimenter in Tropics. Read his letter!

Camaguey, Cuba, July 17th, 1923

"My experimental room is located in the center of Cuba, amidst the Gulf, which is reputed to be the general headquarters of static and all atmospheric disturbances of the whole universe.

I had my sets equipped with wire rheostats having vernier adjustments and my radius of reception was 350 miles from Havana with imperfect reception from Atlanta, Georgia.

After installing Bradleystats, I increased the radius 1000 miles without distortion and picked up Detroit, Schenectady, Pittsburgh, Fort Worth and other stations. When static is performing one of its infernal displays, I lower the filament heat with the Bradleystat to reduce noises. There is only one point of filament heat where this condition is fulfilled and the wire rheostat cannot furnish this with critical detector tubes.

For this reason, I claim the Bradleystat is the only apparatus for controlling filament heat, and if proper adjustment is made, static noises are practically eliminated.

Yours very truly,

Beware of Imitations—Avoid Substitutes

Numerous attempts have been made, without success, to duplicate Bradleystat performance by using carbon powder in tubes and other containers instead of the scientifically-prepared graphite discs found only in the genuine Bradleystat. For perfect filament control and uninterrupted performance, be sure to ask for the Bradleystat. The name Bradleystat is embossed on the porcelain container for your protection.

Allen-Bradley Co.
Electric Controlling Apparatus

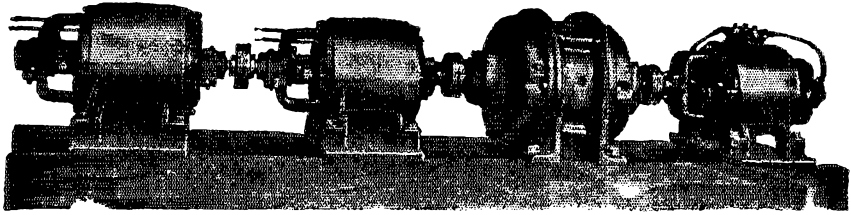
277 Greenfield Ave.

Milwaukee, Wis.

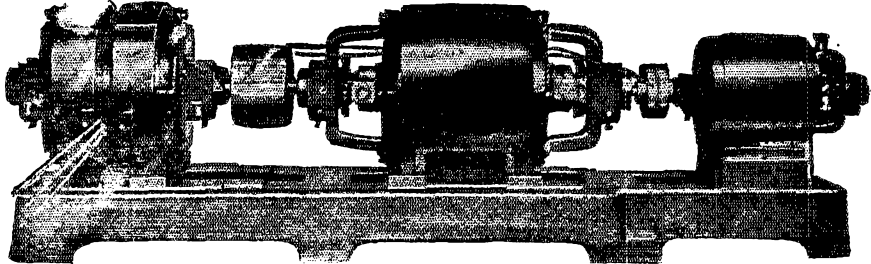
THE ALLEN-BRADLEY CO. HAS BUILT GRAPHITE DISC RHEOSTATS FOR OVER TWENTY YEARS

TRADE "ESCO" MARK

Quality always has been and always will be The World's safest investment.



This is a special 4 Unit Set for Wisconsin Dept. of Markets—The largest broadcasting Station in existence. A 10 H.P. 220 V. 60 cyc. 3 phase Motor Two 1800 V. 2000 W. Generators to operate in series, producing 2000 V. 4000 W. and one 12 V. 2000 W. Filament Current Generator. These two, and many other types, used by most prominent Educational Institutions, various U. S. Government Departments, Research Labs., Newspapers, Dept. Stores.



Sold by Principal dealers in U. S. and Abroad
Ask for Bulletin 248

Electric Specialty Co., 225 South Street, Stamford, Conn., U. S. A.
PIONEERS IN DEVELOPING QUALITY WIRELESS APPARATUS

TRANSMITTING EQUIPMENT

Buy the equipment for your station from us, for we specialize in amateur equipment—give good service, good goods and fair prices.

INDUCTANCES

No. 1 A high grade single coil inductance with continuously variable taps.....\$7.50
No. 2 Coupled circuit inductance for Hartley circuit.....\$15.00
Grid coil.....\$1.50

KEYS

A very high grade balanced action radio key. Bakelite base. Tungsten contacts.....\$5.00

METERS

We carry the celebrated Jewell Meters. If you don't have their catalog ask us for one.

TRANSFORMERS

Type A. Furnishes plate and filament current for up to four 5 watt tubes. Price.....\$15.00
Type B. Furnishes plate current for one or two 50 watt tubes. Price.....\$20.00
Type C. Furnishes filament current for one or two 50 watt tubes. Price.....\$12.50

CONDENSERS

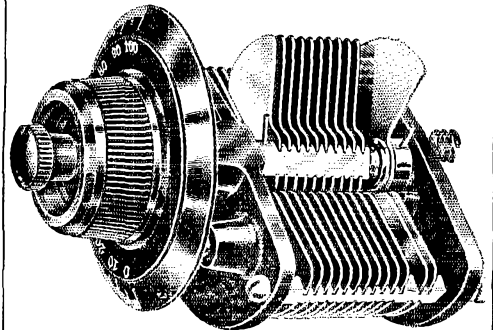
Write for data on new condensers and filters ready about October 1st.

Catalog Free

THE WILCOX LABORATORIES
LANSING, MICHIGAN

(Send along your orders for receiving equipment)

The Double Knob Sexton Condenser

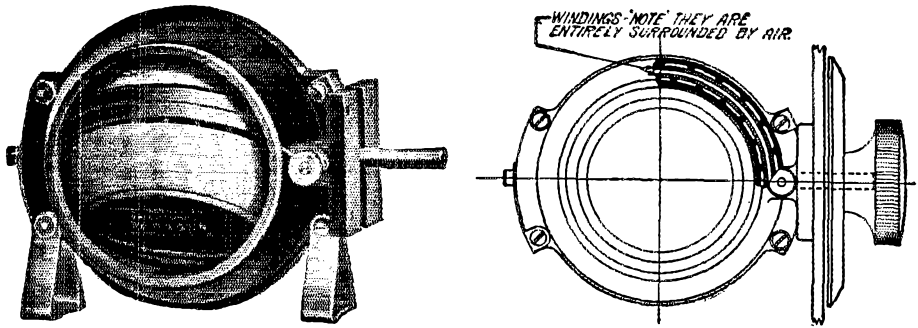


Most compact vernier condenser built. Furnished with 3 inch black bakelite dial. Separate button for vernier control. Ball thrust bearing insures perfect action.

For name of Distributor write our Western Representative, F. L. Tomlinson, P. O. Box No. 2308, San Francisco, or

THE HARTFORD INSTRUMENT CO., INC.

308 Pearl Street, Hartford, Conn.



New Paragon \$5.00 Variometer

Assures Maximum Efficiency on
New High-frequency Wavelengths

The new band of wavelengths, recently enforced, involve radio currents of extremely high frequency.

This calls for an inductance unit of exceptional electrical and mechanical excellence.

Any amateur will quickly see why the ribbed design of our new No. 60 Paragon Variometer assures greatest efficiency at these high frequencies.

Material reduction of solid dielectric in the support forms permits us to offer this essential radio adjunct at an extremely reasonable price.

While comparatively lighter in

weight and considerably smaller than most variometers, our new Paragon No. 60 loses nothing in durability and gains much in overall (minimum to maximum) wavelength range.

In rebuilding his receiving equipment to conform with new standards, the radio-wise amateur will take these merits into account and will find it far easier to secure expected results on wavelengths of 150 to 200 meters with an inductance unit of this excellent design, than with any other.

Write for complete catalog of Paragon Radio Products.

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

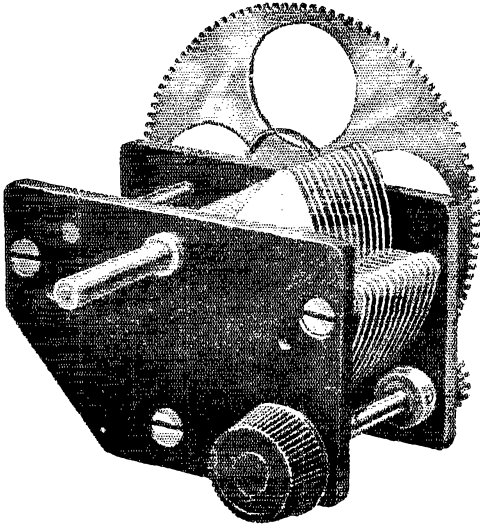
PARAGON

Reg. U. S. Pat. Off.

RADIO PRODUCTS

MAXIMUM - EFFICIENCY

Announcing!



A new improved MAXEFF Condenser

WITH electrical and mechanical features that develop highest receiving efficiency. Finest type construction throughout—one of the lowest minimum capacities of any condenser on the market—continuous vernier gears—and many other features that make it superior in every detail.

Ask your dealer for Circulars or order direct from the prices quoted below

STANDARD VARIABLE CONDENSERS

No. Plates	(Guaranteed Capacities) Capacity	List Price
3	vernier	\$1.50
12	.00025	2.50
16	.0003	2.75
24	.0005	3.00
44	.0009	3.50

Add \$1.75 for Geared Vernier Attachment



The Higgy-Avery Co.

Manufacturers

Columbus

Ohio

TWENTY!

COUNT 'EM, OM,—TWENTY

20 QST'S POSTPAID FOR \$2.50

HERE THEY ARE:

1917—May, June, July, August

1919—June

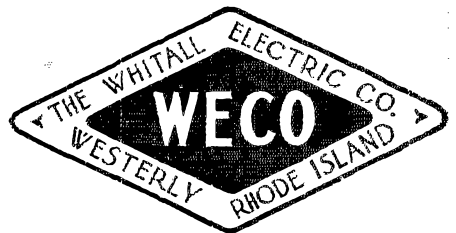
1921—June

1922—April to December, inclusive

1923—January to May, inclusive

First come, first served. Don't get left, for we only have a few of some issues.

QST, 1045 Main St., Hartford, Conn.



BARGAINS

In All Makes of Radio Material—
Send for Our Special Bulletin
No. 30

We carry Radio Corporation, Federal, Magnavox, Acme, Frost, Chelsea, Electrose, Atwater-Kent, Cutler-Hammer and many others.

We are distributors for practically all the leading makers.

PROMPT AND EFFICIENT SERVICE
TRY US AND SEE

Whitall Electric Company
Westerly, Rhode Island

CITIZENS RADIO CALL BOOK

Contains

Complete up-to-date best List of all American and Canadian Stations

All the latest hookups with operating and construction data. Reflex Circuits, Neutrodyne, Four Circuit Tuner, Haynes, Grimes Inverted Reflex, Reinartz, Flewelling and many others.

SCOOP

English, French, Australian and Mexican Amateur Stations.

All American and Canadian Telephone Broadcasting Stations and World High Power Stations with complete operating schedules.

THREE LARGE MAPS

Interesting articles, Kilocycle-Meter Table, Radio Log, Blank Map, Distance Chart, "Choosing Your Regenerative Circuit," by Paul Godley.

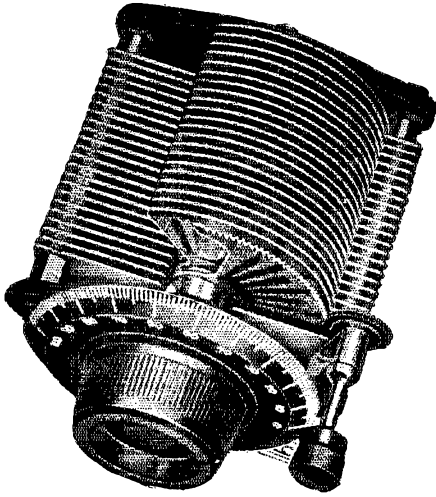
ARRL Section Revised to date.

200 Pages of wonderful information for only

50c

When ordering direct include 15c for postage.
Dealers write for guaranteed plan of sale.

CITIZENS RADIO SERVICE BUREAU
508 S. Dearborn St., Chicago, Ill.



HEATH'S Radiant Condensers

Tempered Plates

The greatest condenser trouble—*warped plates*—is made IMPOSSIBLE in *Radiant Condensers*. No more readjusting, bending and make-shift supports. Both the rotating and stationary plates are PERMANENTLY FLAT as a straight edge ----- Flattened under powerful presses, and tempered by a new process, the plates of *Radiant Condensers* are unaffected by temperature changes. You can identify *Radiant Condensers* by the radiating rays design on rotary plates. *Permanent alignment is "the best condenser buy."*

Geared Vernier

Indefinitely fine control of this delicate adjustment. Micrometer accuracy without special effort. Neat, smooth-working trouble-proof gear. Another advantage for the price of just an ordinary condenser.

Write for illustrated booklet and the name of the nearest Radiant dealer.

LIST PRICES

VERNIER TYPE

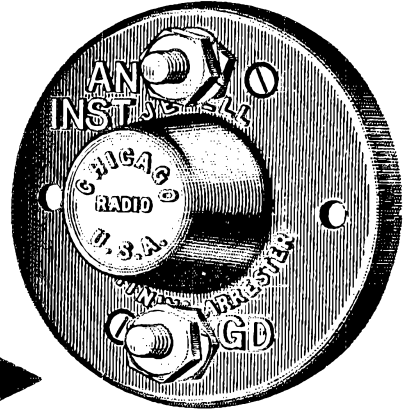
- 18 Plate including 2 1/2" dial and knob.. \$5.00
- 25 Plate including 2 1/2" dial and knob.. 5.50
- 35 Plate including 2 1/2" dial and knob.. 6.50

HEATH RADIO

& Electric Mfg. Co.

207 First St.,

Newark, N. J., U. S. A.



JEWELL LIGHTNING ARRESTER

APPROVED BY
UNDERWRITERS

The latest regulations of the National Board of Fire Underwriters call for a lightning arrester on every building having an outside aerial.

The Jewell Arrester has passed all the Underwriter's tests and carries their approval.

The case is made of porcelain with a brown finish that harmonizes with interior woodwork. The price is right.

PRICE \$1.10

ORDER FROM DEALER

JEWELL ELECTRICAL
INSTRUMENT CO.

1650 Walnut St., Chicago



EISEMANN Head Phones represent unexcelled value. Comparative tests prove their excellence and superior qualities. The design is simple, practical and correct.

