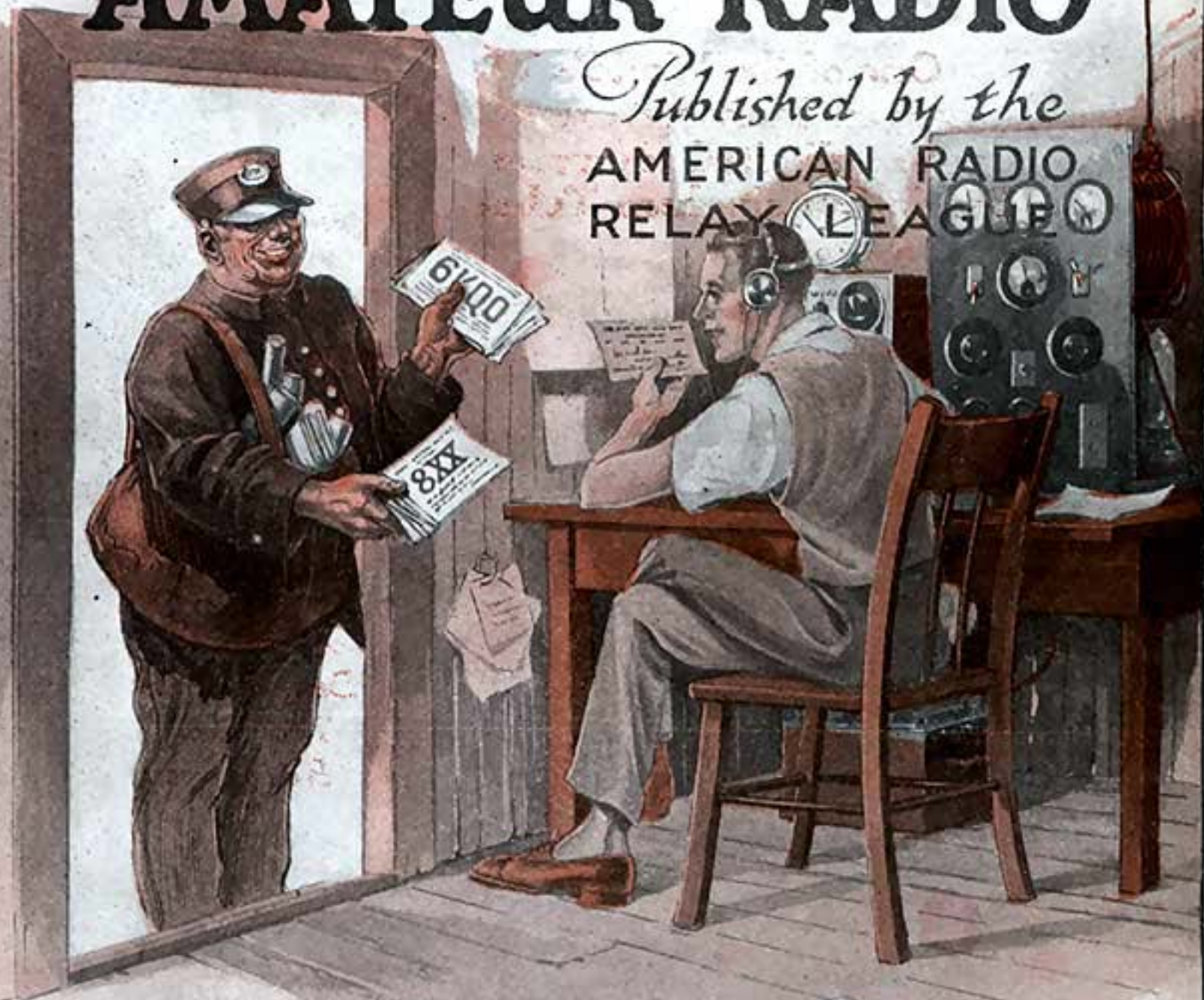


Richard Smith

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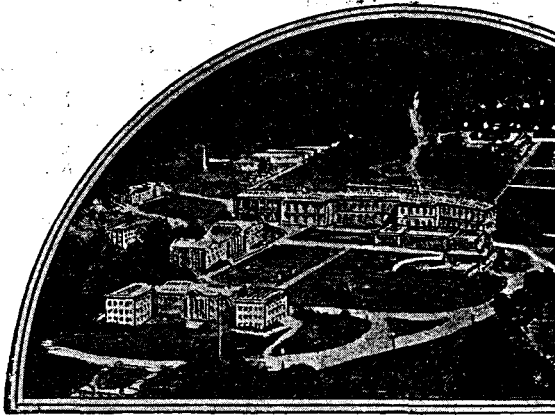
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The American Radio Relay League, Inc., is a national non-commercial association of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, for orderly operating, and for the practical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

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

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# QST

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

VOLUME VI

JULY, 1923

No. 12

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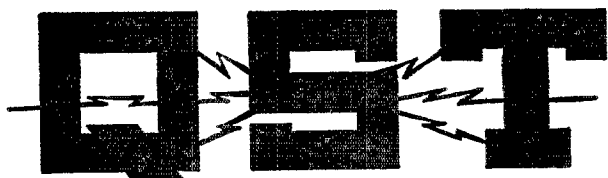
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Our Mascot: The Boiled Owl  
As conceived by 8BEO





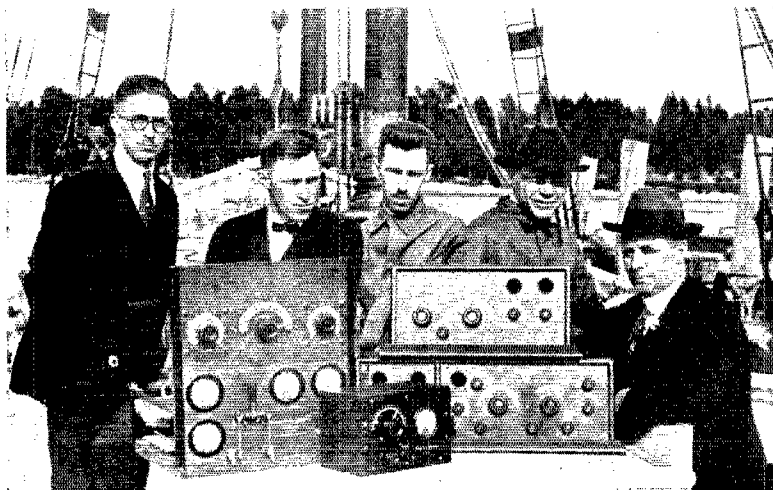
A Magazine Devoted Exclusively to the Radio Amateur

## Amateur Radio Shoves Off for the Pole

Mix of ITS Accompanies MacMillan as A.R.R.L.  
Operator on the "Bowdoin" on Arctic Cruise.

**A**MATEUR Radio is undertaking another of those big and important jobs that only American Amateur Radio can put over, when it sends Donald H. Mix of Station ITS, Bristol, Conn., to accompany Donald B. MacMillan, renowned Arctic explorer, as an A.R.R.L. operator on the schooner

told in the last *QST* how Mr. MacMillan wanted to take a receiving set on this, his eighth cruise, to combat the loneliness and silence of the long Arctic night with news and music from the outside; how this idea had developed into the desire to transmit too and actually talk to the unseen world to the south of him; how his friend



ON BOARD THE "BOWDOIN," AFTER UNPACKING THE EQUIPMENT from a mountainous pile of packing cases. Left to right, F. H. Schnell, A.R.R.L. Traffic Manager; D. H. Mix, WNP's operator; K. B. Warner, Editor of "QST"; M. B. West, Zenith engineer who designed the installation; and Dr. MacMillan, the "Bowdoin's" skipper.

"Bowdoin" when she sails from Wiscasset, Maine, on June 23rd for a fourteen-months trip to the top of the world in the interests of science.

It offers us amateurs, wherever we may live in the U.S.A. or Canada, an opportunity to see a piece of business thru which everybody admits we alone can do. We

MacDonald of the Chicago Radio Laboratory had offered to equip the "Bowdoin" with a complete Zenith installation; and how the A.R.R.L. was going to send one of its members as Mr. MacMillan's operator. In the month since that preliminary announcement, things have buzzed along in great shape and by the time this issue is

out the "Bowdoin" will be well on her way north.

#### The Operator

When our Board of Direction voted to supply the man, strict search was instituted in all the several divisions of our Operating Department to find a ham who had all the qualities demanded of a member of an Arctic party. The Traffic Manager turned up several dozen prospects and while these were still in the simmering-down process word came from Mr. MacMillan that a

### A Message to Members of the A.R.R.L.

I wish to express my deep appreciation to all members of the American Radio Relay League for their co-operation in making possible the first real radio work in the Arctic regions.

If you but stop to consider what communication from you to our ship through our operator, Mr. Donald Mix, who is one of your organization, means to the morale of a crew in the frozen North you should feel well repaid for your efforts. Undoubtedly the greatest hardship of the Arctic explorer is to be cut off entirely from his own world. This isolation has spelled disaster for many an expedition.

This attempt at communication to and from the Northland has never before been attempted in a systematic, well organized way, with the co-operation of such an organization as yours.

Realizing the work that has been done by the "ham" in the past in setting long distance records I look forward to the results of this experiment with utmost confidence.

When we are frozen in for the long Arctic winter we shall look forward eagerly to our radio talks with you. It will link us with our own world to know that at various points throughout North America you members of the A.R.R.L. will be listening eagerly to "copy" WNP—Wireless North Pole.

I firmly believe that if anybody in the wide world can get our signals it will be a member of the A.R.R.L. —Donald B. MacMillan.

Every American amateur must admit that it would be hard to find another man as good. Mix is the operator of 1TS, which month after month has turned into our "Calls Heard" Department lists of calls that have been the envy and the despair of every competitor and the joy of countless DX amateurs who found their calls listed. We have the utmost confidence in him.

#### The Equipment

The entire installation was designed by M. B. West, of the Zenith laboratory, who in middle April visited the "Bowdoin" at her dock in Southport, Me., got a line on the available room for set and aerial, and returned to Chicago to build something to fit. It had to be a short-wave proposition, and only a gang of amateurs can do justice to such a problem. But these were amateurs and the result is a station any amateur could be mighty proud of. Designed by West of old 8AEZ, built by the Zenith organization Matty started, put together by Lowe "GZ," with Clausung of old 8YL helping West, 9BA rewinding the generator, and Mix as operator, it is a ham party. And it will be even more so, for the whole A.R.R.L. is going to be on the other end of the circuit.

#### The Plan

The "Bowdoin" is going to keep in two-way touch with the world via the A.R.R.L. Other polar expeditions have carried radio and failed, and even this trip is going to demand the utmost co-operation of everybody concerned to put it over, but *it is going over*. Mr. MacMillan's voyages are in the interests of science and the particular purpose of this one is to study the flora and fauna of the northland and to gather data on magnetic phenomena. His expeditions are financed largely by his lectures and writings between trips, and in this case radio is helping by conveying a weekly news story to a syndicate of seventy newspapers during the forthcoming trip. As explained in further detail elsewhere in this article, our job is going to be to work Mix and get the story from him, and deliver it to the nearest newspaper which is a member of the syndicate—the North American Newspaper Alliance. It's going to be a tough proposition when the weather is bad, and no man knows what success we will have when WNP is in daylight for five months nor when she is on "the other side of the Aurora," because no man has ever tried those things before. But if any way can get thru with the power the "Bowdoin" can carry we think it'll be our amateur waves, and if anybody can copy WNP we know it will be done by us amateurs of the A.R.R.L. It won't be all dry hard work, either, for Mix plans when possibly to get QSO with somebody with a steady signal and *work* them, and get a real QSL for his coded news-story. And the beauty of

change in plans made it necessary to get the operator on the job without further delay. One of the prospects was Mix of 1TS, a peach of an operator, a born amateur, filling the bill in every particular, and "rarin' to go." So without more ado Mix was escorted to MacMillan, put thru the third degree, and was *accepted*.

this is that it will be about as easy for a west-coast station as it will be for the east—Mix is going *north*. And it won't be all press stuff either, for he's going to work with us, and tell us how we come in up there, and send lists of Calls Heard to QST, and Mr. MacMillan promises to send a weekly message of news to us amateurs!

#### The Route

Only 88 ft. long and with a crew of but seven, the "Bowdoin" is the smallest ship that has ever entered the North, but she is more vessel to the foot than you ever laid eyes on before. She is an auxiliary schooner, built in Maine where they know how, and exceptionally sturdy to withstand the crushing force of 40-foot-thick ice. Carrying 2000 gallons of distillate, she has the greatest cruising range under power of any boat in the world—4000 miles.

After touching at Labrador, the "Bowdoin" will cross Davis Strait to Greenland, and proceed up the west shore of that huge island, stopping perhaps a half dozen times enroute to make magnetic observations, and coming at length to Etah, in 78° North latitude. After getting all set there, they cross Baffin Bay to Cape Sabine, where they are to establish a bronze memorial for the National Geographic Society to the memory of the Greeley Expedition, which there perished from starvation and exposure. They expect to arrive at Cape Sabine about August 15th. Near there, in Flagler Bay, the "Bowdoin" will seek a safe harbor and anchor to await the coming of the long winter night, when she will be solidly frozen in for some nine months. Using the ship as a base, posts will be established for the collection of the scientific data needed, and Mix will have an opportunity to try all the experiments he wants, including a Beverage Wire a thousand miles long if he wants to put it up. This location is at approximately 79° N. latitude and 76° W. longitude, about 540 miles northeast of the Magnetic Pole, and something less than 700 miles from the true North Pole. Should the ship be unable to find a safe harbor in Flagler Bay, Mr. MacMillan plans to drop south to Jones Sound in 76° N. lat. and winter there.

Then when summer comes and the ice melts the "Bowdoin" will turn her nose towards home, and if all goes well will be back by September 1st of next year.

Our brother amateur, Mix, has a wonderful trip before him, and thru it all it is going to seem to him like he was still at home, for he will be *with us on the air*. And we amateurs at home, we're going to listen for WNP, and while finding out how far north our sigs. can go without freezing, are going to put over another hard job to the glory and prestige of our organization, and make the world admit that "we did it!"

K.B.W.

## Station WNP, on Board the "Bowdoin"

IF there ever was a first class amateur station it is this very Zenith station that the "Bowdoin" will carry northward to the inside of the aurora. Everything about the equipment is beautiful, not in surface finish alone, but with that fine capability and fitness that marks apparatus built by those who understand its uses.



West of Zenith and Mix of WNP just after looking at the set.

This is not the conventional attempt of a commercial firm to build a short-wave set; no, this outfit fairly bristles with the information that its builders *know* the short-wave radio game. That is why, in less than a month, it was possible to design the set, build it, make thoroughgoing tests of all the parts and of the finished set, then to pack up and move to Wiscasset and have installation under way before the month had closed. It would have been fine work as a rush commercial job; it was still finer as a free-will contribution from Zenith toward a scientific investigation.

Referring to the large illustration at the beginning of this article, we have at the right the short-wave receiver, standing on top of that a long-wave receiver, and smiling over the two of them our old friend M. B. West of Zenith, of the A.R.R.L. Board, and owner of pre-war 8AEZ, the

most brutal amateur spark of all time. The sets were built and tested under West's direction. Somewhat to the left stands the wavemeter and still farther over is the sending panel. Now let's go back and review them in detail.

#### The Short-Wave Receiving Set

The short-wave receiver is a Zenith 1-R with detector and two steps of audio amplification, all built into a special long cabinet. The tuner is inductively coupled, with switch-tuning in the primary and condenser-tuning in the secondary, the wave length range being 150-850 meters. The coupling is fixed and regeneration is by means of a tickler.

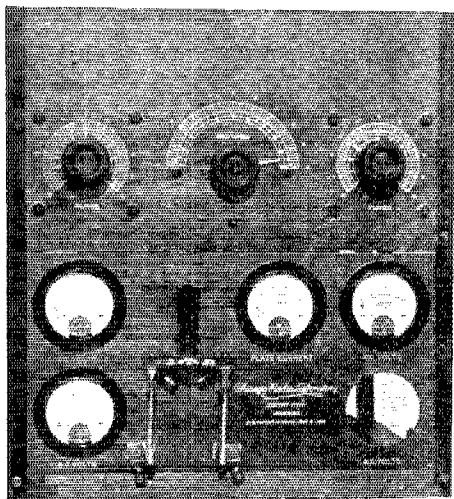


Fig. 1—WNP's Sending Panel

#### The Long-Wave Tuner

The long-wave tuner (shown standing on the short-waver) is a single-circuit device using honeycomb coils for both the tuned circuit and the tickler. This set has built into it a detector and two-step audio-frequency amplifier so that it also is a unit. The long-wave set will be used for the reception of time signals from NAA and also for copying press from Annapolis, NSS, which station may also send messages to the "Bowdoin" at stated intervals. Like the short-wave set this receiver is a beautiful piece of work, with mahoganite Radion panels, "full-grown" knobs that one can get a hold on, and fine readable scales that make an operator's heart glad within him. The cabinets are of piano-finished mahogany and the sets inside are as pretty as the cases.

#### The Wavemeter

The wavemeter is a special job also. It is built as rigidly as possible, to retain its calibration, and has been carefully com-

pared with two standard meters. To take care of accidental burnout of the thermogalvanometer, two spares have been provided and in addition the terminals of the circuit come out to binding posts so that a detector and phones may be used in an emergency.

The congregation has undoubtedly been wondering when the story would work down to the *sending* end of this station—the part that will project its intangible voice from inside the aurora, across the frozen north, to the waiting tuner of the American Amateur. Here she goes!

#### The Sending Set

In Figure 1 is shown the front of the sending set. No explanations are needed except to call attention to the beautiful simplicity of the controls. The 500-cycle line voltmeter (marked "A.C. Volts") had not yet been delivered when the picture was taken.

Figure 2 shows the circuit diagram. One Western Electric "G" (50-watt) tube is used "on each side of the cycle." Because this cannot be done with series feed and also because shunt feeding has quite a few other advantages, the set does not employ our familiar "1DH" series feed connection, even tho the circuit is of the reversed feedback type.

Referring to Figure 3 we see an especially happy arrangement of the transmitting set parts in such a fashion that the controls are well grouped, every part is accessible, and the radio frequency circuits are kept *completely off the panel*; not a solitary thing that carries radio frequency comes out where it can be touched. At the extreme rear of the set are the pancake inductances which are arranged so that the mutual inductance is additive with respect to the self-inductance. These coils are fixed in position and the cords shown in the picture were not used to retain them but to fasten other things in place during shipment. Note that the upper cross-member of the frame is *not* of metal and that nowhere else in the set is there a short-circuited metallic path anywhere near the inductances. Just forward of the pancakes is the grid coil; the edge of it can just be seen. The two vertical white cylinders are the bank-wound plate-circuit radio-frequency choke coils, one to each tube. Between them stands a little wooden rack which holds the plate blocking condensers. In the center of the upper panel is the grid circuit tuning condenser, with a square mica condenser mounted on it and connected in series with it to protect against accidental flashovers. The two vertically mounted tubular grid leaks may be seen standing up next to the variable condenser. The grid condenser is mounted between the lower ends of these resistors but is concealed by the nearer of the two plate chokes.