These phones are comfortable when worn for long periods, are extraordinarily sensitive and reproduce sound with unusual clarity. Complete satisfaction is assured.

Other Radio Products:

Variometers
Variocouplers

Variable Condensers
Detector units

A. F. Amplifier units
Metal Panels

Complete catalogue on request

EISEMANN MAGNETO CORPORATION

William N. Shaw, *President*
BROOKLYN, N. Y.

DETROIT

CHICAGO

SAN FRANCISCO



Trans-Inductor

Most Important Radio Invention of the Year

A radio-engineering triumph that combines the advantages of both Iron and Air-Core Transformers.

It will set a new pace in radio-frequency amplification and selective tuning.

Here is a new thrill for the most hardened "radio bug."

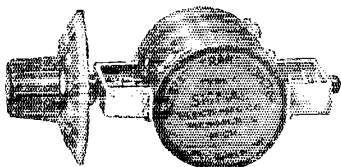
Gives you all the selectivity and wave-length range, (150 to 750 meters) of the best iron core transformer and all the power and clearness of the air-core transformer.

One dial controls inductance, capacity and the iron. Two stage of radio amplification using two Trans-Inductors, Detector and one stage audio, can all be operated from a single 22½ volt B battery.

Works with any Standard detector tube. Brings in stations 1200 to 1500 miles distant thru a loudspeaker, operating from only one stage of audio-frequency.

So novel that we have applied for broad, basic patents.

Ask your Dealer to order one or a pair of Trans-Inductors for you, on our guarantee of performance.



SIGNAL Electric Mfg. Co.

Factory and General Offices
Menominee, Michigan
1915 Broadway,

Atlanta Cleveland New York St. Louis Boston Minneapolis Pittsburgh
Toronto San Francisco Montreal Chicago
(You'll find our branch offices in the Telephone Directory)



PAT. APP'D FOR

75c TURN-IT 75c

GRID-LEAK

"ADJUSTABLE"

Sometimes a fixed leak just happens to be satisfactory, and the right value for tube and signal, but why fuss with fixed leaks to find the one required when a TURN-IT adjustable grid leak has a thousand values at your demand.

The high resistance liquid with its flowing, solvent contact, gives you instantly any value necessary to develop your detector tube's maximum output.

Just clip it into your standard mount. Turn-it until that distant signal comes in clear and loud, and it will stay put. Can be conveniently rigged for panel control.

Your dealer should have one for you, if not send 75 cents to—

CHAS. E. BONINE

20 So. 15th St., Philadelphia

3,250 HOURS' SERVICE

From A \$15.00 F-F BATTERY CHARGER

Dear Sir: Find enclosed fifty-four cents for which please send one set of carbon brushes for an F-F Battery Charger, Type 6. This charger has been in use on an average of 25 hours a week for about two and one-half years and the Carbons have never been renewed. The machine is giving very good service.

Yours very truly,
(Signed) Ralph C. Peters,
1810 Pine St., Boulder, Colo.

This unsolicited report is but one of thousands. It is the result of ten years specialization. You, too, can benefit just as Mr. Peters above, by insisting on the F-F Charger.

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

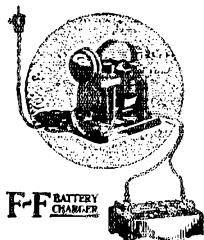
It's Free
Write for Bulletin No. 31
Dealers! Get the F-F Proposition

\$15.00

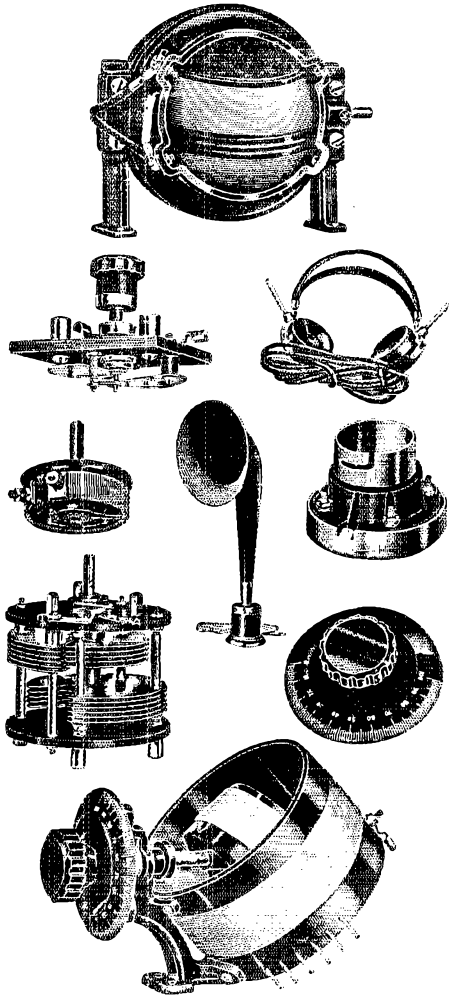
F.O.B. Cleveland

Type 6 charges 6 volt Storage Battery from any 110 Volt 60 Cycle lamp socket at average rate of 6 amperes.

The France Mfg. Co.
10431 Berea Road,
Cleveland, Ohio



Kennedy Parts Now Available!



It has long been the ambition of many radio amateurs and experimenters—particularly those whose aim is maximum efficiency—to build a set using Kennedy precision instruments and parts.

In response to a most insistent demand, resulting from wide-spread ambition, the Kennedy policy has now been altered to make this possible.

The same parts—designed by the Kennedy engineers and made in the Kennedy factories—that have helped establish the high reputation of Kennedy sets, can now be obtained from your Kennedy dealer.

Variometer—Highly finished black moulded Bakelite shell and rotor. Minute clearance. Pigtail connections. For table or panel mounting. Price, without knob or dial. \$8.00

Variocoupler—Windings on highly finished black Bakelite shells. 180° variation. Primary taps connected through inside of tube. Pigtailed connections to rotor. Price, without knob or dial. \$7.50

Balanced Condenser—0.0006 mfd. Rugged construction. Perfect balance. Adjustable tension on end thrust ball bearing. Pigtailed connection to rotor. A real precision instrument. Price, without knob or dial. \$8.00

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

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

Non-Microphonic Socket—Cushioned type. Highly finished moulded Bakelite base. Tube shell and cup polished nickel plated. Positive side-contact connector springs. Price \$1.50

Dial—100 division. Beautiful black oxidized metal finish with silver etched figures. Kennedy type fluted Bakelite knob. Price. \$0.75

Loud Speaker—Remarkably faithful reproduction with exceptional tonal purity. Adjustable damping of diaphragm. Polished nickel base and trimmings. 10-inch bell on horn. Price. \$30.00

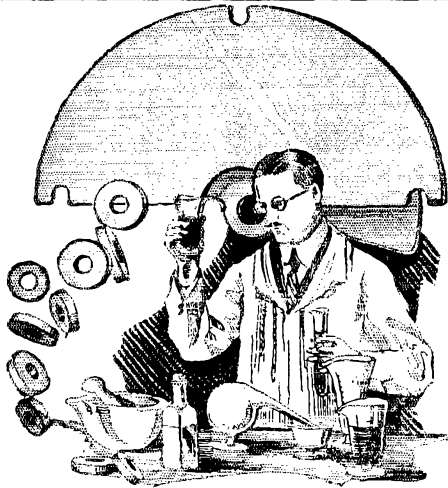
Head Phones—Perfected to fill the demand for unusual quality. Extremely sensitive on weak and distant signals. No rattle or blare on loud signals. Light and comfortable. 3000 Ohms. Price. \$9.00

See these parts at the nearest Kennedy dealer.

THE COLIN B. KENNEDY COMPANY
SAINT LOUIS SAN FRANCISCO

K E N N E D Y

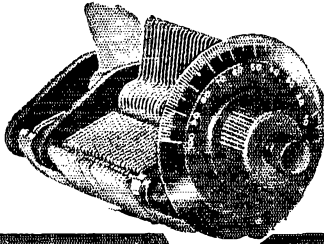




U.S. TOOL CONDENSERS

*Plates and Spacers
Chemically Treated
to Prevent Oxidizing*

THE greatest enemy of condenser efficiency—oxidizing of plates and spacers—is conquered in *U.S. Tool Condensers*, by an exclusive chemical process. Years of continual use and exposure leave these condensers unharmed—as perfect as the day they were purchased. Built to maintain a reputation, gained through years of honest manufacture. Write for illustrated booklet and the name of the nearest U.S. Tool dealer—**TODAY!**



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

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



**A NEW
FROST
FONE**



A SUPERFINE headset with maroon bakelite shells and caps, moulded terminal blocks and new type construction without lead wires. Order today from your dealer and note their superiority to all others.

No. 172 \$6.00
3200 Ohms

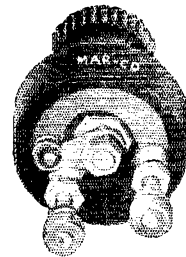
HERBERT H. FROST, Inc.
154 West Lake Street, Chicago, Illinois
30 Church Street, New York





Each individual Marco Variable Grid Leak is separately tested for a range of $\frac{1}{5}$ to 5 Megohms

Panel
Mounting

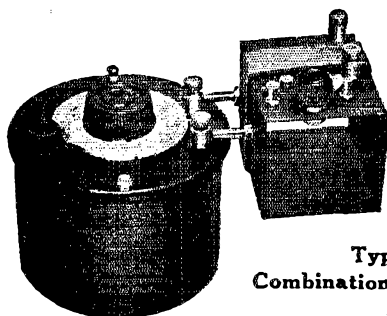


Price
\$1.50

Standard Condensers Mount
on Terminals

Martin-Copeland Co.
PROVIDENCE, R. I.

Radio Frequency Filter



**Type 247W
Combination Wavemeter and
Filter**

Have you a Broadcasting station you would like to eliminate? You can do it with our Type 247W Combination *Wavemeter* and *Filter*.

This combination, consisting of our Type 247 low loss condenser and a special coil, will enable you to cut out objectionable Broadcasting and similar annoyances. The wavelength scale is read directly on the condenser dial. Range 150 to 500 meters. Simple and efficient.

PRICE \$10.00

Send for Bulletin 916Q.

For those who desire a completely enclosed instrument we offer our Type 305 Filter. This instrument is similar to the Type 247W Filter in its general characteristics. It has in addition a special series-parallel selector switch enabling the filter to be used as an acceptor or rejector without changing the external connections. It is enclosed in a walnut cabinet fitted with Bakelite panel.

Type 305 Filter and Wavemeter - - \$25.00

GENERAL RADIO COMPANY

Manufacturers of Radio and Electrical Laboratory Apparatus

Cambridge,

Massachusetts

"RED-HEAD"

—a triumph in radio receiver design

HERE'S what we say about "Red-Heads"—they're EXTRA-ORDINARY radio receivers. We believe they're the best receivers on the market today. Superlatives are easy to say and hard to back up. Here's how we back up ours. We GUARANTEE that you'll like "Red-Heads." You take no risk in buying them. We'll refund your money plus postage if you don't agree with us after trial.

"Red-Heads" are the lowest priced, high-grade, aluminum-backed receivers on the market. Nine years of receiver experience are behind their quality.

What One User Says

The Newman-Stern Co.,
Waupun, Wis., July 26, 1923
Gentlemen: In 1915 I purchased a pair of your "Red-Head" phones. This pair of phones was one of the first you put out. They are still in good condition and, I believe, beat most of the other phones on the market. Very truly yours,

D. J. SAXON.

And "Red-Heads" are better today than they ever were.

READY NOW! The New 1924 Model F—3000 Ohms

The new Standard "Red-Heads" have ELEVEN improved features—new this year. Beautiful and graceful in appearance; light in weight; aluminum case; the famous brown-red ear caps; military headband; high-grade cord; exquisitely sensitive and fine toned. 3000 OHMS PER PAIR.

At your dealer's or prepaid on receipt of price. Per pair, Complete **\$6.50**

THE NEW "RED-HEAD" JR. 2000 Ohms

Makes its bow to the public this year in response to a demand for an extra fine 2000 Ohm phone. A remarkable production with the same workmanship and guarantee as our standard Model F. Complete with headband and cord.

At your dealer's or prepaid on receipt of price. Per pair, Complete **\$5.00**

THE GUARANTEE

Money back if after 7 days trial you're not satisfied that Red-Heads are the BEST receivers on the market at the price.

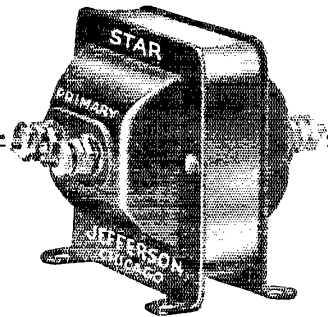
The Newman-Stern Co.
Dept. QS., East 12th St., Cleveland, O.



Since 1915
Pioneers in
Radio—year
after year
striving to
achieve one
purpose—
better and
better radio
receivers.



If you cannot get "Red-Heads" at your dealer's, we'll mail them direct to you prepaid on receipt of price and your dealer's name.



JEFFERSON

Amplifying Transformers

have gained an enviable reputation for audibility and amplifying power. In tens of thousands of receiving sets they are insuring 100% amplification—increased range, super-sensitivity, and the elimination of howling and distortion.

This positive preference rests on the unmistakable superiorities of design and operation which make Jefferson Amplifiers the choice of discriminating radioists.

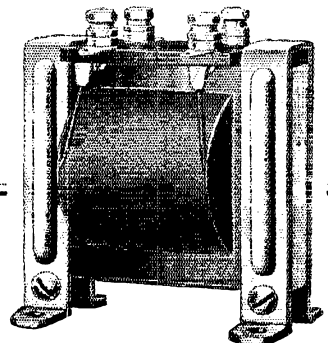
FIVE JEFFERSON TYPES

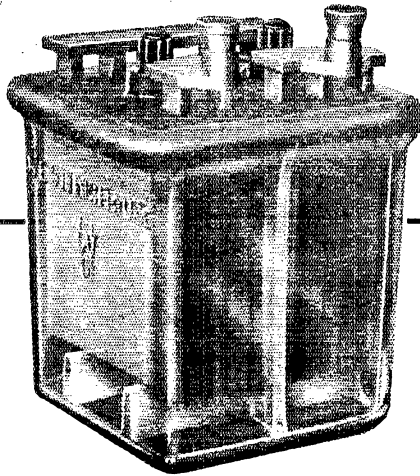
The five Jefferson types meet the demand for an audio-frequency transformer for every requirement. In this assortment you are sure to find the transformer which will make your set super-sensitive, and enable you to tune in distant stations with ease, and freedom from distortion.