Underneath the shelf can be seen the two filament by-pass condensers which entirely conceal the special plate transformer; gift of our old friends Thordarson Electric Mfg. Co.

The wave length range of the set depends on the tuning limits of the grid circuit, as ample inductance is provided to load up a small antenna.

there is never room enough—the yard should be larger. Imagine then the problem of putting up an honest-to-goodness antenna between two masts that were 60 feet high and *only 23 feet apart*. It looks impossible. However, the Zenith gang went after it and devised an antenna of four wires that begins at a single insulator on the mainmast truck, then goes forward to

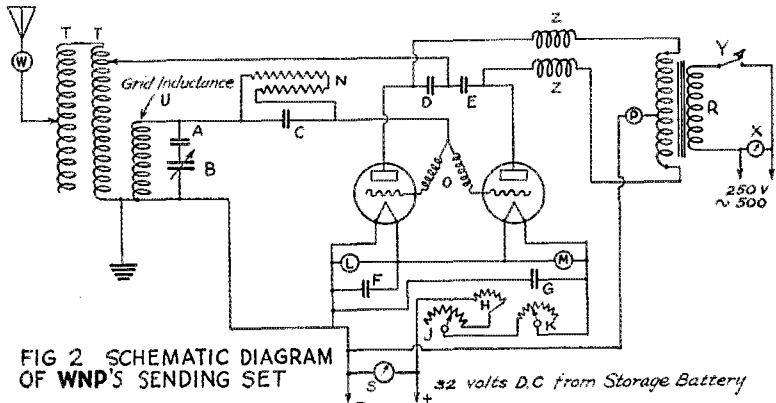


FIG 2 SCHEMATIC DIAGRAM OF WNP'S SENDING SET

- A—Small mica series condenser .0015 microfarads.
- B—50-plate variable condenser of about .0018 microfarads capacity.
- C—Mica grid condenser .00035 microfarads.
- D & E—Glass condensers (plate stopping) of about .002 microfarads each.
- F & G—1 microfarad, UC-490, mica condensers.
- H—4 ohm fixed resistance.
- J & K—Filament rheostats.
- L & M—0-15 Jewell voltmeters.
- N—2-5000 ohm R. C. A. grid leaks in series.
- O—Grid chokes, each of 15 turns of No. 22 D.C.C. on  $\frac{3}{8}$ " tube.
- P—0-500 Jewell milli-ammeter.

- R—Thordarson special plate transformer. Primary volts 250, secondary 1700 volts each side of center tap.
- S—0-50 Jewell voltmeter.
- T—Two Telefunken inductances connected in series aiding. Total 34 turns  $\frac{1}{4}$ " ribbon.
- U—Grid inductance—17 turns No. 18 D. C.C. on tube  $10\frac{1}{2}$ " in diameter. Coupled to coils T and tuned by condensers B & C.
- W—Aerial ammeter, Jewell 0-5 or 0-10.
- X—0-350 volts 500 cycles, Jewell special.
- Y—Mescos key with  $\frac{1}{8}$ " contacts.
- Z—Plate choke coils to keep radio frequency out of plate transformer. Each coil triple bank wound of No. 22 D.C.C. on tube 2"x8".

In line with the idea of keeping radio frequency off the panel the antenna ammeter is not mounted in the set at all but is supported on the wall by porcelain insulators, or rather the thermo-couple is so supported and leads are run down from there to some convenient location at which the meter may be placed. Like the other meters this is a special Jewell, and plenty of spares are provided.

**The Installation on the "Bowdoin"**

Anyone that has ever put up an amateur antenna in a back yard knows that

four insulators on a spreader on the fore-topmast (which has been extended slightly for the purpose), and then slants downward to a short bowsprit, the wires coming to a short spreader at a point above the forecastle transom. The lead-down then drops to a deck insulator and into the forecastle.

Space on the "Bowdoin" is scarce and the Zenith set is lucky to have an operating table 6 feet long which displaces one of the bunks. The receivers and the sending set are mounted on this table and the

motor generator is underneath, with the starting box just above the motor. The generator is a half-kilowatt Telefunken 500-cycle alternator driven by a direct-connected 32 volt D.C. motor. Power for the motor is derived from the ship's stor-

with a temporary antenna of the same sort as that which the "Bowdoin" carries. The little antenna barely reached above the roof of the Zenith plant but the set had not been on the air five minutes before a joyous chorus was answering the old familiar call of 9ZN with the equally familiar sine of "GZ" after it. Lowe had a busy night of it, for without any schedules he worked 1AW, 2OM, 3JJ, 6KA, 8VQ, 8AWP, 9CWB, 9BXA, 9APS, and finally, in broad daylight 9ZT at Minneapolis. All were worked without difficulty and all showed an intense interest in a station that could push such signals thru. On the east coast 9ZN could best be described as tremendous and a flood of wires and letters shows that all parts of the country were trying to get a word in edgewise and simply had to report in some fashion.

On the last day of May,\* West and Mix had the installation tuned up on the "Bowdoin" at dock in Southport, Maine, and that night they got on the air signing WNP. The set performed just as well as in Chicago, and at this writing is pushing tremendous signals across most of the country. The success of

the installation is assured.

S.K.

## The Practical Operating Dope

**W**AVELENGTHS: WNP will transmit on wavelengths of about 185, 220, and 300 meters according to the demand of the receiving operator with whom communication is being carried on. However, it may be expected that the 220 meter wave will be the one most used, and only in unusual cases when communication is without the bounds of reason will a change be made. WNP has authority to use any wavelength outside of the above three if the occasion demands a departure from them.

Dr. MacMillan will permit Mix to operate every night, but due consideration must be given the length of operating hours of the transmitter because of the limited amount of fuel which is carried to operate the Delco outfit. At other times it may be necessary for Mix to "turn to and lend a hand" in rigging the ship. However, WNP can be expected to be listening at odd times even tho the transmitter is not being operated. These are things which must be taken into account with the foregoing schedule. The starting time may seem rather late, yet we must give the fellows

\*See Calls Heard on page 65.

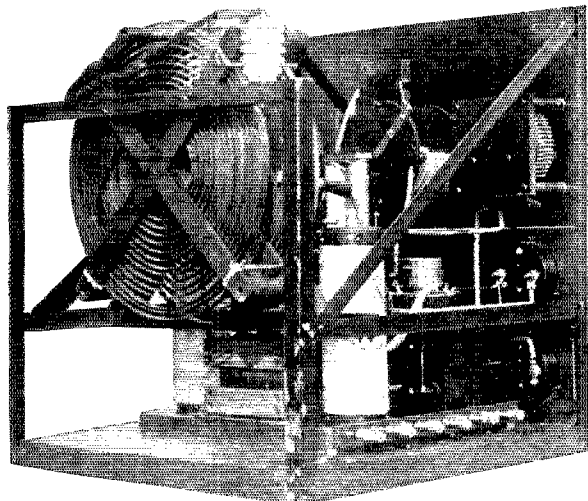


Fig. 3—Rear View of the Sending Set.

age battery, a new 160 ampere-hour set of U.S.L.'s contributed by the manufacturer and guaranteed to last ten years. This is kept charged by either of a pair of 350-watt Delco light plants, contributed by the makers.

Spare parts are provided in profusion, all the "makings" of complete duplicate receiving sets, a complete set of spare parts for the sending set, spare windings for the motor, a big batch of tubes, and all manner of accessories—in watertight boxes. Worthy of special mention are the B batteries. Ten thousand cells were made up by the Burgess Battery Company and carefully seasoned on the shelf. Then 1,000 of the very best were chosen and made up into blocks and packed in waterproof packages—enough to last 18 months. But it did not stop here, for there were furnished parts, tools, chemicals, and detailed instructions so that Mix can *make up* enough batteries to last for *two years more*. The whole performance was gratis. Fine business!

The everlasting amateur enthusiasm cropped up again in connection with the generator which was sent out to be re-wound and came back with a tag—"Work on this generator personally done by 9BA; 73."

### What the Set Has Done

As soon as it was finished the set was installed on South Kedzie Avenue, Chicago,

on the west coast the same chance as is given those on the east coast.

#### Messages and Delivery

Dr. MacMillan has agreed to send a weekly story to the North American Newspaper Alliance, with main offices at Room 928—63 Park Row, New York City, whenever communication is possible. The A.R.R.L. has agreed to do its utmost in endeavoring to copy these messages and deliver them to the member-papers of the N.A.N.A. Each story will be about five hundred words in length and will be sent in code or plain English as determined by Dr. MacMillan, and Monday morning of each week at one o'clock is the scheduled hour of starting. In return for what we are going to do, Dr. MacMillan will permit Mix to communicate with us amateurs and log the calls of stations he hears during the entire trip. Each week WNP will send the list of calls heard to A.R.R.L. Headquarters and that is another thing we amateurs must get.

Our method of handling Dr. MacMillan's messages addressed to the N.A.N.A. will be as follows: each week on Monday A.M. or as soon thereafter as communication is possible, WNP will tune down to amateur wave lengths and get in touch with any available amateur. If he is successful he will give his story to whatever amateur he happens to work. That amateur will QSL for the message in the usual manner. Failing to raise any amateur during the scheduled period, WNP will then broadcast the message and it is up to us to get it. You see, it may be perfectly easy to copy

or by broadcast. There is included as a table a list of newspapers affiliated with the N.A.N.A. They have been instructed in regard to handling Dr. MacMillan's messages. The first thing you are to do when you receive a message is to make a legible copy of it and MAIL it IMMEDIATELY to the nearest member



Mr. MacMillan in Arctic furs, ready for a sledge trip. (Photo by Schervee).

### WNP'S SCHEDULES

—EASTERN STANDARD TIME—

- 10:00 P.M. to Midnight—WNP will QRX for press reports.
- Midnight—WNP will QRX for reports via NSS (17,000 meters).
- 1:00 A.M. to 2:59 A.M.—WNP will communicate with amateurs.
- 3:00 A.M. to 4:59 A.M.—WNP will work a special schedule.\*
- 5:00 A.M. to 7:00 A.M.—WNP will communicate with amateurs.

\*WNP will QRX on about 750 meters for special work with limited commercial stations. For example, the *Detroit News* (WWJ) will operate on this schedule.

WNP, but because of some unknown reason WNP may not hear our stations. If we amateurs fail, *if we fail during our period*, WWJ and perhaps other stations operating under limited commercial licenses will try to work WNP later the same nights. In total failure of communication after a reasonable length of time, N.A.N.A. will broadcast thru NSS (17,000 meters) at midnight the following night just what results we had.

Now, what to do when you get a message from WNP either by direct communi-

newspaper to you. This story is to be given ONLY to newspapers on this list—no others. The proper address is:

North American Newspaper Alliance,  
c/o (Insert complete name and address of the member newspaper nearest you.)

Just as soon as you have done this, mail a detailed report and copy of the message to A.R.R.L. Headquarters that we may give you due credit for your work. Be sure and advise whether the message you handled was QSL'd for by you, whether you copied it as it was being sent to an-

other station, or whether it was sent as a broadcast message. These things are important. *All amateurs are requested to report daily when hearing or working WNP, that consistent records may be kept.* A report of the successful stations will appear in *QST* each month.

#### Urgent Messages

As every precaution is being taken before the "Bowdoin" sails, a special class of mes-

sages from Dr. MacMillan. The text of such a telegram may be as follows: "Have received urgent message from MacMillan advise disposition immediately." The newspaper will then acknowledge receipt of your wire and will advise just where and how delivery of the message shall be made.

#### Logs

It is very important that you keep an accurate log of everything in connection

### Members of the North American Newspaper Alliance

The Post & Telegram,	Bridgeport, Conn.	E. G. Burkam, Journal & Herald,	Dayton, Ohio
The Times	Hartford, Conn.	The Post,	Charleston, S. C.
The Register,	New Haven, Conn.	The Banner,	Nashville, Tenn.
Republican & American,	Waterbury, Conn.	The Virginian-Pilot,	Norfolk, Va.
The Star,	Washington, D. C.	The News-Leader,	Richmond, Va.
The Sun,	Baltimore, Md.	The Gazette,	Charleston, W. Va.
Jersey Journal,	Jersey City, N. J.	The Star,	Toronto, Ont.
C. E. L. Wingate, Boston Post,	Boston, Mass.	The Star,	Montreal, Que.
The Times-Union,	Albany, N. Y.	London Advertiser,	London, Ont.
The News,	Buffalo, N. Y.	Phoenix Gazette,	Phoenix, Ariz.
The Star-Gazette,	Elmira, N. Y.	Arkansas Gazette,	Little Rock, Ark.
The Post-Standard,	Syracuse, N. Y.	Los Angeles Times,	Los Angeles
The Observer-Dispatch,	Utica, N. Y.	San Francisco Bulletin,	San Francisco
The Times-Union,	Rochester, N. Y.	Denver, Post,	Denver, Colo.
The Times,	Erie, Pa.	Idaho Statesman,	Boise, Idaho
The Bulletin,	Philadelphia, Pa.	Times Picayune,	New Orleans, La.
The Times,	Scranton, Pa.	Shreveport Journal,	Shreveport, La.
Pittsburgh Gazette-Times,	Pittsburgh, Pa.	Lincoln State Journal,	Lincoln, Neb.
New York World,	New York City	Omaha World-Herald,	Omaha, Neb.
Birmingham Age-Herald,	Birmingham, Ala.	Oklahoman & Times,	Oklahoma City
The Constitution,	Atlanta, Ga.	The Oregonian,	Portland, Ore.
The News,	Savannah, Ga.	Dallas News & Journal,	Dallas, Texas
The News,	Chicago, Ill.	El Paso Herald,	El Paso, Texas
The News,	Indianapolis, Ind.	Houston Chronicle,	Houston, Texas
Register-Tribune,	Des Moines, Iowa	Express & News,	San Antonio, Texas
The Tribune,	Sioux City, Iowa	Salt Lake Telegram,	Salt Lake City, Utah
Courier-Journal Times,	Louisville, Ky.	Seattle Times,	Seattle, Wash.
The News,	Detroit, Mich.	Spokesman-Review,	Spokane, Wash.
The Tribune,	Minneapolis, Minn.	Calgary Herald,	Calgary, Alta.
Dispatch & Press,	St. Paul, Minn.	Edmonton Journal,	Edmonton, Canada
The Star,	Kansas City, Mo.	Vancouver Province,	Vancouver, B. C.
Globe-Democrat,	St. Louis, Mo.	Victoria Colonist,	Victoria, B. C.
Times-Star,	Cincinnati, Ohio	Halifax Herald & Mail,	Halifax, N. S.
The Plain Dealer,	Cleveland, Ohio	Winnipeg Tribune,	Winnipeg, Man.

sages has been provided for bearing the prefix *URGENT*. This prefix will be used only in emergencies or unusual circumstances. While none is expected, the occasion may arise and we must be on the lookout for it. Instructions for delivery of *URGENT* messages must be observed carefully. If by any chance you should receive or copy a message bearing the prefix *URGENT*, the very *first* thing for you to do is to telephone or telegraph *IMMEDIATELY* to the nearest affiliated newspaper of the N.A.N.A. informing its office that you have received an urgent message

with hearing, working or accepting messages from WNP. Do everything you can to expedite communication and *DELIVERY* of messages falling into your hands.

#### Calls Heard Reports

Is there anybody who has to be told what to do with a list of calls heard by WNP? If so, we'd like to know that chap!

Official A.R.R.L. Broadcasting Stations will keep the gang informed weekly (Sunday and Monday 12:01 A.M. local time) as to what luck we are having with WNP.

F.H.S.



# Electric Filters

By F. S. Dellenbaugh, Jr.\*

Most things in amateur radio have gotten beyond guesswork; reliable information is available. A glaring exception is the electric wave filter—the thing we commonly call simply a “filter.” Here we depend on pure guesswork; most of our filters are worthless; our only actual designs are those given in Ballantine. We therefore present this paper as a real contribution to amateur radio. In the first installment is given elementary information regarding filters; in the second there will be shown the methods of designing filters that will meet most amateur requirements. —Technical Editor.

**T**HE term “Filter” is applied to a circuit having the ability to discriminate between electric currents or voltages of different characteristics. Usually the use of the term is restricted to circuits discriminating with respect to frequency only, in which case they are often called “wave” filters. *The simplest filter* of this type is a condenser, which is used extensively in radio hook-ups to separate direct and alternating currents. Thus if our radio frequency is 1,000,000 cycles (corresponding to a 300 meter wave) and we pass it thru a condenser of 0.001 microfarads capacity, the condenser will have a reactance of:—

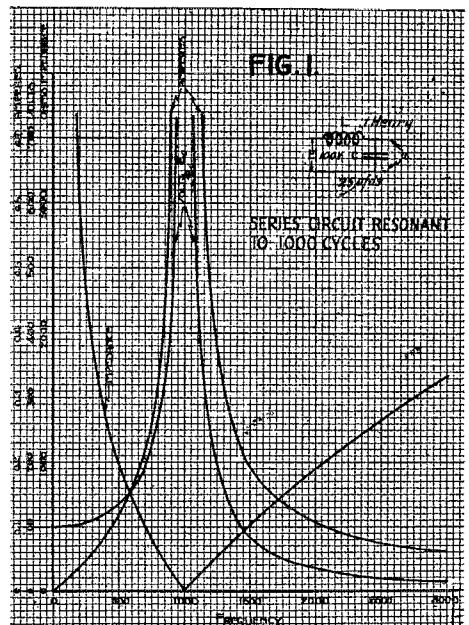
$$\frac{1}{2\pi f C} = \frac{1}{(2) (\pi) (1,000,000) (0.001) (10^{-6})}$$

159 ohms, which is quite low compared to the other resistance in most radio circuits and so has little effect upon the passage of the high frequency current. This same condenser when transmitting *audio* frequency of 1000 cycles will have 1000 times the reactance or 159,000 ohms, which will reduce the audio frequency to a small fraction of the amount that would flow if the condenser were not present. In this way fairly good separation of the audio and radio frequencies is obtained. But suppose that instead of the relatively low audio frequency we wished to get rid of another radio frequency, say a 400 meter wave, corresponding to 750,000 cycles. The condenser has a reactance of 212 ohms for this frequency, and so does not discriminate between a 300 and 400 meter wave sufficiently to be of practical use in separating one from the other.