Radio Bulletin Sent Free

Jefferson Electric Mfg. Co.

425 S. Green Street, Chicago





One-piece glass case, including solid glass cell partitions and plate rests. Visible interior; liquid level easily watched. Rechargeable; lasts indefinitely.

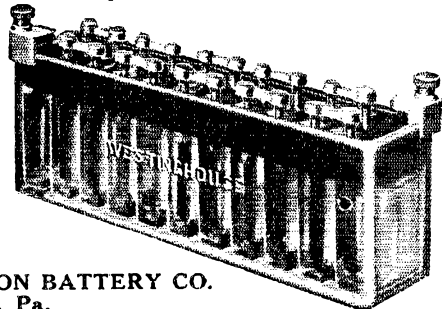
New!

Westinghouse **CRYSTAL CASE** Radio Batteries *The Complete Line*

Thousands of radio fans already know and enjoy the advantages of the glass-case Westinghouse "B" Batteries. Now the same advantages may also be had in Westinghouse **CRYSTAL CASE** "A" Batteries, in voltages and amperages to meet various filament requirements. See your radio dealer, or the nearest Westinghouse Battery Service Station, at once. You're probably going to improve your set for this winter's big radio treats, and Westinghouse **CRYSTAL CASE** Batteries are a logical first step.

Westinghouse
CRYSTAL CASE
"B" Batteries

The 22-MG-2 (22 volts) is a marvel for steady, noiseless, full-powered service. Can be easily and repeatedly recharged. Larger types, too. Also single 2-volt "C" cells.



WESTINGHOUSE UNION BATTERY CO.
Swissvale, Pa.

WESTINGHOUSE

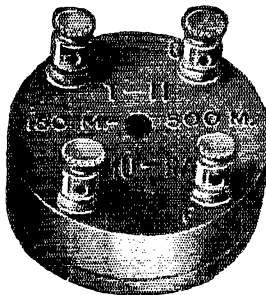
Radio "A," "B" and "C"

BATTERIES



*Extend the Range
of Your Set with*
Mu-Rad R-F
**Amplifying
Transformers**

200-600 Meters Air Core



"I CONSIDER these results remarkable," writes a man in Canada who received from Dallas, Texas; Atlanta, Ga.; St. Louis, Mo.; and Kansas City in one evening on his set in which he used *Mu-Rad R.F. Transformers*.

Give your set the greatest possible range by using these wonderful transformers. The same instruments which have helped to establish the astonishing distance records of *Mu-Rad Receivers*. No iron losses, loss by capacity effect, nor eddy current loss. Clear, undistorted amplification. Write for folder.

Send 10¢ for R.F. circuit diagram and treatise on MU-RAD R.F. Amplification.

DEALERS:

Mu-Rad Transformers give you more frequent use of your money because they move so quickly

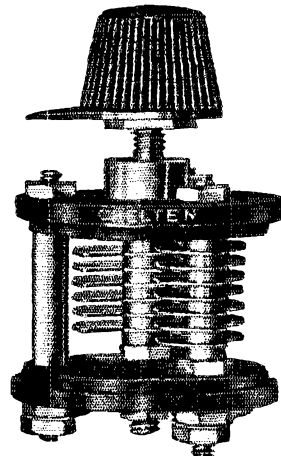
For UV-199 Tubes Use Type T-11 for the First Stage Type T-11A for the Second Stage Type T-11B for the Third Stage For UV-201A or WD-11 Tubes Use Type T-11C in all stages with damping coil.

Get Our Interesting Proposition

MU-RAD LABORATORIES, INC.
804 FIFTH AVE. ASBURY PARK, NEW JERSEY



Add a Vernier to your present Condenser



Sells for *Patent Applied for* **\$1.50**
Actual Size

This little Chelten Midget Variable Condenser will add a Vernier feature to your present condenser.

You'll be surprised how it clears up signals and sharpens tuning. Its capacity is .000045 Mfd. or about the same as a 3 plate condenser.

Pick out any space on your panel where there is 1 3/4" to spare, drill one hole, mount the Chelten Midget and see how much better your set performs.

The Midget is a precision instrument the same as our well known line of High Grade Chelten Variable Condensers. We also manufacture Jacks — Plugs — Switches — Rheostats — Dials — Knobs — Sockets — Crystal Detectors, etc.

Your Dealers Should Have These in Stock, If Not Please Write Us Direct.

Since 1910 Manufacturers of High Grade Electrical Specialties.

Chelten Electric Company

4861 Stenton Ave.,
Philadelphia





“What panel shall I use?”

ONE of the first questions you probably will ask yourself when you get ready to build your radio set will be about the choice of a good panel. Your answer will determine, to a large extent, the efficiency of your set.

Of course you want a panel that has superior insulating properties. Celoron Radio Panels are used by fans who appreciate the value of a good radio panel. They have high dielectric strength and great volume and surface resistivity. Celoron panels are uniform in quality, and do not warp or crack.

You will find Celoron panels easy to saw, drill, and tap. They engrave evenly without feathering, and enable you to build a set that is neat and attractive as well as efficient.

Approved by Uncle Sam

Celoron Radio Panels are approved by the U. S. Navy Department Bureau of Engineering and the U. S. Signal Corps. Many of the leading manufacturers of radio equipment use Celoron in their standard parts.

To radio dealers: Send for special dealer price list showing standard assortments

Diamond State Fibre Company

BRIDGEPORT

(near Philadelphia)

PENNSYLVANIA

BRANCH FACTORIES AND WAREHOUSES

BOSTON

CHICAGO

SAN FRANCISCO

Offices in Principal Cities

In Canada: Diamond State Fibre Company of Canada, Limited, 245 Carlaw Ave., Toronto

CONDENSITE
CELORON
 STANDARD RADIO PANEL

Each panel is wrapped separately in glassine paper and carries complete instructions for working and finishing. Ask your dealer for one of the following sizes:

1—6 x 7 x $\frac{1}{8}$	5—7 x 18 x $\frac{3}{16}$
2—7 x 9 x $\frac{1}{8}$	6—7 x 21 x $\frac{5}{16}$
3—7 x 12 x $\frac{1}{8}$	7—7 x 24 x $\frac{3}{8}$
4—7 x 14 x $\frac{3}{16}$	8—12 x 18 x $\frac{3}{16}$

We also furnish Celoron in full-sized sheets and can cut special sizes if desired. If your dealer has not yet stocked Celoron panels, ask him to order for you, or write direct to us. Indicate by number the size you want.

Send for free booklet

Our booklet, “Tuning in on a New World,” contains a list of the leading broadcasting stations in the United States and Canada, several efficient radio hook-ups, and an explanation of the symbols used in radio diagrams. Write at once and be sure of getting yours before the supply is exhausted.

**WEIGHS
ONLY
8 OZ.**



The Scientific

**THE
PHONE
IT
TOOK
A SOLID YEAR
TO DESIGN**

SEND NO MONEY!

**20,000 TURNS
EQUIVALENT TO
3,000 OHMS**

**Order TODAY
by Postcard
and Pay
Postman
on arrival**

\$2.95

**POST-
PAID**

**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 BOSTON, MASS.

"ALL-AMERICAN"

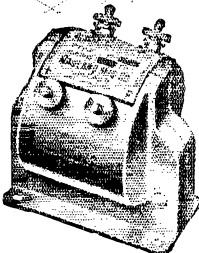
*Sets another
World Record!*

The reception on board the *Berenburgia*, night after night, of the signals from the Drake Hotel, Chicago, during the entire voyage, from New York to Cherbourg, France, a distance of 4000 miles, was a world record achievement for consistent reception. The set used employed "All-American" Amplifying Transformers.

Today another record is being made. Slowly working its way up into the frozen North is the *Bowdoin* on board of which is Captain Donald B. McMillan, on a scientific expedition to the North Pole.

Night after night, up in the Arctic Ocean, he is listening to the world thousands of miles south of him. Again "All-American" Amplifying Transformers are being used, and again new world records are being achieved. You, too, can set new records with your own set by the use of "All-American" Amplifying Transformers.

Ask your dealer to show you these world record-breaking instruments. They are as attractive as they are efficient. Book of Successful Hook-ups sent free on receipt of 2c stamp.



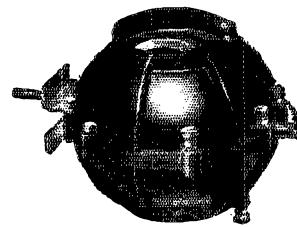
**Audio Frequency
Transformer**



**Radio Frequency
Transformer**

RAULAND MFG. CO.
200 No. Jefferson St., Chicago, Ill.

**Kellogg Radio Equipment
For Better Results**



The Kellogg Variometer

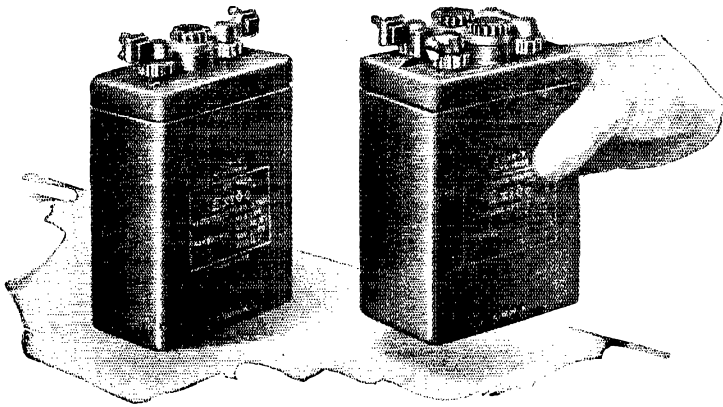
The stator and rotor are of Kellogg Bakelite, with properly proportioned windings of well insulated copper wire.

Two terminals are provided for the rotor and three for the stator, permitting the variometer to be used in all known variometer circuits.

Kellogg variometers have no sliding contacts; nothing to wear or "short." A spring takes up all play and allows the rotor to turn with a smooth even motion.

No. 501..... Each \$8.00

**KELLOGG SWITCHBOARD
& SUPPLY COMPANY
CHICAGO**



Midgets in size—but giants in power

IMAGINE a radio storage battery so light you can lift it on the palm of your hand, but powerful enough to supply all the current you need for long-distance receiving—and then some!

The new two- and four-volt Exide A Batteries for low-voltage tubes weigh only five and six pounds each. And they are wizards of efficiency—right in step with the latest developments in radio receiving.

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 quarter-ampere tube for approximately 96 hours. The four-volt A Battery, having two cells, will light the filament of a 60-milliamper 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.

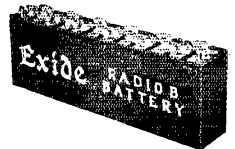
noiseless current. It permits the niceties of adjustment that make radio receiving an unalloyed

pleasure. 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.

Exide

RADIO BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, PHILADELPHIA

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

Service Stations Everywhere

Branches in Seventeen Cities

KEEP TO THE RIGHT

Quality Apparatus

We stock all makes and types of complete Radio sets and parts

Acme Apparatus Co.
 Adams Morgan Co.
 Andrea, F. A. D.
 A. & P. Radio Supplies Co.
 Baldwin, Nathaniel
 Brach, L. S. Mfg. Co.
 Brandes, C. Inc.
 Bunnell, J. H.
 Clapp-Eastham Co.
 Corwin, A. H. & Co.
 Cutler-Hammer Mfg. Co.
 DeForest Radio T. & T. Co.
 Dictograph Products Corporation
 Dubilier Condenser Co.
 Eby Mfg. Co.
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Firth, John & Co.
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 Frost, Herbert H.
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 Riley-Klotz Mfg. Co.
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 Weston Elec. Inst. Co.
 Wireless Press, Inc.

Delivery same day order received

Pioneers in the Radio Field

Send 10¢ for Latest Catalog

ROSE RADIO AND ELECTRICAL SUPPLIES

129 Camp Street, New Orleans, La.

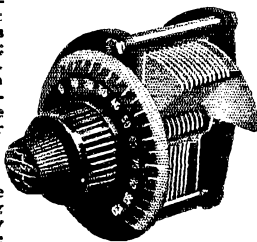
H&H Radio Material

Nutmeg Brand

Based on 30 Years' Manufacturing and Electrical Development-Work

We carefully fill orders direct where the goods are not sold locally, if sent along with the name and address of your Dealer.

Features of H.&H. Variable Air Condensers: Double-cone bearings with adjustment screw; smoothest possible action. Blades assembled with absolute precision; anchored solidly in large supporting posts—proper spacing is permanent. Aluminum alloy blades; extra large brass center post; bakelite ends. The utmost in engineering skill, at prices you may well take advantage of:



W 605	5-Plates, .000125 mfd.	\$2.50
W 611	11-Plates, .00025 mfd.	3.00
W 623	23-Plates, .0005 mfd.	3.50
W 643	43-Plates, .001 mfd.	4.00
W 621	11-Plates with Vernier Dial Control	4.25
W 633	23-Plates with Vernier Dial Control	5.00
W 643	43-Plates with Vernier Dial Control	6.00

Ask for interesting circulars

THE HART & HEGEMAN MFG. CO.
 HARTFORD, CONN.

Build Your Own HAZELTINE NEUTRODYNE

with
FREED - EISEMANN

Licensed Essential Parts

Complete wiring diagram, instructions, etc. sent in special container

with patented essential parts. Three NEUTROFORMER COILS mounted on variable condensers, and DOUBLE NEUTRODON (as illustrated), sent for \$24.00. Ask your dealer to show you these parts, as well as complete assembled five-tube Neutrodyne Set in mahogany cabinet, Model NR-5, \$150.

Or send 25c for Neutrodyne Constructor which shows "How to Make the Neutrodyne"

FREED-EISEMANN RADIO CORPORATION

255 Fourth Avenue, Dept. 25, New York
 Licensed by I. R. M. Inc. Under Hazeltine Patents

See Later Announcement
RASLA SALES CORPORATION
 10 E. 43rd St., New York City

Get your money's worth!



Music's charms cease when batteries fail

Your radio set works best on near and far stations, only when your batteries are delivering ample current.