The same argument holds true in just the reverse manner with a single inductive reverse manner with a single inductive the high reactance and the low frequencies being passed without much opposition. But still the discriminatory power exists only in a very rudimentary form and in order to obtain *good* filter action, combinations of inductance and capacity are used.

*The simplest combined filter* is the familiar resonant circuit. These circuits

are of two kinds, the series resonant circuit and the parallel resonant circuit. In the *series resonant circuit* an inductance and capacity are connected in series. If a variable-frequency voltage is impressed, the current increases with frequency up to the resonant point, after which it again dies away. If the losses are small the current may become very great at the



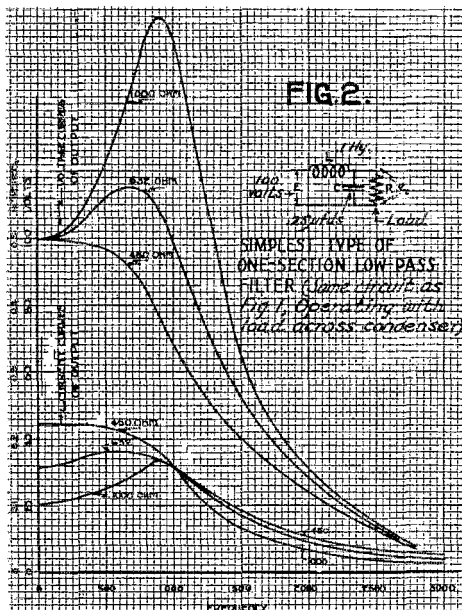
resonant point, as shown in Fig. 1. *The parallel resonant circuit* consists of a condenser and inductance connected in parallel and is identical with that used for tuning in radio receiving sets. It has somewhat opposite characteristics to the series resonant circuit. The voltage across the elements is always equal to the impressed voltage, and as the frequency rises from some low value the current entering the circuit from the power supply *decreases* until at resonance it is only enough to supply the losses. The current surging around in the closed circuit made by the two ele-

\*Dept. of Electrical Engineering, Massachusetts Institute of Technology.

ments of the resonant circuit, however, may reach very large values. Thus the series circuit will pass currents near the resonant point easily, but resists the passage of other frequencies, while the parallel circuit will resist the passage of currents close to the resonant frequency, but passes all other frequencies with relatively small loss. Combined circuits built up from the reson-

is made to use it, the voltage will fall off rapidly. If we start with a frequency far below resonance, the reactance of the inductance L is small, and that of the capacity C high; therefore, we should expect the voltage across C to start at a value approximately equal to that of the source. As the frequency is increased the current increases and the reactance of C decreases. But the current increases faster than the frequency, while the reactance of C decreases directly with the frequency, so the voltage across C will rise, reaching a maximum at the resonant frequency. After that both the current and reactance of C are decreasing, the first rapidly and the latter directly with the frequency as before, so the voltage across C drops rapidly, until at very high frequencies nearly all of the voltage of the source appears across the inductance L, which now has very high reactance, and the voltage across C falls close to zero.

Let us try this out on an actual circuit. While the amateur filter ordinarily deals with 60-cycle supply this is an inconvenient figure and we will make the discussion on the basis of a 1000-cycle resonant circuit. We will therefore say that the circuit of Fig. 1 has the following values:



ant circuits just discussed can be constructed to pass or reject a band of any desired width.

**The Series Resonant Circuit**

Figure 1 shows the characteristics of a series resonant circuit. An inductance L is connected in series with the capacity C and an input-voltage E impressed. The resonant point will be given by the usual formula:—

$$f_r = \frac{1}{2\pi \sqrt{LC}}$$

where:—

f. is the frequency at resonance in cycles per second.

L is the inductance in henries

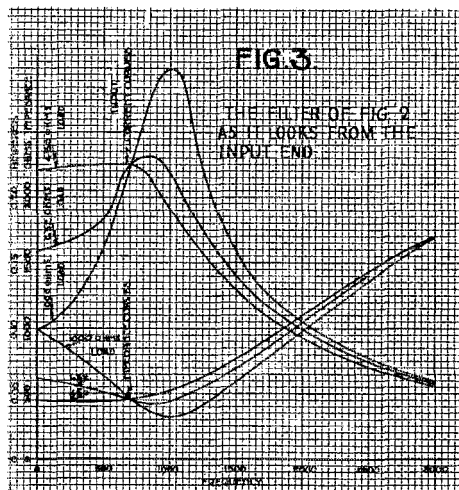
C is the capacity in farads

π is 3.1416.

The wave length in meters is given by the relation

$$\frac{300 \times 10^8}{f}$$

while the voltage across the inductance and across the capacity may be enormous in this circuit, this voltage does not represent any power, and the moment an attempt



- L=100 millihenries=0.100 henries.
- C=0.25 microfarads=0.25 × 10<sup>-6</sup> farads.
- E=100 volts.
- e<sub>c</sub>=Voltage across the condenser.
- i=Current flowing in circuit.

The resistance of an inductance of this sort wound with No. 28 B.&S. D.C.C. wire with an air core would be about 40 ohms,

but for the present it will be neglected. The reactance of a condenser is:

$$X_C = \frac{1}{2\pi f C} \tag{1}$$

in ohms, if C is in farads.

The reactance of an inductance is:— $2\pi f L$  in ohms, if L is in henries. (2)

The total impedance of the circuit will be the sum of these two, or:

$$Z = 2\pi f L - \frac{1}{2\pi f C} \tag{3}$$

The current in the circuit will be the voltage (E) divided by the impedance, which is:

$$i = \frac{E}{\left(2\pi f L - \frac{1}{2\pi f C}\right)} \tag{4}$$

The voltage across the condenser is the product of its reactance and the current which is:

$$e_c = \frac{i}{2\pi f C} \tag{5}$$

The calculated values are shown in Fig. 1.

Two assumptions have been made which cannot be realized in practice. First, the potential of the source (E) has been assumed constant. This does no harm as it would be possible to readjust it to get the same value for each frequency if desired. Second, the resistance of the resonant circuit was assumed zero, which is not true. If we take it at the probable value of 40 ohms, however, we find that the resulting curves are so nearly the same, except at the resonant point, that if they were plotted in Figure 1 the lines would run together.

**The Series Resonant Circuit Under Load —the Simplest Low-Pass Filter**

Suppose we connect a resistance of 1000 ohms across the condenser terminals. The mathematics of the circuit is complicated a little, but the ordinary theory of alternating current circuits shows that the voltage across the condenser will be given by:

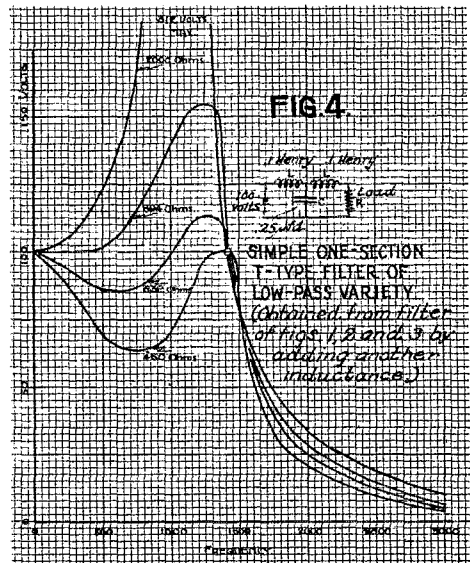
$$e_c = \frac{E}{\sqrt{\left(1 - (2\pi f)^2 LC\right)^2 + \left(\frac{2\pi f L}{R}\right)^2}} \tag{6}$$

where R is the resistance, in ohms, connected across C.

Calculating the values of  $e_c$  from this for various frequencies we obtain a curve such as the upper one of Figure 2, and as expected it is very similar to the curve  $e_c$  (volts) in Figure 1, except that the values reached at resonance (1000 cycles) are much more moderate. As a low-pass filter circuit the load of 632 ohms is obviously the best one, for the voltage across the load

rises less than ten percent between zero frequency and 1000 cycles, while at the latter value it immediately begins to fall off.

Several interesting facts can be observed from Figures 2 and 3. First, the current in the load at 1000 cycles, the resonant frequency, remains the same no matter what the load resistance may be. This peculiarity enters into all filter circuits in various ways. It has also been



proposed by Steinmetz and others as a method of constant-voltage to constant-current transformation. From Figure 3, it is also seen that at 707 cycles, which is the resonant point divided by  $\sqrt{2}$ , the input current and the total circuit impedance will be constant regardless of the value of the load resistance.

Thus we have developed a filter circuit with the peculiar properties of transmitting current below a certain frequency, and then increasing its resistance to the flow of current for further increase of frequency. This type is known as a low pass filter. This filter is very valuable particularly where the supply consists of a direct current with superimposed alternating current which can be wiped out, leaving the direct current only. It is also valuable where the source of supply consists of alternations of a fundamental frequency with superimposed harmonics of higher order, which can be wiped out by a circuit of this sort leaving the tone pure, or the alternations of one frequency only.