Storage batteries, tuned up with Tungar, give the fine results which the owner of a high class radio set is justified in expecting from his instrument.

With Tungar—the go-between from house lighting circuit to storage battery—you do not need to move the battery, or buy a new one. Just attach to a lamp socket or a convenience outlet, turn on the current and leave it, any time, day or night.

Tungar is certain, clean and quiet. There are no moving parts to get out of order or to make noise. Its cost of operation is low.

For years motor car owners have used Tungar for charging their automobile batteries. See one at any good electrical shop, or write for literature. Address Section Q 10.

Merchandise Department
General Electric Company
Bridgeport, Connecticut

Tungar Battery Charger. Operates on Alternating Current.

(Prices east of the Rockies)

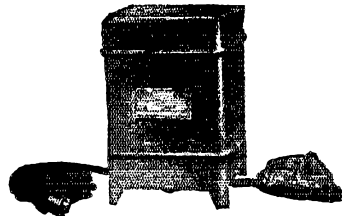
2 Ampere Outfits Complete—\$18.00

5 Ampere Complete—\$28.00

Special attachment for charging 12 or 24 cell "B" Storage Battery—\$3.00

Special attachment for charging 2 or 4 volt "A" Storage Battery—\$1.25

Both attachments fit either Tungar



Charge 'em at Home, with

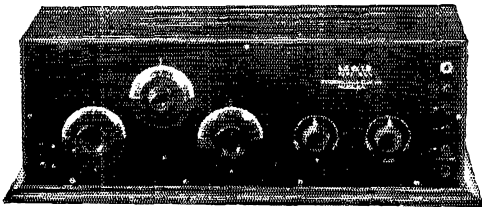
Tungar

BATTERY CHARGER

35A-103C

A GENERAL ELECTRIC PRODUCT

**Who Says Radio Won't
Work in Summer?**



The W. C. 5

can do it. Read what this owner says:

"I have no outside antenna; just plug into the light socket. Last night I picked up K.G.W. Portland, Ore. very clear. It is about 1500 miles from here, also had Atlanta, Ga. nine hundred miles. Picked up Omaha last Sunday morning at ten o'clock when the temperature was 95 in the shade and the sun shining bright. Very few sets will do that. Got K.P.O. Saturday night; San Francisco, Cal. about two thousand miles. Took a friend of mine over to the house the other night and let him hear a real machine. He has a \$300.00 outfit and is willing to sell same and get a W. C. 5."

*Frank Williams,
Winona, Minn.*

Price \$80.00

Wave Lengths 160 to 750 meters

The W. C. 5 is a 4 tube set. One stage of tuned radio frequency amplification is employed ahead of the detector to make it supersensitive. Two powerful stages of audio frequency are used to bring up the volume of signal strength. Simplicity of construction and the elimination of unnecessary parts make this set easy to operate and effective for receiving from long distances.

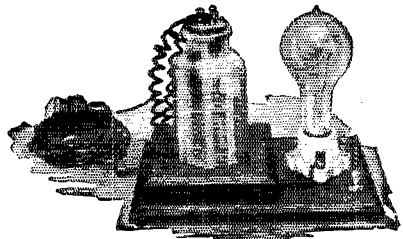
TO THE A.R.R.L.

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 W. C. 5. 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 W. C. 5 together with information as to where you can see one in operation.

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

WESTERN COIL AND ELECTRICAL CO.

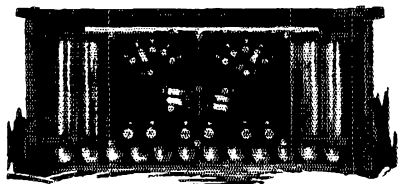
304-Fifth St., Racine, Wis.



Kimley "B" Battery Charger

Storage Batteries
designed for

RADIO



100 volt "B" Battery with Panel Control

Among the users of KICO Storage "B" Batteries are prominent engineers, the United States Government, many colleges and educational institutions and most of all, thousands have been sold to amateurs who understand radio.

A FEW REASONS

1. Alkaline type will not sulphate nor buckle.
2. Not harmed by short-circuiting, overcharging, or standing idle.
3. Panel switches afford single cell variations (Critical adjustments are essential for phone reception.)
4. Easily recharged from any 110 volt A.C. line by means of a small home rectifier.
5. Using a 100 volt battery on a detector and two or three steps of audio amplification, one charge lasts from two to four months.
6. Neat and compact.
7. Unlimited life.
8. The 100 and 145 volt batteries can be paralleled as one unit by using the series parallel switch.
9. All batteries are sold with the privilege of receiving your money back if not satisfied within 30-day trial.

Prices without rectifier

	Plain	(With Panels)
16 cell 22 volt.....	\$5.50	
24 cell 32 volt.....	7.25	\$11.75
36 cell 48 volt.....	9.50	14.00
50 cell 68 volt.....	12.50	17.00
78 cell 100 volt.....	17.50	22.50
108 cell 145 volt.....	23.50	28.50
Unmounted rectifier.....	1.00	
Mounted rectifier.....	2.50	

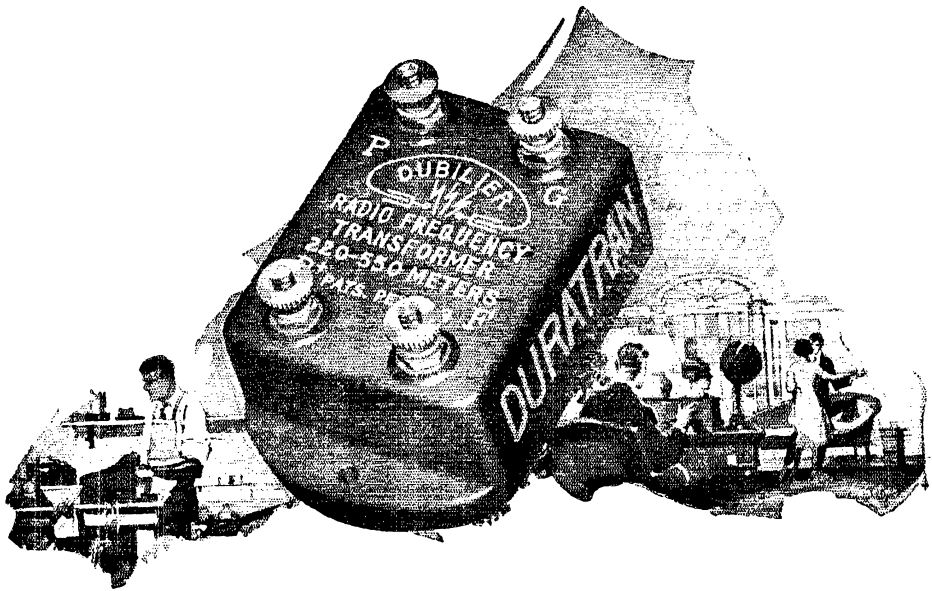
F. O. B. Buffalo, N. Y.

Literature gladly furnished.

KIMLEY ELECTRIC CO., Inc.

2665 Main St.,

Buffalo, N. Y.



The Dubilier Duratran *Amplification on all wave lengths*

THE Dubilier Duratran is the supreme radio-frequency transformer. It amplifies powerfully and uniformly over *all the wave-lengths* now used by broadcasting stations.

Price \$5.00

At all good dealers

DUBILIER CONDENSER & RADIO CORPORATION
48-50 WEST FOURTH STREET
NEW YORK

DUBILIER DEVICES

FROST-RADIO

Ask Your Neighbor



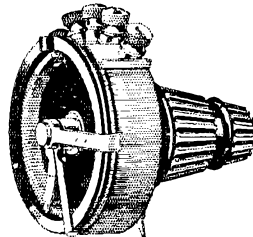
FROST-RADIO

A New **FROST-FONE** with drawn aluminum shells.
 No. 161, 2000 ohms..... \$4.00
 No. 171, 3000 ohms..... \$5.00

FROST-RADIO again sets the pace with apparatus of advanced design and construction. Note our new No. 172, 3200 Ohm Maroon Bakelite **FROST-FONE**—our new Nos. 161 and 171 Aluminum Shell **Fone**—the complete line of genuine moulded Bakelite tube control units, rheostats, potentiometers, sockets, dials, switches, and other apparatus. Priced right—made right—guaranteed by the name of the maker.



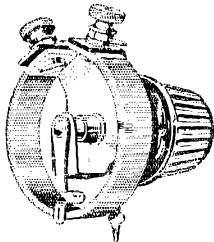
FROST-RADIO



FROST-RADIO

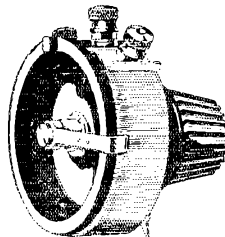
No. 607, Maroon Bakelite Tube Control Unit,.... \$1.75

No. 172, a new **FROST-FONE** with Maroon Bakelite Shells and Caps. 3200 ohms... \$6.00
 No. 162, 2000 ohms (composition shells and caps)... \$5.00



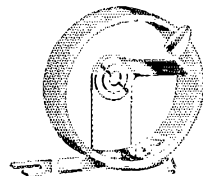
FROST-RADIO

No. 600, Metal Frame Rheostat, 6 ohms..... 60c
 No. 602, 35 ohms..... 60c
 No. 601 Vernier, 6 ohms... 75c
 No. 604 Vernier, 35 ohms... 75c
 No. 603 Potentiometer, 400 ohms..... 60c
 No. 605 Potentiometer 200, 400 ohms..... 60c



FROST-RADIO

No. 654, Bakelite Potentiometer, 400 ohms..... \$1.25
 No. 655, 200-400 ohms..... \$1.25
 No. 650; Rheostat, 6 ohms..... \$1.00
 No. 651 Rheostat, vernier, 6 ohms..... \$1.25
 No. 652 Rheostat, 35 ohms..... \$1.00
 No. 653 Rheostat, vernier, 35 ohms..... \$1.25



FROST-RADIO

No. 630, Resistance Unit for storage battery use, 35 ohms..... 25c

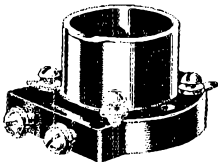
HERBERT H. FROST, Inc.

154 W. Lake Street, Chicago
 30 Church Street, New York

FROST-RADIO

Ask Your Neighbor

On this page we show the new FROST-RADIO sockets, single and in gangs, for standard base and C-299 or UV-199 tubes. Genuine moulded Bakelite. Note also our new shock absorber sockets for panel or table mounting, which are absolutely non-microphonic. Go to your dealer today and order your fall and winter radio set needs. There is no finer or more complete line, nor one which offers you greater value for your money than FROST-RADIO.



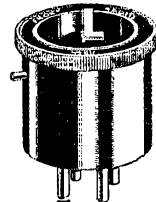
FROST-RADIO

No. 612, Bakelite Socket for C-299 tubes, panel or table mounting.....50c



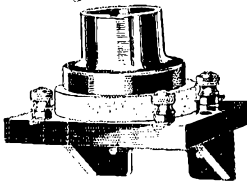
FROST-RADIO

No. 619, Bakelite Shock Absorber Gang, Standard Base\$2.75



FROST-RADIO

No. 611, Bakelite Adapter for C-299 tubes.....50c



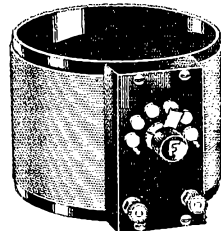
FROST-RADIO

No. 617, Bakelite Shock Absorber Socket for C-299 tubes, panel or table mounting.....\$1.00



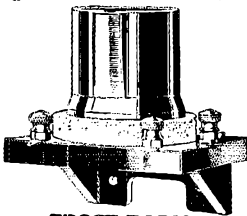
FROST-RADIO

No. 616, Bakelite Shock Absorber Gang, C-299..\$2.75



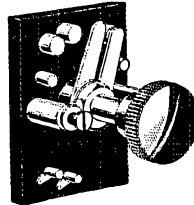
FROST-RADIO

No. 631, Bakelite Inductance Unit for short wave sets. Complete as shown..\$2.50



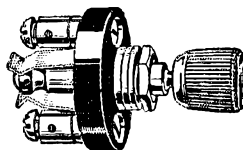
FROST-RADIO

No. 618, Bakelite Shock Absorber Socket, Standard base, panel or table mounting.....\$1.00



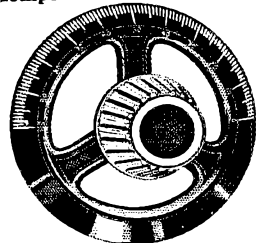
FROST-RADIO

No. 620, Bakelite Potentiometer Cut-out Switch 50c



FROST-RADIO

No. 608, Push-Pull Battery Switch.....30c



FROST-RADIO

No. 614, Bakelite Spider Dial, 2 1/2 in.....50c
No. 615, 3 inch.....60c

HERBERT H. FROST, Inc.

154 W. Lake Street, Chicago
30 Church Street, New York

Keep On Getting Results With Sterling RADIO EQUIPMENT

DEPENDABILITY MEANS ECONOMY

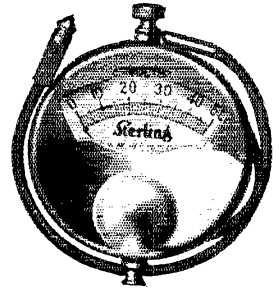
Getting results day in and day out is largely a matter of insisting on dependable radio parts—equipment that is known for its quality everywhere. "Sterling" Radio devices, made by a manufacturer whose prestige began long before radio was born, give you endless satisfaction. The quality itself is the most economical feature.

STERLING
PORTABLE RECTIFIERS
POCKET METERS
AUDIO & RADIO FREQUENCY AMPLIFYING
TRANSFORMERS
FILAMENT RHEOSTATS
12 POINT ROTARY SWITCHES

THE STERLING MFG. COMPANY

2831 Prospect Ave.,

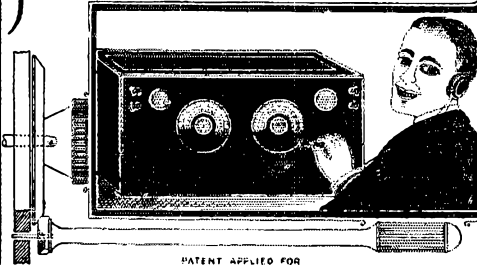
Cleveland, O.