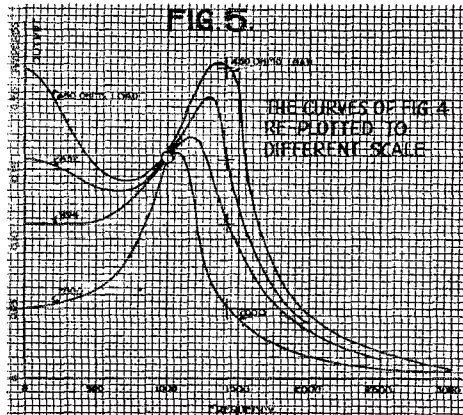
**Single Section Filter Characteristics**

The discussion of filters can be presented from several points of view, but usually the circuit is such that approxi-

mately constant voltage is applied to the beginning of the filter. Then the thing we are interested in is the current in the load or perhaps the voltage across the load, as the two are related by the resistance of the load, in accordance with Ohm's Law. Therefore in this discussion the usual method of dealing with attenuation has been abandoned and the results given directly in terms of current and voltage at the load for constant voltage applied at the beginning of the filter.

**The "T" Type of Filter**

The circuit described above (even tho it is better than a single condenser or inductance) does not give a very sharp separation of frequencies. It seems as though an inductance in series with the load R should aid in reducing the current at high frequencies—in other words, should improve the filtering action. Fig. 4 shows the effect of adding such another inductance. We see that there really is a much more rapid reduction in the output-voltage at higher frequencies but that the "cut-off" (at which the output voltage begins to drop below the input voltage) has been moved out from 1000 cycles to 1414

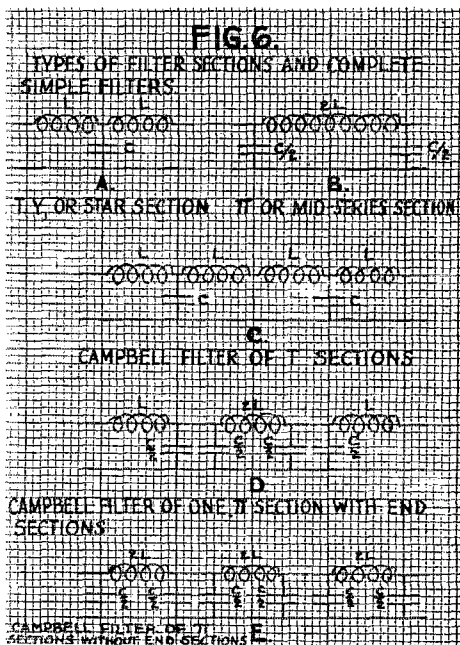


cycles. This is the original resonant frequency multiplied by  $\sqrt{2}$ . Because these curves ran into each other they are replotted to a different scale in Fig. 5 by dividing the previous voltage scale by the load resistance. Comparing these new curves of Fig. 5 with the ones of Fig. 2 we see that again the current in the load is constant at 1000 cycles, regardless of the load resistance, and that the current at 1414 cycles is always equal to the current that we would have with D.C. supply. 894 ohms is found to be the smallest load resistance that can be used and still have the current in the load, for frequencies below the cut-off, either equal to or greater than the current that would flow if the

filter were absent. This is typical of all filter circuits as will be shown by further curves.

**Types of Filter Sections**

The circuit just discussed and shown again in Fig 6A is called a "T section" of filter. Two of these sections may be con-



nected in series as shown in Figure 6-C, which will give sharper cut-off. Figure 6-C may be rearranged as in Figure 6-D. This is similar to the filter circuits shown in QST for October, 1922, and consists of a resonant circuit in the middle with special "end circuits." We can, if desired, leave off the special end circuits and put several of the resonant circuits together as shown in Figure 6-E.

**The Filter Under Ideal Conditions**

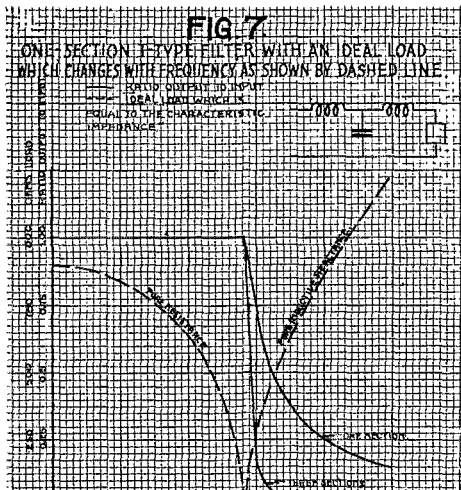
The full line curve of Figure 7 shows the ideal curve of transmission efficiency of a one-section and a three-section filter of the T type. It will be seen that below the cut-off frequency the current passes right thru as though the filter were not there. These ideal conditions can never be obtained. There must be losses in the inductance and the capacities and these effect the result slightly. The chief stumbling block, however, is that the "ideal conditions" assume that we have an "ideal load" which has the curious property of being exactly equal at all frequencies to the "characteristic impedance" of the filter. This characteristic impedance is not the ordinary impedance but a special value ar-

rived at from the mathematics of transmission lines. It is independent of the number of sections in the filter and depends on the inductance and capacity used in one section. Obviously it is not possible to design any load (except another filter section) which will have these peculiar characteristics. Accordingly we can never actually get the flat top and sharp cutoff as shown in Fig. 7.

We have already seen from Figure 4 that the best load was an 894-ohm resistance and it is seen that this is the value of the *characteristic impedance of the filter at zero frequency*. The expression for the characteristic impedance at zero frequency is:

$$Z_0 = \frac{2L}{C} \quad (\text{at zero frequency}) \quad (7)$$

for the type of filter being considered, and for the values of  $L=0.10$  henries and  $C=0.25$  microfarads, this gives the value



of 894 ohms. This is our first requirement in filter design.

**The Filter Under Actual Conditions**

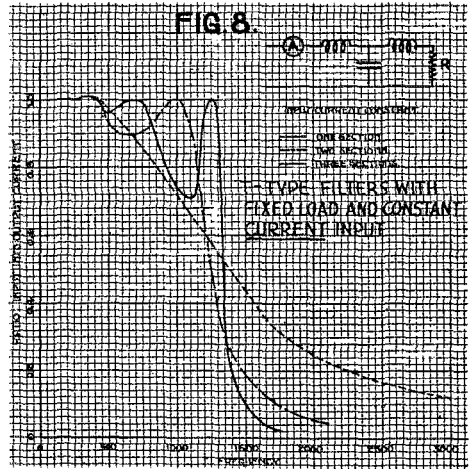
In comparison with the ideal curves of Figure 7, we have the actual curves of Figure 8 and 9.\* One section is seen to give very poor results under these conditions, but as more sections are added the drop of current after cut-off becomes very rapid. However, there are always bumps in the current transmission below cut-off, and the number of these bumps is always equal to the number of sections in the filter. We also see that as more sections are added the drop in current after

\*These actual curves are calculated values for filters without loss, and with the load of 894 ohms resistance. While still theoretical curves, enough test work has been done to be assured that the actual results will be very close to the calculated values.

the cut-off point becomes much more rapid. Also the bumps nearest the cut-off frequency are always the largest, and so in designing a filter it is desirable to avoid distortion by having the cut-off frequency removed as far as possible from any of the frequencies it is desired to transmit.

**Effect of Resistance in Power Supply**

From Figure 8 and 9 it was seen that the bumps during the transmitting range



of the filter cause a decrease in current for the constant current case and an increase in current for the constant voltage case. From this it might seem as though smooth transmission would be obtained with a circuit part way between constant current and constant voltage. In fact this is what usually happens, the source of power falling off in voltage as the current increases.

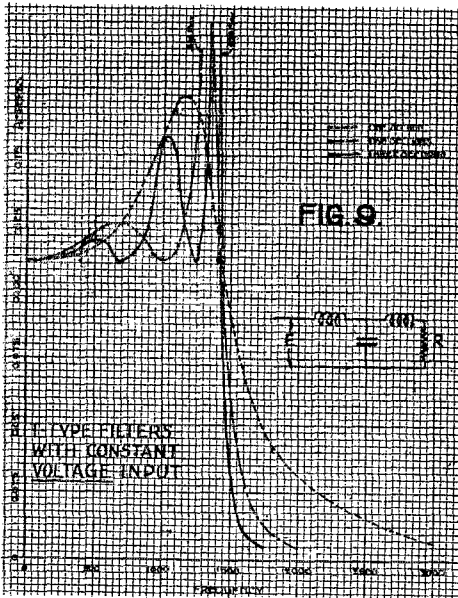
Figure 11 shows the results with a resistance in the power end. It will be seen that the bumps are still present. An increase in the load resistance tends to make all of the bumps of more or less uniform height. Thus fortunately the conditions to be expected in an actual circuit help to prevent distortion. If the resistance is increased above 894 ohms it reduces the cut-off point and spoils the sharpness of the filter action. If we were interested in frequencies between 500 and 1200 cycles, 894 ohms resistance in both load and source would result in the filter being as free as possible from distortion. Thus in general it is desirable to have the filter designed so that

$$\sqrt{\frac{2L}{C}}$$

has a value approximately the same as the resistance of both the load and the source of power. This is the second requirement of filter design.

**Effect of Losses in the Filter Circuit**

So far the filter circuits discussed have been assumed to be free from losses. Of course this cannot be obtained in actual



of poor transmission and as this is not as satisfactory as points of better transmission as obtained with the T type, it may be said that in general the T type of filter section is preferable to the  $\pi$  type. This curve is calculated for a constant-voltage circuit, and if a constant-current circuit is used it will be found that the peaks reverse as they did before. For constant-current circuits a  $\pi$  type filter will be better and for constant-voltage circuits a T type filter will be better. This cannot be interpreted too literally as there are other factors to be considered, but makes a good general rule.