It is made accurately, carefully calibrated, good looking and durable. It registers the voltage instantaneously and is reliable throughout. Also ammeters and voltmeters.

No. 34B 0-30 Volts List Price \$2.25
 No. 34C 0-50 Volts List Price 2.75

HUNT'S UNIVERSAL HAIR-LINE RADIO TUNING DEVICE



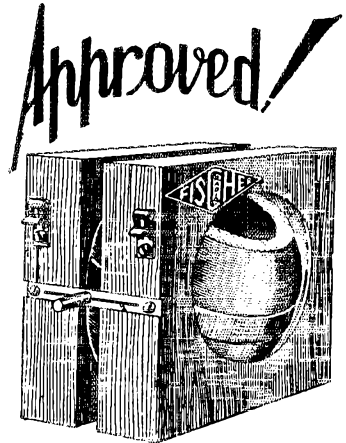
PATENT APPLIED FOR

Overcomes Body Capacity

Gives micrometric adjustment outside the field of inductivity

Tested and approved by amateurs and experts. Enables you to tune distant stations easier and more clearly. Simple as A B C. Installed from outside, no dismantling of your set necessary. Audibility made more natural or less distorted by the fine adjustments obtained. One Hunt's Device handles all dials on set or several sets. Costs only one dollar on guarantee of money refunded if not satisfied. Ask your dealer or direct from

Hunt Co., 483 Shrine Bldg., Memphis, Tenn.



The Champ—VARIOMETER NO. 53

Approved as a Record Breaker

Approved because it makes 600 Meters

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.

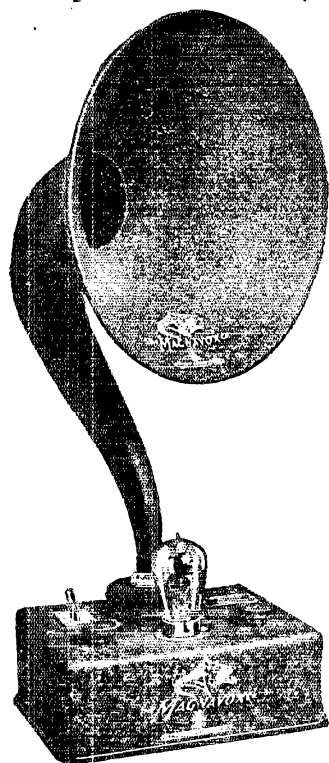
123 Liberty St.,

New York City

Magnavox Radio

Reproducers and Amplifiers

IT has been the dream of every Radio user to own in one unit a Power Amplifier and electro-dynamic Reproducer, thus insuring perfect radio reproduction. The new instruments of the unit type here illustrated in one and two stages of amplification may be had through dealers everywhere.



New Magnavox Combination Set A1-R

There is now a Magnavox for every receiving set. The full line embraces:

Magnavox Reproducers

R2 with 18-inch curvex horn . . .	\$60.00
R3 with 14-inch curvex horn . . .	35.00
M1 with 14-inch curvex horn. Requires no battery for the field . . .	35.00

Magnavox Combination Sets

A1-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 1 stage Amplifier . . .	59.00
A2-R consisting of electro-dynamic Reproducer with 14-inch curvex horn and 2 stage Amplifier . . .	85.00

Magnavox Power Amplifiers

A1--new 1-stage Power Amplifier . . .	27.50
AC-2-C--2-stage Power Amplifier . . .	55.00
AC-3-C--3-stage Power Amplifier . . .	75.00

The new Magnavox semi-dynamic Reproducer M-1, designed for dry battery receiving sets, is also of great interest to radio users. Write for complete catalog.

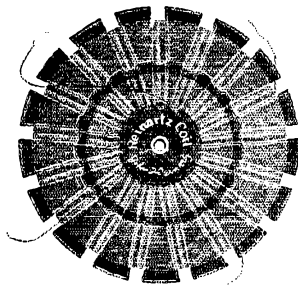
THE MAGNAVOX CO., Oakland, Cal.

New York Office: 370 Seventh Avenue

PERKINS ELECTRIC CO., LTD., MONTREAL, CANADIAN DISTRIBUTORS

AT LAST THE GENUINE REINARTZ

Each coil bears a facsimile of John L. Reinartz's signature



Covers all broadcast-wave lengths now used

Made under John L. Reinartz's specifications by The Eugene T. Turney Laboratories, Inc., exclusively

Primary Coil.....57 turns 8 taps
 Secondary Coil.....45 turns 2 taps

Diameter 5 1/2 inches. Bakelite cores

Packed in individual boxes. With new copyrighted Reinartz hookup
 List \$2.50 Standard package 3 doz.

Jobbers & Dealers write for discounts

TRISTAN SALES CORPORATION, Dept. D.

Sole National Distributors

1 UNION SQUARE

REGIONAL REPRESENTATIVES

NEW YORK

Baker-Smith & Co.
 741 Call Building,
 San Francisco, Calif.
 Walter I. Ferguson & Co.
 208 Baltimore Bldg.,
 Kansas City, Mo.

Amalgamated Lamp Co.
 1220 West 6th St.,
 Cleveland, Ohio
 J. H. Lyte,
 65 North 63rd St.,
 Philadelphia, Pa.

O. P. Smith Co.,
 205 W. Harrison St.,
 Chicago, Ill.
 C. L. S. Holmes Co.,
 601 Boston Block,
 Minneapolis, Minn.

Regal Inductance Switch



15 point Inductance Switch complete in one unit. No more difficult drilling of holes in panel. No more messy soldering. No more uneven switch points. Beware of cheap imitations—ask for the "REGAL"

Price \$1.50

New Regal Products for the 1923-1924 Season

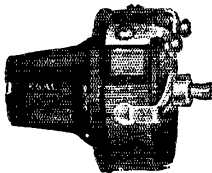
New Regal Audio Frequency Transformer
New Regal Double Arm Inductance Switch
New Regal Vernier Rheostat - 30 OHMS
New Regal Potentiometer - 250 OHMS
New Regal Vario-Coupler

Write for catalog No. 28

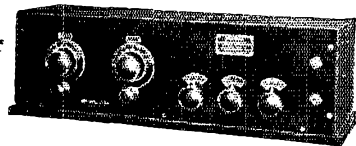
Regal Rheostat

A high grade quality instrument. Has full exposed resistance wire, giving sharp sensitive tuning.

6 Ohms \$1.00
 30 Ohms 1.00
 30 Ohms Vernier 1.25



THE AMERICAN SPECIALTY CO.
 BRIDGEPORT, CONN.



MA-13

Mr. Radio Dealer: Tie to a Profit-Maker--the Mu-Rad!

When the presidents of a score or more of Chicago's largest banks buy the Mu-Rad Receiver and write in voluntary testimonials of approval, there must be a reason.

When one of Chicago's oldest and largest exclusive Radio stores sells more Mu-Rad Receivers than all other types of Receivers combined there must be a reason. And there is! Mu-Rad sells because to hear the Mu-Rad is to buy it. More than 20% of Mu-Rad demonstrations result in sales!

Write for Mu-Rad Franchise

It costs you nothing to get complete details of our special Mu-Rad proposition. Just drop us a line—today—before someone else in your neighborhood gets exclusive Mu-Rad privileges.

Chicago Radio Apparatus Co.

Jobbers of Good Radio Merchandise

General Offices: 407 S. Dearborn St., Chicago



THE SYMBOL OF SERVICE

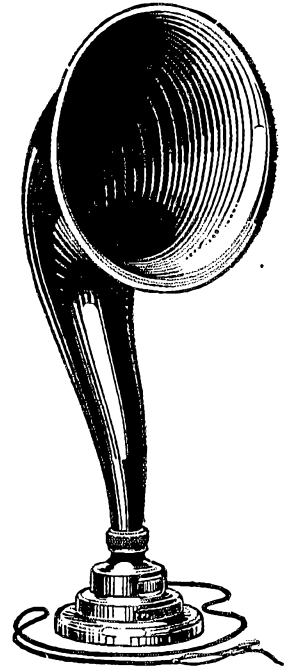
CONTINENTAL

"New York's Leading Radio House"

Radiola Loud Speaker

UZ-1320 reproduces broadcasted programs with clear and undistorted tones.

The magnetic system, the shape of the horn and the material of which it is made are of the very best. Mechanically this unit is very ruggedly built. The finish is of a dull black with a felt base. The bell is 12 $\frac{1}{4}$ " in diameter and the height is 26 $\frac{1}{2}$ ". One adjustment is provided for securing maximum efficiency on different values of signal strength.



UZ-1320



THE SYMBOL OF SERVICE

Distributors for the Radio

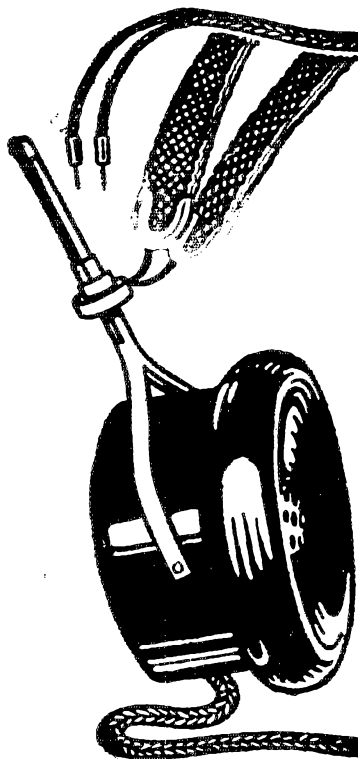
Corporation of America.



2050-Q

CONTINENTAL RADIO and ELECTRIC CORPN.

6 AND 15 WARREN STREET - - - NEW YORK, U.S.A.



Only the Original
NATHANIEL BALDWIN
 MICA DIAPHRAGM
RADIO PHONES

—are sold under the absolute guarantee of satisfaction after a fair trial, or purchase price refunded, together with transportation charges.

These phones are manufactured under the personal supervision of the inventor. Their high efficiency in radio reception more than doubles your satisfaction and enjoyment from your receiving set.

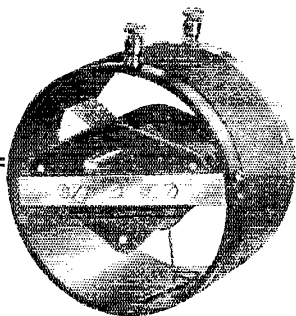
Ask your dealer for the original **BALDWIN**. If he cannot supply you, write for circulars and price lists.

NATHANIEL BALDWIN, INC.
 3474 South 23rd East, Street
 SALT LAKE CITY, UTAH

Attractive proposition open to distributors and dealers.

New Tuning Unit
For the Coming Season

Indispensable Now for New Sets



Price
\$4.00

HORNE VERNI-TUNER
 (Trade Mark)

Primary, Secondary and Condenser.
 All within a short 4 inch tube
A GREAT SPACE SAVER

Sharper tuning than possible with any other coupling at one-half the cost.

Used for the Main Tuning-in circuits. Regenerative, all types, Tuned Radio-Frequency. Reflex—Reinartz—Ultra Audion—Flewelling.

At your dealer or postpaid on receipt of purchase price. Write for free descriptive leaflet.

HORNE ELECTRIC & MFG. CO.
 Mercer and Colgate Sts. Jersey City, N. J.

FERBEND
 TRADE MARK
Wave Trap
 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

The "B" Battery is the Life of Your Radio Set

THIS IS NUMBER ONE OF A SERIES

THE only function of your Radio set is to produce sound-waves—those mechanical disturbances in the air caused by some rapidly vibrating body. So far as the Radio set itself is concerned the actual source of the sound is the "B" Battery. It is not an exaggeration to say that the "B" battery is the "life of your Radio"; for the set itself is simply a device to reproduce sounds, and the sounds all have their origin in the "B" Battery.

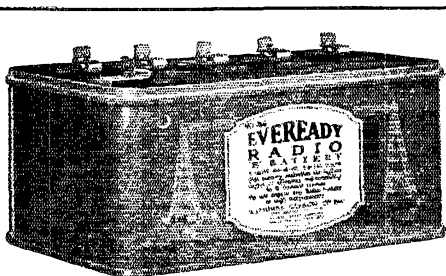
The "B" Battery is simply a box full of electrical energy; harnessed for you by experts. Without the Radio wave the flow of energy from the "B" battery is smooth, steady and *silent*. It is the final aim and purpose of all the many parts which go to make up a Radio receiving set, to convert the otherwise steady flow of electrical energy from the "B" Battery, into a rippling, vibrating, throbbing, audible current.

As the sound-waves—whether caused by the human voice in talking or singing, or by musical instruments—are modulated up and down—now high—now low; so does the current from the strongly vital "B" Battery follow the modulations and the variations, so that the original message, in all its delicacy of tone and vibration, comes clear and distinct through your Radio set.

Not a mere adjunct to the pleasure-giving quality of your Radio set is the "B" Battery—instead, it is the vital, life-giving part—the very heart of your Radio set.

Do not slight this vital part—give your Radio set the advantage of the best—use Eveready "B" Batteries.

Note: This is No. 1 of a series of informative advertisements which will appear in this Magazine. They are designed to help Radio users get the most out of their Batteries and Radio sets. If you have any battery problem, write to G. C. Furness, Manager Radio Division, National Carbon Co., Inc., Long Island City, N. Y.



The New Metal Case Eveready "B" Battery (No. 766)

"The Life of Your Radio"

The same popular 22½ volt Eveready "B" Battery in a new, handsome, durable, waterproof, metal container. Eveready quality throughout. At all dealers, \$3.00.

The "B" Battery is the vital part of any radio receiving set. Eveready Batteries—especially made for Radio—serve better, last longer and give better results.

Manufactured and guaranteed by

NATIONAL CARBON COMPANY, Inc.
Long Island City, N. Y.

EVEREADY

Radio Batteries

—they last longer

Advanced Radio Course!



Mr. E. N. Pickercoll, Chief Radio Officer S.S. Leviathan—formerly a student of the Radio Institute of America.

Write for Information Today

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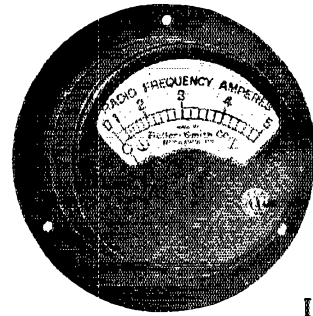
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is now ready. It covers not only our line of 3 1/2 inch thermal instruments, but also our lines of A.C. and D.C. instruments in the same size cases. All ranges required in modern radio work are included.

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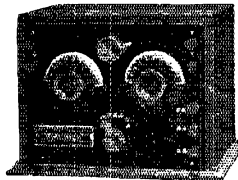
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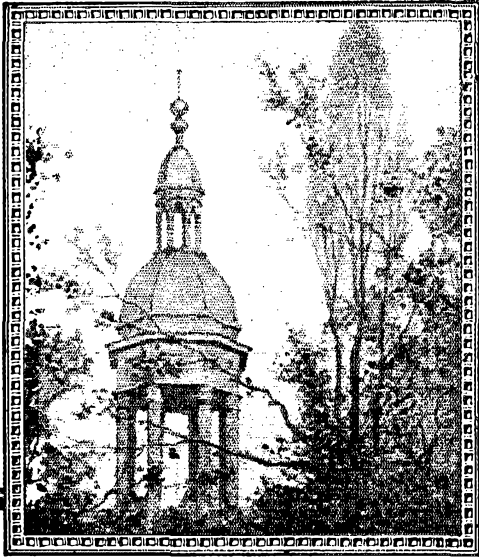
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IN THE Trans-Atlantic tests between amateurs in the United States and Europe, conducted by the American Radio Relay League, December 11th to 30th, four out of five who succeeded used Acme Transmitting Apparatus.

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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 and research departments 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. 31, Cambridge, Massachusetts. Branches in New York, Cleveland, Chicago, Kansas City, San Francisco.

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Gentlemen: Kindly send me your latest catalog of:

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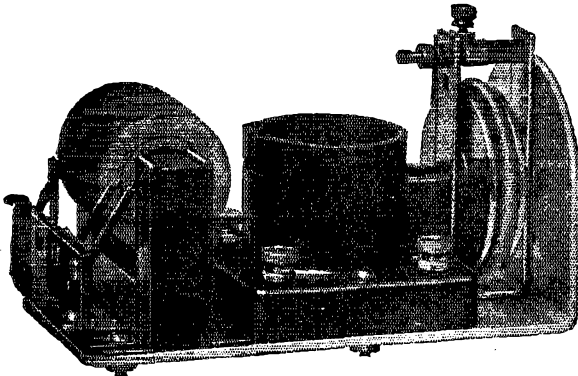
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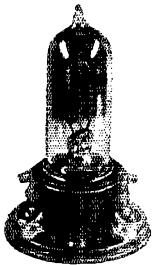
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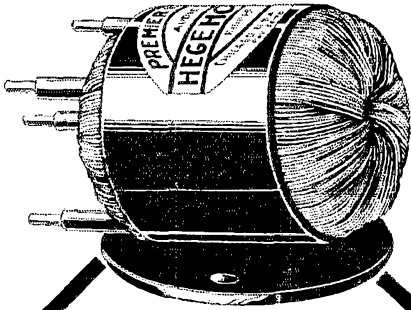
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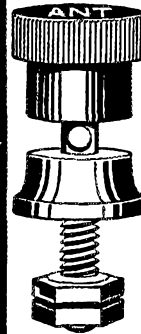
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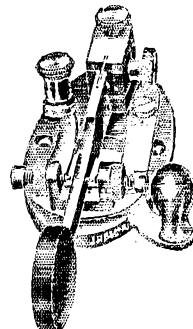
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Other types carried in stock.

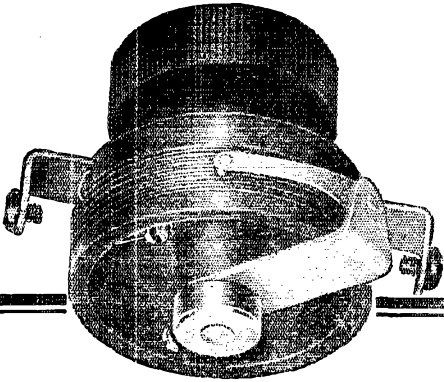
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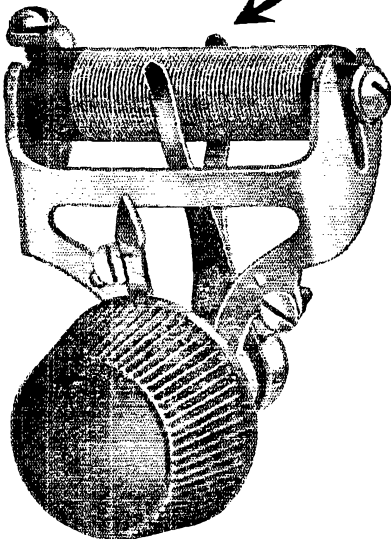
A single wire followed its entire length by a contact, permits the most infinitesimal variation in resistance.

A cut-out switch on the shaft operates with no change in the tuning adjustment. The contact on the resistance wire remains stationary.

An adjustment can be maintained and the tube turned on or off at will.

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Assembled \$.80
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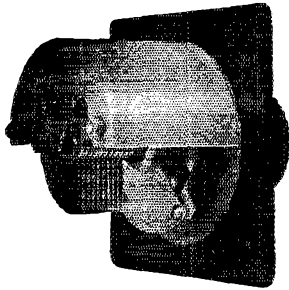
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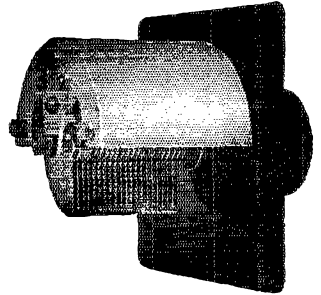


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- D-2 Highest Grade 4" Dial. 1.00



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A-1	Capacity	.001	Mfd.	\$4.50
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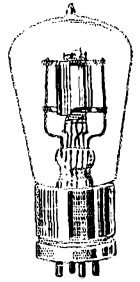
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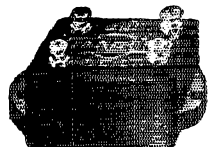
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Nowhere is it possible for the young man to secure better radio experience, a more intimate contact with one of the few men who are destined to shape the future of radio as they have its past. Nowhere will the young man have quicker advancement in the direction of his natural aptitudes and abilities. His future will depend on himself alone.

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"Built First to Last"

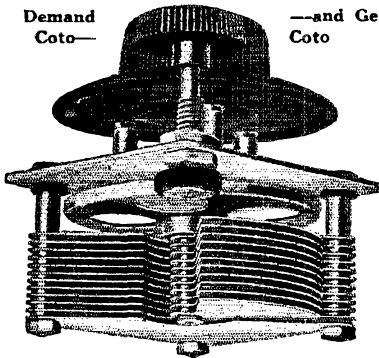
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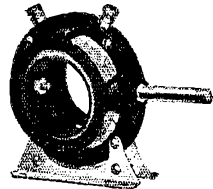
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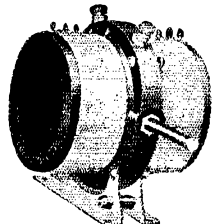
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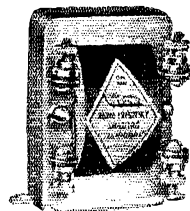
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A little gem in moulded bakelite. Stator is honeycomb wound. Range 200 to 600 meters. Size 3 1/2 x 1 3/4 x 3 3/4 inches. Base or panel mount. Type 8000, \$5.00.

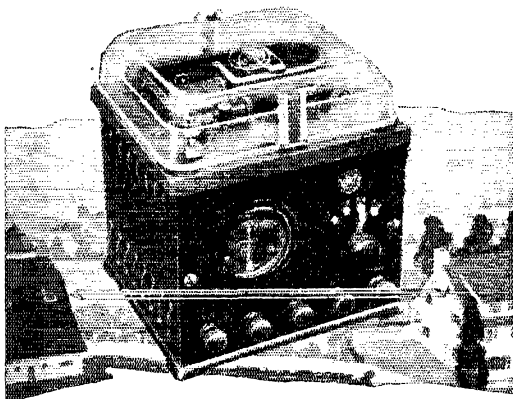


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—And, in fact, *the only one* which you need. Keeps strong, clear signals in your set by keeping the batteries to full capacity.

The Valley Type ABC Battery Charger is made for all storage batteries:

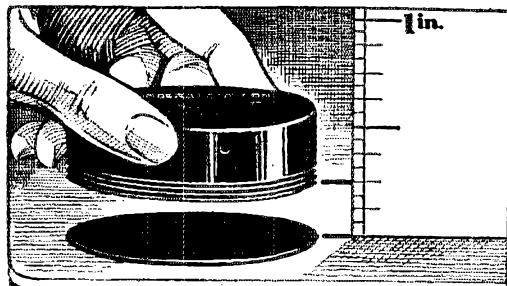
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Bakelite panel, glass top. Made so that it fits in with your radio equipment. In fact, it belongs with any receiving set.

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18 Boylston St., Boston, Mass.
G. R. ENTWISTLE, Radio Director

CALLS HEARD POSTAL CARDS (for DX reports)

Station call in color and description of station printed on government or bristol cards. 80¢ hundred up.

Station Letterheads—Rubber Stamps

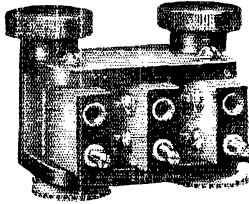
Write for Samples

RADIO PRINT SHOP

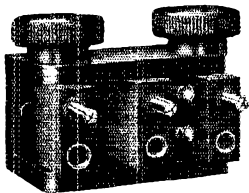
Box 582

Kokomo, Ind.

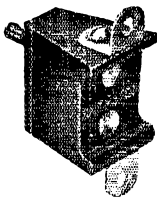
BRANSTON D. L. HONEYCOMB COILS AND MOUNTINGS



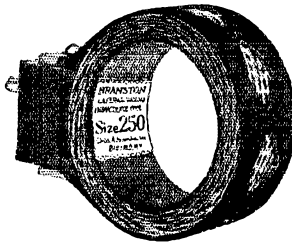
R-61 Three Coil \$5.00
Geared Type. Front panel mounting. Substantial gears give vernier adjustment. Very neat appearance made of Genuine Bakelite, complete with flexible leads.



R-73 Three Coil \$4.50
Bakelite Mounting. Neatest three coil mounting on the market. Made of Genuine Bakelite and complete with flexible leads.



R-77 Bakelite Coil \$50cts.
Mounting with brackets instead of screws for mounting.



Study these mountings carefully. Our new No. R61 3-coil front panel mounting and No. R62 rear panel mounting are equipped with strong brass nickel plated gears, insuring smooth vernier adjustment. Back geared type is equipped with arrow knobs that show position of coils. Mountings are substantially constructed of genuine Bakelite and are equipped with flexible leads.

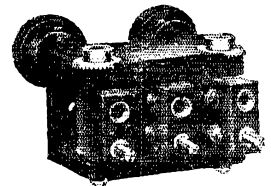
Branston D. L. Honeycomb coils are accepted as standard in regards to superior construction and electrical units of measurement. Your dealer can purchase Branston Coils and Mountings from his distributor. Insist on the Genuine.

Send 2¢ in stamps for Series 1 "Hook-Up" circulars showing five good Honeycomb Coil Hook-Ups and Catalog of famous Branston Radio Apparatus. Write today. Give us name of your radio dealer. If he can't supply you, write

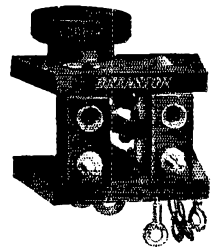


CHAS. A. BRANSTON, INC.
823 Main St., Buffalo, N. Y.

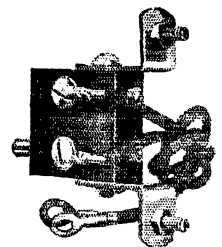
In Canada—Chas. A. Branston, Ltd.,
Toronto, Ont.



R-62 Three Coil \$6.00
type, Bevel Geared Mounting. Bevel gears provide very smooth operation and vernier adjustment. Made of Genuine Bakelite, complete with flexible leads. Arrow knobs show position of coils.



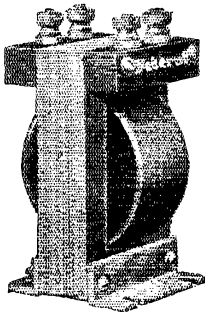
R-71 Two-coil \$3.25
Mounting. Very neat and capable of smooth operation. Only two mounting screws required. Complete with flexible leads.



R-68 Single movable \$90cts.
Bakelite Mounting. Plug with extension angle brackets and flexible leads.

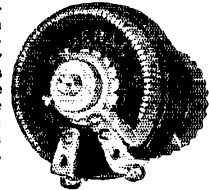
R-69 Same as No. \$90cts.
R-68 only stationary.

Amateurs use Federal Guaranteed Parts



The new Federal Audio Frequency Transformer No. 65 is creating a sensation. It gives greater amplification. And the whole range of an orchestra from the low notes of the drums to the high notes of the piccolo are faithfully reproduced. It is the peer of Audio Frequency Transformers.

This Federal Tri-Rheostat No. 27 was designed for the radio fan who wants to experiment. It will efficiently handle dry cell tubes and batteries or the large six volt storage battery tubes. It is a universal rheostat in every sense of the word.



More than 130 Federal Standard Radio Parts offer the Radio enthusiast a complete line of guaranteed parts of one quality,—the best.



Federal Radio Equipment

Federal Telephone and Telegraph Company

PITTSBURGH BOSTON BUFFALO, NEW YORK PHILADELPHIA CHICAGO
SAN FRANCISCO BRIDGEBURG, CANADA LONDON, ENGLAND

General Electric 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—balance collect.

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.

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

AT LAST!