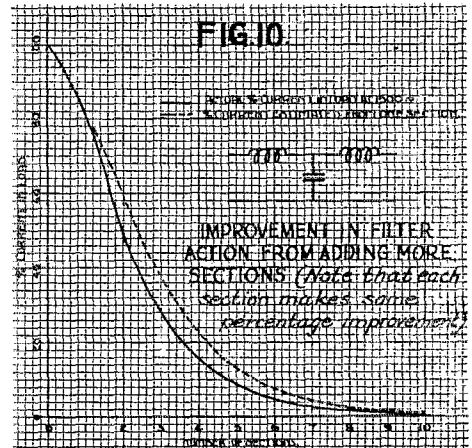
**High Pass Filters**

Instead of taking the voltage across the condenser of the series resonant circuit and applying it to the load resistance (or the next filter section), as has been done in all of our filters so far, it would be possible to take the voltage across the inductance instead. We should expect the same general character of results except that they should be reversed with respect to frequency, and this is what actually happens. If we look at the curves already shown and consider that the frequency increases from right to left instead of left to right we will get a very close approximation to the curves that would be obtained by actually calculating the conditions. This

filters, and so Figure 12 has been calculated to show the effect of resistance and leakage losses. Each inductance is assumed to have a resistance of  $r$ , and each condenser to have a loss  $G$  such that the phase angle is  $89^\circ$ . It will be noted that the losses in the filter have very little effect upon the falling off of current after cut-off has been passed, and that they tend to smooth out the bumps during the transmission part of the curve, particularly at frequencies near the cut-off value. The values used in Figure 12 can easily be obtained in practice.

**Differences Between T and  $\pi$  Type Filters**

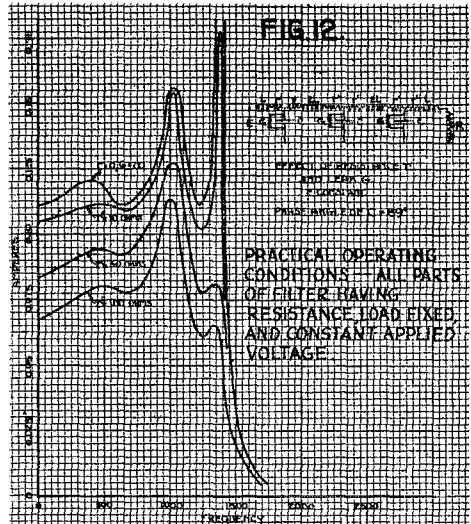
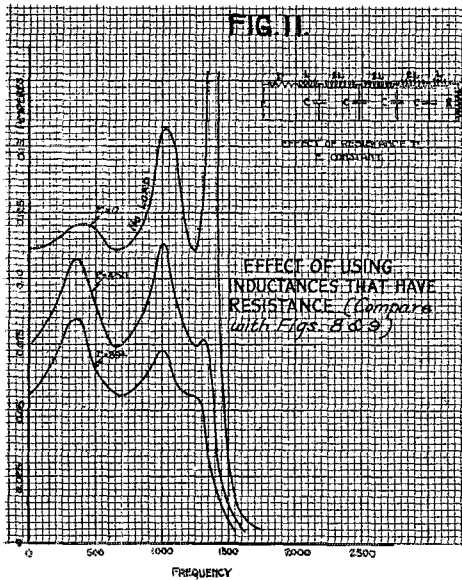
The circuits considered thus far have been all of one type; namely, that shown in Figure 6-A. If the filter could be operated under the ideal conditions discussed under Figure 7, it would not matter whether this circuit or that of Figure 6-B were used, both giving similar results. Practically, however, it does make a difference, and the curves of Figure 13 show the results obtained with a three-section filter of the type of Figure 6-B having the same constant and cut-off as the previous filters. A constant input voltage is assumed exactly as in Fig. 9 for the T filter. If this curve is compared with Figure 9 it will be seen that it is similar except that the bumps during the transmission part are reversed. Thus there will be points



is fairly obvious, since the voltage across the inductance at zero frequency will be zero, and then will rise slowly until the resonant point is approached, when it will increase rapidly to approximately the same value as the impressed voltage and remain more or less constant for any further increase in frequency. The same formula can be used for calculating the resonant or cut-off frequency, and the load resistance should be adjusted to the filter constants in the same way. As this type of filter transmits very poorly at all frequencies

below the cut-off value and transmits very well at all frequencies above the cut-off value, it is called a *high pass filter*. Figure 14 shows a T type high-pass filter of the same cut-off value, with constant voltage impressed, connected to the same resistance load of 894 ohms. Comparing it with the three section curve of Figure 9 it will be found to be similar except turned around the other way. The bumps are also spread out some, since they now extend from cut-off to infinity instead of from zero to cut-off frequency. Thus the third bump is off-scale as plotted and will be very flat due to being stretched out in the direction of the frequency scale. The high-pass T- and

This type is called a "band-elimination" filter. In these band filters it is not always necessary to have both inductance and capacity in all the branches of the circuit.



If they are all present as shown in Figures 15-D and -E it is possible to so proportion the different constants that two bands will result, separated by any desired amount.

**Summary of Filter Characteristics**

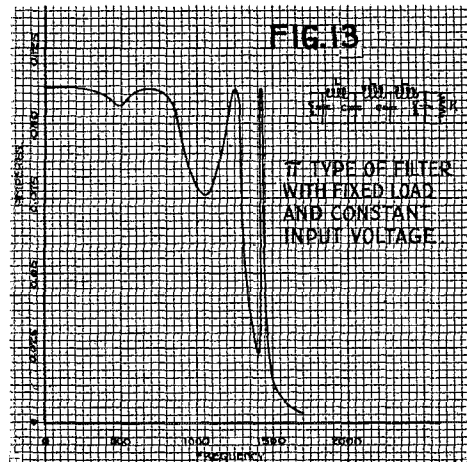
1. The behavior of the combinations of inductances and capacities in what are called "filter circuits" can be explained

$\pi$ -section filter circuits are shown in Figures 15-A and -B.

**Band Filters**

If a low-pass filter of 2000-cycle cut-off were connected to a high-pass filter of 1000-cycle cut-off, and then to the load, it is evident that below 1000 cycles nothing could get through due to the second (high-pass) filter, and above 2000 cycles nothing can get thru due to the first (low-pass) filter. Therefore the frequencies transmitted are limited to those lying between 1000 and 2000 cycles. This combination is called a "band-pass" filter. A circuit of this sort made up of two  $\pi$  section filters is shown in Figure 15-C. It is not necessary to make separate filters, but the different parts can be combined into one filter section, as shown in Figure 15-D, and the same results will be obtained. This may also be made with two T-section filters in the same way.

By inverting the band-pass filter the filter shown in Figure 15-E is obtained.



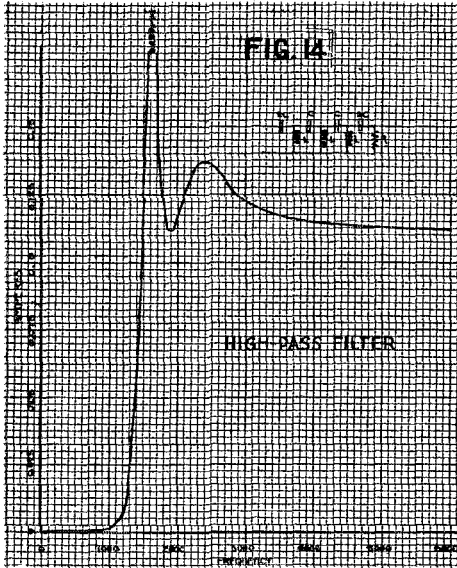
from the consideration of the characteristics of simple resonant circuits.

2. Filter circuits can be made to have four different types of characteristics:

- A—Low-pass filters.
- B—High-pass filters.

- C—Band-pass filters.
- D—Band-elimination filters.

3. Under ideal conditions current will pass thru the filter circuits without change in magnitude of the frequencies *within* the transmitting range and will be reduced to a very small part of the normal current at frequencies *outside* the transmitting range. The current is never reduced entirely to zero at any frequency.



4. The ideal conditions can never be attained in practice, with the results that a certain amount of distortion is introduced by the characteristics of the filter throughout the transmitting range, but outside the cut-off frequencies the current is reduced very nearly the same as in the ideal case. The distortion is worse near the cut-off frequencies, but is reduced by losses in the filter circuit.

5. The characteristics of the filter are very greatly affected by the load and by the characteristics of the source of power. There is always one best load for any given filter, or, if the load is fixed, the filter can be designed to meet the particular load conditions. But a filter which operates well in one circuit may operate very poorly in another. The best load is a pure resistance, and loads having reactance or resonant characteristics will upset the filter characteristics very much.

6. Filter sections may be of two general types known as the T and  $\pi$  types. In general the first is better for circuits of approximately constant voltage and the second is better for circuits of approximately constant current. When more than one section is used the main part of the com-

bined filter is the same in either case and the type used only affects the end branches. It should be noted that *the terminal unit of any multi-section filter is always different from the value of the units within the body of the filter.* Thus:—

A—T type low-pass filter. The end inductance are  $\frac{1}{2}$  the inductance used in the repeating sections, since this latter is the sum of two section inductances.