An Attractive, Conservative DEFERRED PAYMENT PLAN

For The Purchase of Everything In
RADIO APPARATUS

Complete details sent on request without obligation; Or, send 25¢ for a year's subscription to the IODAR SERVICE BULLETIN, which will be allowed on your first purchase. The Bulletin contains a 'little of everything' of interest to every radio man. Don't wait, write now to Dept., 41 of the

IODAR SALES COMPANY

114 So. Oak Park Avenue
OAK PARK, ILLINOIS



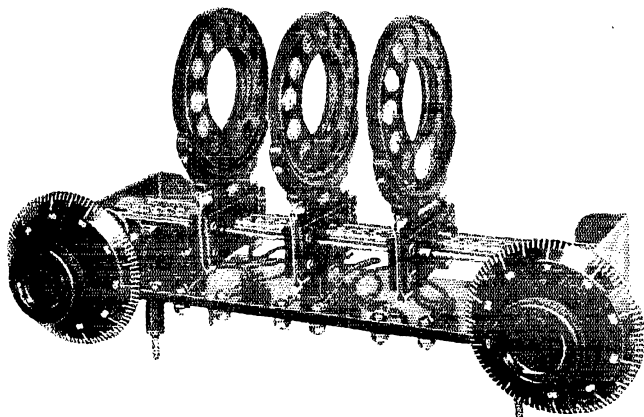
SOUTHERN RADIO CORPORATION

Radio Engineers and Jobbers

905 Realty Building, Charlotte, N. C.

CURKOIDS

THE SUPREME INDUCTANCE



The Curkoid of a year ago was the best inductance known. We now present our improved Curkoid after months of research and test. It is wound in the same form—a Cur-tate Epitrochoid—but has proportions which result in 25% increased effectiveness.

Curkoids are not affected by any exterior influence or body capacity whatever. They have very low distributed capacity, high inductance, extremely low high frequency resistance;—and this resistance “does not rise with the increase of frequency as rapidly as with other types of inductance” (unsolicited comment). All these make our resonance curve very acute and of greater height.

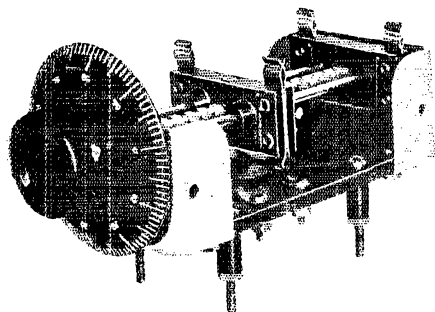
Our new model #3 Couplers are the only accurate scientific method of coupling interchangeable inductances. They produce perfect threading of the magnetic flux fields. They have micrometer movement of 1/400 inch to one graduation on the dial.

Essentially our products are improvements that make radio worth while.

Our booklet giving tried and approved hook-ups, general authentic information, radio data, etc., Price 10c.

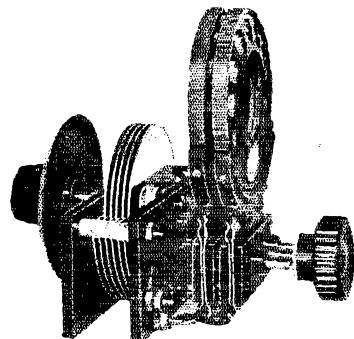
CURKOIDS

Curkoid Triple Coupler.....	\$8.00	No. 200K	\$1.85
Curkoid Dual Coupler.....	6.00	No. 250K	2.00
Tuned Radio Frequency Unit (Illustrated)	9.00	No. 300K	2.10
Dials (each).....	.50	No. 400K	2.25
No. 20K	1.40	No. 500K	2.25
No. 25K	1.50	No. 600K	2.40
No. 35K	1.50	No. 750K	2.75
No. 50K	1.60	No. 1000K	3.45
No. 75K	1.65	No. 1250K	3.85
No. 100K	1.70	No. 1500K	4.45
No. 150K	1.75		



RIEGER RESEARCH CORP.

112 West 44th St.
New York, N. Y.



SUPER VALUES LOUD SPEAKERS

List Price		Our Price
\$60.00	Magnavox Type R 3	\$51.00
35.00	Magnavox Type R 2	29.50
25.00	Atlas Amplitone	19.50
161.00	Western Electric 10 A	125.75
55.00	Western Electric 10 D	44.00
30.00	Music Master	24.50

PHONES

Brands	\$5.25
N & K German	5.50
Dictograph	5.50

CONDENSERS

3 Plate Vernier	.90
23 " "	2.50
43 " "	2.75
23 " Plain	1.50
43 " "	1.90

FADA NEUTRODYNE PARTS

List Price	\$25.00	Our Price	\$18.75
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TUBES

U V 200 Radiotron	3.95
U V 201 A "	5.75
U V 199 "	5.75
W D 11 "	5.75
W D 12 "	5.75

AUDIO TRANSFORMERS

List Price		Our Price
\$4.50	All American, 3 to 1 Ratio	\$3.95
4.75	All American, 5 to 1 Ratio	4.10
4.75	All American, 10 to 1 Ratio	4.10
4.25	Jefferson, 4 to 1 Ratio	3.75
7.00	Jefferson, 10 to 1 Ratio	5.55
\$4.50	Thordarson, 6 to 1 Ratio	\$3.95
4.00	Thordarson, 3 1/2 to 1 Ratio	3.60
4.50	Kellogg (501) 4 1/2 to 1 Ratio	3.95
4.50	Kellogg (502) 3 1/2 to 1 Ratio	3.95
5.00	Gen'l Radio 3 to 1 Ratio	4.25
7.00	American	5.55

All Mail Orders Shipped Promptly. Send Money Order, including Postage

Write for Our Catalogue A

HANES-ZENER CO.

The RADIO MAIL ORDER HOUSE—

Known for Low Prices

3 WEST 29th ST., NEW YORK CITY

Make Your Own Alkaline STORAGE B BATTERY



Artistic and substantial rack complete with test tubes 3/4" diam. by 6" long separators and terminals; prices as follows:—
18 Cell 22 Volt ... \$3.00
36 Cell 45 Volt ... 4.00
60 Cell 75 Volt ... 6.00
Best quality drilled Edison elements with nickel wire 10¢ per pair.

Test tubes, per doz., 50¢

Hard rubber separators, per doz., 20¢

We can furnish complete batteries if you so desire.
18 Cell \$6.00 36 Cell \$9.50 60 Cell \$12.50
Full directions with all shipments.
Entire satisfaction guaranteed or money refunded.
SIMPLEX MFG. CO. WILKINSBURG, PA.

CLEARANCE SALE

Here are a few items that I am selling off at greatly reduced prices. Send for list of other bargains.

Type C Baldwin Fones	\$10.00
Type E Baldwin Fones	10.00
Type F Baldwin Fones	12.00
4000 ohm Brown Adjustable Fones	16.00
Type E-2 3000 ohm Everett Fones	5.00
Type 2-A 2000 ohm Stromberg-Carlson Fones	5.00
2400 ohm Kellogg Fones	5.00
Type 1002-C 2200 ohm Western Electric Fones	8.00
50-W 1100 ohm Federal Single Fones	4.00
Federal Pleiophone Loud Speakers	5.00

THE RADIO STORE

562 East Colorado St.
Pasadena Calif.

RUSONITE

CRYSTAL RECTIFIER

(Patent Pending)

THE PERFECT SYNTHETIC CRYSTAL DETECTOR

SENSITIVE OVER THE ENTIRE SURFACE

No Hunting for "Spots." Loud and Clear. Endorsed by Thousands of Satisfied Users.

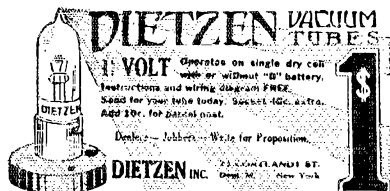
Sensitivity Guaranteed Price Mounted 50c

14K. Gold Supersensitive RUSONITE CATWHISKER, Price Permanent. Will not Oxidize. 25c

RUSONITE REFLEX CRYSTAL Manufactured Expressly for Reflex Circuits. Will Stand Up Under Heavy Plate Voltage. Price Mounted \$1.00

Order from your dealer or direct from

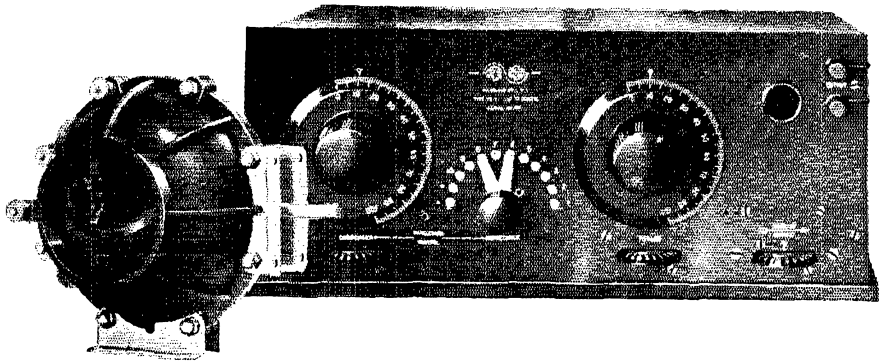
RUSONITE PRODUCTS CORP.
15 Park Row, New York, N. Y.



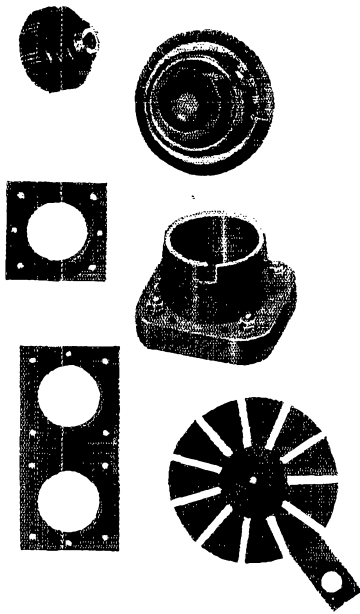
1 VOLT Operates on single dry cell with or without "B" battery. Instructions and wiring diagram FREE. Send for your tube today. Satisfies 100% of users. Add 10¢ for postal cost.

Dealer—Jubbers—Write for Proposition.

DIETZEN INC. 23 MANHATTAN ST. Dept. 10 New York



**Dielectric Strength that is
Constant under varying climatic
temperatures is the property of
phenol resin insulation**



Combined with this dielectric strength are the additional advantages of mechanical strength, freedom from moisture absorption, lasting beauty of finish and color.

The leading manufacturers of radio parts and panels have adopted phenol resin insulating materials because they give uniformly satisfactory service under practically all working conditions.

BAKELITE
Condensite
REDMANOL

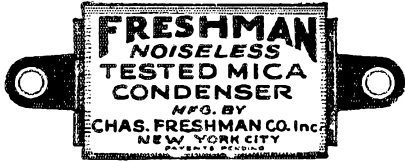
are the registered
Trade Marks for the
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manufactured under
patents owned by
BAKELITE CORPORATION

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General Bakelite Co., 8 West 40th Street, New York
Condensite Co. of America, Bloomfield, N. J.
Redmanol Chemical Prod. Co., 636 W. 22nd St., Chicago

THE MATERIAL OF A THOUSAND USES

The Condenser Sensation of Modern Radio



Through the accuracy and dependability of Freshman Condensers, hook-ups and circuits have been perfected which have completely revolutionized the art of Radio Reception.

These little Storers of energy and Rectifiers of Radio Current are the very heart of a well built radio set.

The proper fixed condenser will make all the difference in the world in the reception, clarity and selectivity your set affords.

Capacity	Each	Capacity	Each
.0001	\$.35	.002	\$.40
.00015	.35	.0025	.50
.00025	.35	.003	.80
.0002	.35	.004	.75
.0003	.35	.005	.75
.00035	.35	.006	.75
.0005	.35	.008	1.00
.0006	.40	.01	1.00
.0008	.40	.015	1.50
.001	.40	.02	2.00
.0015	.40	.025	2.50

The FRESHMAN is so designed that constant equal pressure is exerted on the condenser plates over the entire area. They are the only condensers that do this and therefore the only condensers that avoid noises, which are due to variable pressure on the plates.

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

Chas. Freshman Co. Inc.
Radio Condenser Products

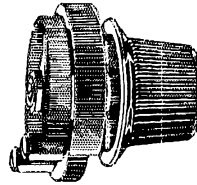
106 SEVENTH AVE., NEW YORK

You Must Use



RHEOSTATS

To get the best possible results from your set—no matter what type it is. They guarantee noticeable improvement in your reception.



6 Ohms. \$1.00
20 Ohms. 1.25
30 Ohms. 1.30
25¢ extra with dial.

Suitable for either table or panel mounting. Condensate base, high grade resistance unit, attractive knob. Adjustable shaft to any thickness panel.

All AmSCO Products at your Dealers. Write for complete descriptive literature on our complete line.

AMSCO PRODUCTS, Inc.

Broome & Lafayette Sts., New York

\$10.85



U. S. Army Model 1917 Rifle

Cal. .30, five shot. Barrel 25 1/4 in., total length 46 in., weight 19 1/2 lbs. Barrel and stock new. Sight mounted over receiver. This type used by A. E. F. Price \$10.85. Ball cartridges \$1.50 per lot. Goggles cleaning kit 85 cents. \$79 page catalogue 50 cents. Circular for 2 cent stamp. Established 1892.
FRANCIS BANNERMAN SONS, 501 Bway, N. Y. City

40%

Discount to retailers. All standard lines of radio goods at this price. Inquiries given our prompt attention.

R. R. GARRICK

#91 Homestead Ave.,
Beechwood, Upper Darby, Pa.

RHAMSTINE *

The Rhamstine Victophone replaces the reproducer on your phonograph and transforms it into an ideal loud-sepaker. \$7.50 post paid.

J. THOS. RHAMSTINE *
2162 E. Larned St., Detroit, Mich.
*Maker of Radio Products

KNOW YOUR TUBE

We test each tube individually, in our own laboratory. Tubes not testing up to standard are discarded.

With each tube WE SUPPLY A CHARACTERISTIC CURVE, with amplification constant, mutual conductance, plate resistance, etc.

Immediate deliveries on Radiotron 200, 201-A, WD-11, WD-12, UV-199 and 216-A tubes.

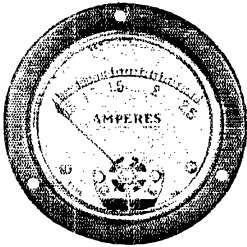
DEALERS: Write for interesting proposition.

C. W. THOMPSON COMPANY, Mattoon, Illinois

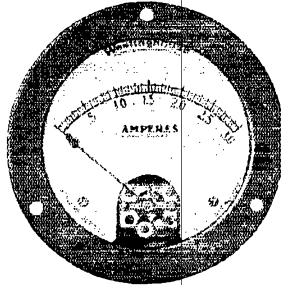
"BUILD YOUR OWN"
With "RASCO" Parts!
If you need small radio parts in a rush, "RASCO" will supply them cheaper, better and quicker than any one. Be sure to get our great 68-page catalog. Over 500 different parts, 300 illustrations. This catalog contains 75 Vacuum Tube Hook-Ups, all values being shown. Due to great cost, catalog sent only upon receipt of 15c. stamps or coin.
Radio Specialty Co., Inc.
98Q Park Place, New York

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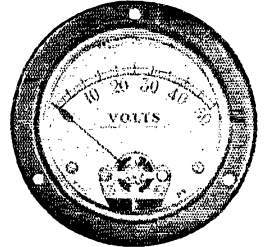
Radio Instruments



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



Radio Ammeter
3-in. Dials, 2 1/2-in. Scales



Radio Voltmeter
2-in. Dials, 2-in. Scales



A Type BX Radio Frequency Ammeter in the transmitting circuit will indicate the strength of the current in the antenna, which, in turn indicates the effectiveness and character of transmission.

A Type BX Voltmeter in the "B" battery circuit, tells the condition of the battery and will also detect weak and dead cells of the battery.

A Type BX Voltmeter across the filament circuit will pay for itself by increasing the tube life. The vacuum-tube filament is designed for a certain amperage and voltage. Values of current or voltage below the standard will decrease the efficiency of the set. Values above the standard, even the slightest amount, will materially shorten the life of the tube.

Type CX Instruments have 3-inch dials and 2 1/2 inch scales, otherwise they are the same as the type BX.

Accurate
Reliable
Economical

Ask nearest office for Folder 4471-B

**Westinghouse Electric
& Manufacturing Co.**
Newark Works, Newark, N. J.

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Baltimore, Md., 121 E. Baltimore St.
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Buffalo, N. Y., Ellicott Square
Chicago, Ill., 111 W. Washington St.
Cincinnati, Ohio, Third and Elm Sts.
Cleveland, Ohio, Euclid and East 14th St.
Columbus, O., Third and Rich Sts.
Dallas, Texas, Akard and Commerce Sts.
Dayton, O., 14 West Fourth St.
Denver, Colo., 910 Fifteenth St.
Detroit, Mich., 1535 Sixth St.
El Paso, Texas, Oregon and Mills St.
Houston, Texas, Main and Congress Sts.

Indianapolis, Ind., Illinois and Market Sts.
Jacksonville, Fla., East Union and Ionia Sts.
Kansas City, Mo., 1012 Baltimore Ave.
Louisville, Ky., 312 Fourth Ave.
Los Angeles, Cal., 420 S. San Pedro St.
Memphis, Tenn., 130 Madison Ave.
Milwaukee, Wis., 425 E. Water St.
Minneapolis, Minn., 2303 Kennedy St., N. E.
New Orleans, La., 921 Canal St.
New York, N. Y., 165 Broadway.
Norfolk, Va., 300 Main St.
Omaha, Neb., 1819 Farnam St.
Philadelphia, Pa., 1325-1329 Chestnut St.
Pittsburgh, Pa., 306 Fourth Ave.

Portland, Ore., Sixth and Oak Sts.
Richmond, Va., Seventh and Franklin Sts.
Rochester, N. Y., 119 E. Main St.
St. Louis, Mo., 717 So. Twelfth St.
Salt Lake City, Utah, Second South and Main Sts.
San Francisco, Cal., 1 Montgomery St.
Seattle, Wash., 3451 E. Marginal Way.
Spokane, Wash., Riverside & Stevens Sts.
Syracuse, N. Y., S. Warren and E. Wash. Sts.
Tacoma, Wash., S. 11th and Commerce Sts.
Toledo, O., Madison Ave. and Superior St.

Westinghouse

CLASSIFIED ADVERTISEMENTS

Six cents per word per insertion, in advance. Name and address must be counted. Each initial counts as one word. Copy must be received by the 1st of month for succeeding month's issue. NOTE NEW CLOSING DATE.

IMPORTANT ANNOUNCEMENT

TO ALL TRANSMITTING HAMS

Effective with the next QST, we will have a special section of Classified Advertisements, at a special low price, for New QRA's.

Copy must list only the following—THE CALL, NAME AND ADDRESS OF HOLDER. The charge is 50¢ straight, cash with copy.

EVERYTHING FOR THAT EDISON B. 100 VOLT BATTERY ALL READY TO ASSEMBLE—FUMED OAK CABINET, ELEMENTS WIRED, SOLUTION, TEST TUBES, SEPARATORS, \$14.00. SHIPPING WEIGHT 25 LBS.; 5 100 VOLT UNITS, \$60.00; GREAT FOR TRANSMITTER, POWER AMPLIFIER, HIGHLIGHT TUNGAR CHARGERS, CONSTRUCTION SHEET, 50¢. GLASS TEST TUBES, ANNEALED, 3/4" 3¢, 1" 4¢. SHIPPING WEIGHT 1 OUNCE. LARGEST SIZE TYPE A ELEMENTS READY DRILLED AND WIRED 10¢ PAIR, DRILLED 7¢ A PAIR. COMPLETE CELL, INCLUDING SOLUTION 15¢. SHIPPING WEIGHT 3 OUNCES. TYPE G ELEMENTS READY DRILLED AND CLEANED 5¢ PAIR. 2 POSITIVES, 1 NEGATIVE 6¢. 3 POSITIVES, 2 NEGATIVES 11¢. MAKES A WHOPPER OF A TRANSMITTING BATTERY FOR 50 WATT TUBES. 1 1/2 OUNCES PER PAIR SHIPPING WEIGHT. HAVE A LOOKSEE. SAMPLE 5 ELEMENT CELL 25¢ POSTPAID. EVERYTHING TO MAKE UP THE HIGH CAPACITY 5 ELEMENT CELL, INCLUDING SOLUTION, (ELEMENTS DRILLED) (20¢ CELL.) SHIPPING WEIGHT 5 OUNCES. 99% PURE. SIZE 20 SOFT DRAWN NICKEL WIRE FOR CONNECTORS 1 1/2¢ FOOT. PERFORATED HARD RUBBER SEPARATORS 1/2¢. CAN GENUINE EDISON SOLUTION READY MIXED ENOUGH FOR 100 VOLTS \$1.50. SOLUTION IN POWDER FORM 75¢ POUND. FULL STOCK RADIO CORPORATION TRANSMITTER PARTS, SHIPPED PREPAID. A RADIO STORE AS NEAR AS THE POSTOFFICE. FRANK MURPHY, 4837 ROCKWOOD ROAD, CLEVELAND, OHIO.

PORCELAINS FOR THE AERIAL. WE'RE ALL USING 'EM NOW. HELP SNAP THOSE SIGS OVER INTO AUSTRALIA. OHIO BRASS CO. PORCELAIN ANTENNA INSULATORS BEST. QST SAYS SO. 5" 75¢. 10" \$1.75 PREPAID. HOLES BUSHED WITH COPPER TUBING, BRUSH ELIMINATOR ON ORDERS FOR 6 OR MORE. STATIC SHIELDS \$1.00. DON'T TRUST THAT HEAVY FLAT TOP OR CAGE TO A SPINDLELEGGED INSULATOR. OB PORCELAINS STRONG MECHANICALLY AS WELL AS ELECTRICALLY. STAND OVER 3000 LBS. PULL. SML, CLEVELAND.

BARGAINS: 1 Grebe CR5 and RORK Amplifier, new, cost \$135 sell \$75. 1 W. E. 10A Loud Speaker cost \$161 sell \$120 (used 1 month). A. Alger, Lorain, Ohio.

WANTED: Natrometer. Address G. R. Altwater, 525 Fifth Ave., Pittsburgh, Penna.

SPECIAL: Clapp-Eastham HR and HZ units—regular price \$40, special at \$20—also Federal crystal sets list \$25, Our price \$10 with phones; \$5 without. Buckeye Radio, Akron, Ohio.

WILL TRADE: or sell cheap: lot of slightly used receiving apparatus. What have you? What do you want? Also have 2" spark coil, Tesla coil, etc.—9CAR.

BARGAINS: Two step amplifier \$15; Five dial omnigraph \$10; Chamberless One Horse Power Steam Engine \$8.00; Three 201 tubes \$2.50 each; 1 200 tube \$2.50; Two Myer's tubes in sockets, \$3.00 each; Three Murad Radio Frequency Transformers, \$10; One Inch Spark Coil \$3.00; Also variable condensers, honeycomb coils, rheostats, etc. All in good condition. Jesse P. Burton, Box 232, Ashland, Virginia.

WESTINGHOUSE TYPE TF, 20 Watt phone and C.W. complete, tubes 500 volt motor generator, microphone, key. All brand new, \$175.00. Ralston Boone, 124 Wythe Ave., Bluefield, W. Va.

SPECIAL: Bakelite transmitting lead-in tubes, 16 inches long, corrugated, half inch hole thru center. Price \$2.50 only 44 left. The Buckeye Radio Service-Akron, Ohio.

SELL: 450 watt Thor plate transformer 3000 volt secondary center tapped 1500, \$14. 150 Watt mounted filament transformer, also Thor, handles two fifties, \$7. Eighth horse 1800 rpm synchronous motor, \$20. Sixth horse 3400 rpm induction motor, \$18. All above for 110 volts 60 cycles. Excellent condition. 9PQ.

QSL—Send stamp for sample cards, 3BSB.

FOR SALE: Grebe CR-9, received 2000 miles, \$95.00 with VT-1 and two VT-2 \$110.00. Johnston Coil, R. F. D. 22, Laddonia, Mo.

RUBBER STAMP with large call letters 50¢; Radiogram and Relay Radiogram blanks 25¢ per hundred, Post Card 60¢ hundred. Send us your orders. Carolina Printing & Stamp Co., Wilmington, North Carolina.

FOR SALE: A few 23 and 43 plate condensers at factory cost, \$1.25 and \$1.75. Hard rubber insulation. Metal end plates. Well made and reliable. Circle C Producers, 1431 West 114 St., Cleveland, Ohio.

SELL TWO "S" tube rectifiers \$4.50 each. Guaranteed good condition. J. Marvin Cook, Langford, S. D.

WE CAN SAVE YOU MONEY on any kind of radio equipment. Our prices are guaranteed to be lower. Send stamps for large price list. Cut Rate Radio Co., P. O. Box 472, Newark, N. J.

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QRA 8WZ now Lee Davis, 240 Carr Ave., Clarksburg, W. Va.

BARGAIN: For synchronous rectifiers or gaps; two Wagner 1/2 H.P. synchronous motors slightly used, good as new, list \$30.00, sell \$20.00 each; one Zenith 1/2 H.P. synchronous gap, list \$110.00, sell \$50.00. C. C. Endly, 22 Sturges Ave., Mansfield, Ohio.

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FOR SALE: 10 watt C.W. 1KW Spark, and Spider Web Receiver with two step. 9CUF.

FOR SALE: 1KW Type R Thordarson, \$10.00; 1KW Acme, \$15.00; .01 Dubilier Condenser, 25,000 volts, \$25.00. George B. Faunce, 30 Caloris Ave., Millville, N. J.

SELL: 20 watt C.W. and fone set. Includes four tubes, three meters, motor generator. Good DX. \$125.00. Also two special 30 foot steel radio towers. R. F. Fowler, Frankfort, Indiana.

QRA 8ZH SAND Frank Fallain, 321 First Avenue, Flint, Michigan. Please correct call books. Your cards answered immediately.

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SELL: Five watt complete, tube, transformers, 2BZJ.

QST: Genuine Baldwin Fones, \$10. New. Write. Leland Gibson, 9ELT, Box 8, Whitewater, Kansas.

ATWATER-KENT variocoupler, 2 variometers, new 5 watt Radiotron, Audiotron with adapter, American

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WQAZ's EQUIPMENT for sale. A 15 watt set using three 5 watt tubes as oscillators, three as modulators, and one speech amplifier. Best DX 1200 miles during summer. Been in operation only seventeen times. \$400 cash. Holland Radio Co., Greensboro, N. C.

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4GX's 20 watt set for sale. 2300 mile DX record. Have put in 100 water. Complete \$90.00. Send for photo. Holland Radio Co., Greensboro, N. C.

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ammeter, \$6.00, Type 74, 0-10 A.C. Ammeter, \$6.00, General Radio, 0-5 Hot Wire, \$5.50, 0-2.5, \$5.25, Roller Smith, 0-2.5, \$3.75, 900 Cycle Transformers, W. E. J's, E's, and G's. General Electric 15 Watt Rectifier Tubes, \$6.50. Parts from Marconi Two K.W. 500 Cycle transmitters. Prices on Application. TRAVIS RADIO LABORATORY RADIO 5-ZAK, 102 DIAZ ST., SAN ANTONIO, TEXAS.

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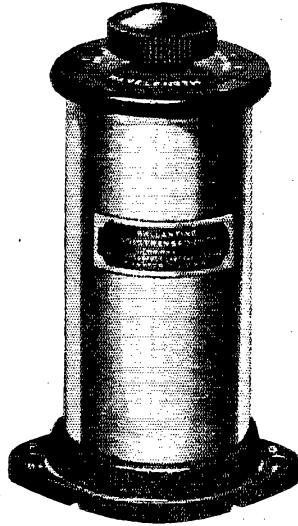
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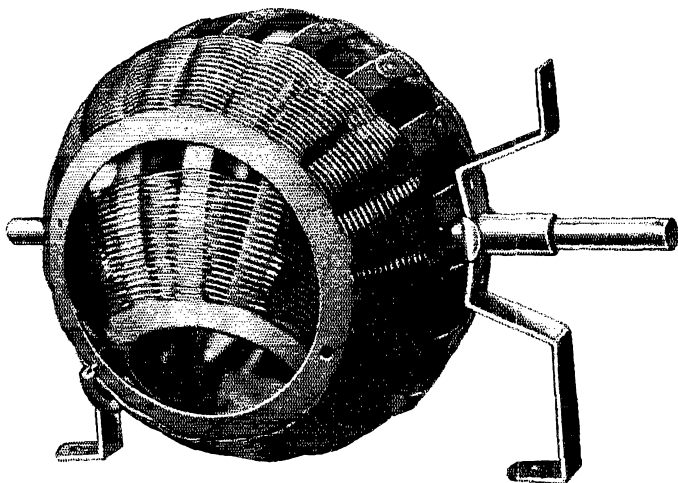
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