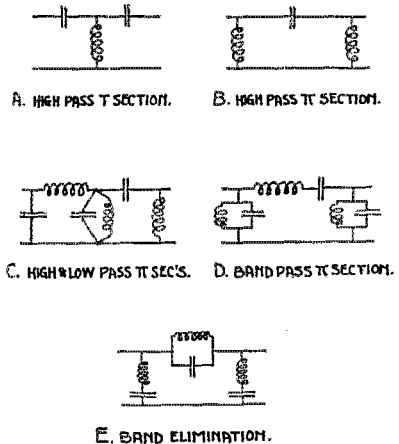
B— $\pi$  type low-pass filter. The end capacities are  $\frac{1}{2}$  the capacity used in the repeating sections for the same reason as A.

C—T type high-pass filter. The end capacity is twice the capacity used in the repeating sections, since the latter is the sum of two section capacities in series.

D— $\pi$  type high pass filter. The end inductance is twice the inductance used in the repeating sections, since the latter is the sum of two section inductances in parallel.

7. Increasing the number of sections is useful since it causes more rapid decrease in current in passing thru the cut-off frequencies. If the decrease in current for one section is known at any given frequency, it can be estimated for any number of sections by assuming that each succeeding section reduces the current reach-

FIG. 15



ing it by the same amount as the first section. The actual reduction of current will usually be more than the amount estimated in this way.

8. Within the transmitting range the current will very somewhat with frequency, having several high and several low points. *The number of these high and low points will always be equal to the number of sections used in the filter.* The magnitude will depend upon the load, the type of filter, and the losses in the filter

(Continued on page 31)



## Rotten Rectifiers

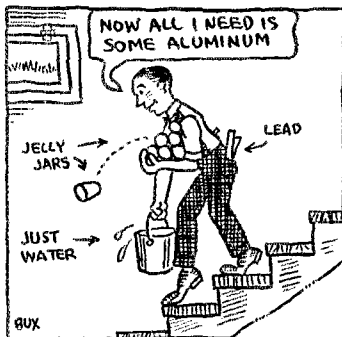
By The Old Man.

Only the Secretary of the League can write a proper introduction for the Old Man, because no one else in these diggings is sure of the O.M.'s identity. But the Secretary is busy with affairs of state this A.M. so I am batting for him, not guaranteeing any home runs.

Most of the members of A.R.R.L. know what a Wouff Hong is, a large number suspect what a Retytsnitch may be, very very few can explain the uses of a Bliffsky, and only a handful can explain the two great mysteries—the reason why all interference is blamed on the amateur and the location and identity of the Old Man. The O.M. thrives on mystery, he flees from publicity, and in spite of this is a good ham, plugging along the rocky path of the amateur and falling over the usual number of troubles. Whenever he falls harder than usual he is inspired to write a story telling us what is rotten about that particular thing. —“LQ”

**W**HILE waiting for ten-thirty to come around, and another Quiet Hour to pass down into history, I will take the opportunity to pass a few polite comments upon that wonderful and fearful bit of electrical machinery known to science as the “Chemical Rectifier.” To those who have come down from early days in Amateur Radio, there is a condition of affairs recognized as “Rotten Construction.” In the course of my long and dusty career, I have seen much of this type of construction. I have beheld annunciator wire carrying fifteen amperes, and frying out the fat and dripping it around and smoking up the place so that it smelled like a soap-rendering establishment; and I have seen house wiring designed and installed to carry a load of four sixteen-candle-power incandescent lamps which had to be fused with 25-ampere fuses; I have seen high-tension wiring pinned up with pins and propped up with bits of wood so that a deepdrawn sigh was sufficient to jar something loose and set off the entire works in a blinding flash.

And now enters the scene the new tempter—The Chemical Rectifier. It was borne of the desire to get from an A.C. supply something that at least had relationship to D.C. The Vacuum tube hankered for a D.C. supply. *QST* had inspired us all to go



down cellar and build a chemical rectifier, and quit this bum A.C.-on-the-plate business.

When an amateur starts to build something, it is one of the prerequisites that it

shall be completed in approximately seventy-five minutes elapsed time. Thirty minutes is better, but things are becoming complicated these days and more time has been recognized as necessary. Cases have been known where as much as an hour and fifty minutes have been consumed in the building of a single unit of an amateur transmitting station. This is very exceptional, however, and arouses suspicion.

In the construction of a chemical rectifier, as with other amateur apparatus, the raw materials are limited to those that may be found in the usual well regulated kitchen, pantry, or garret. *QST* advised that it was healthful to limit the voltage per cell to around fifty. 2000 volts A.C. from a plate transformer figured out as requiring forty cells. But it so happens that mother usually sports something like eighteen jelly jars that are not working. So the number of jars in the rectifier becomes eighteen. When it came to the aluminum, *QST* warns us that it must be absolutely double distilled and chemically pure stuff. The material that came from the old automobile body down at the garage must be chemically pure or it would not have been used in an automobile. So this constitutes the material for the aluminum electrodes except in the cases where the aluminum turned out to be zinc (Note, aluminum can't be made of zinc), in which event some aluminum wire is borrowed or otherwise acquired.

The authorities are united on the subject of distilled water. But this type of water costs money and takes time to procure; so the stuff that comes out of the tap and looks pretty good and tastes pretty fair is adopted. The authorities also are said to have joined hands on the subject of borax, but mother usually has what seems to be a satisfactory quantity of the Twenty Mult Team brand upon the top shelf, and if it would kill ants in the pantry, it ought certainly to kill the reverse phase of the kind of A.C. current the electric light company dispenses. And so, with the assistance of an old bit of lead pipe which had been flattened out, and sliced up, a chemical rectifier comes into being, and is hooked up to the business end of a plate transformer.

I have seen quite a few of these rectifiers in operation in various amateur stations. The jelly jar is the favorite type. We frequently meet the milk bottle type, however. The latter is rather attractive when the bottles are clean and shiny and arranged in a wooden box. I am not partial, however, to the construction which consists of a five-foot board balanced upon a chair, and anywhere from twenty to forty jelly jars strung out on the board. One has to be too precise in one's movements, and one cannot permit cats, dogs, or children to lean upon the far end of the board. Neither am I partial to miscellaneous bits of lead which have seen better days, being twisted about an aluminum wire. The contact seems too vicarious, if this term is permissible in amateur radio literature. My soul yearns for something tight in such cases.

When it comes to insuring the separation at all times and under all circumstances of the lead electrodes and the aluminum electrodes, I am also impressed by the sublime confidence exhibited by many of us. Simply hanging two bits of metal down into a jelly jar three-quarters full of borax solution, and asking some thirty or forty of these jars to co-operate with each other and also with the owner of the station, strikes an old crab like me as tending toward the haphazard. Again, I like to see things battened down tight where they will stay even though somebody does move suddenly. Of course I know that the argument is that if two electrodes get together, it only means cutting out that one jar, or giving the fellow the dit-dah-dit-dit-dit signal and reaching down and fixing the rebellious electrodes. The trouble however, is that in reaching down to fix one thing in such a station, one is very apt to unfix about fifteen other things. Frequently all of the fifteen are not known to the operator, who only fixes a dozen or so of them, with the result that when he presses the key the next time a conflagration breaks out.

I took a crack at this chemical rectifier business myself after some ten months deliberating over the subject, and although I made every effort to build things right I had a lot of trouble. I happened to meet Fred Schnell about the time I was making up my mind, and I had a long talk with him. He stood out solid for everything *QST* had said about chemically pure aluminum, voltage per cell, and distilled water, and so alarmed me that I stuck religiously to all three. I went over to the Dairy Company and aroused the deep suspicion of the manager by buying forty-eight pint milk jars. He watched me out of sight as I drove away with them. I had some honest-to-goodness aluminum in the cellar, and I bought some one-eighth inch sheet lead. I also bought a half keg of real borax and ten gallons of distilled water.

I wanted to have enough. I suppose it took ten hours of high priced time to transform this collection of material into a real business-like rectifier, all nicely assembled in a mahogany box.

Consulting *QST* on Rectifiers again, I decided the thing needed a charge, so I put it on all night at what I thought was a low rate. Here was mistake Nr. 1. Something got hot during the night, and when I went down in the morning, my fine rectifier looked as though it had been used as a garbage receptacle for several months. Dirty borax salt encrusted everything from end to end, and about half an inch of a vile looking liquid reposed in the bottom of each bottle. All the aluminum had about a quarter of an inch of nasty borax salt baked on hard. A cold chisel and a hammer had little effect upon it.

What happened during the night to run the current up, I do not know, but the lesson I do know. It is, forget the forming business altogether. Simply make the rectifier and put it to work.

After easing off my emotions with a copious flow of good old sea-faring Eng-



lish, I rebuilt my rectifier, putting in new aluminum electrodes and swabbing things up generally. Cutting out the forming, I connected it right into the set and went to work. For the time being, I left out the filter.

After a few nights working DX, I made the discovery that certain jars sparkled pretty well. Taking down that old April, 1922, *QST* again I noted that this was a bad sign. Not wanting to risk anything that would require building the thing over again for the third time, I began cutting out the sparklers and putting in new solution and new aluminum. I kept cutting out and putting in new, until the job got to be the big thing in my daily life. After a while it began to dawn upon me that I had just about rebuilt the rectifier all over for the third time and yet the sparkling was steadily gaining upon me. Then I tumbled. It was evident that I was busily engaged in cutting out the *good*

cells and keeping in the *poor* ones. Poor cells did not rectify, and hence they did not sparkle. Good cells did rectify and, being over-loaded, they sparkled.

This called for some more old English, causing Kitty to hastily seek other scenes and the little wife to expostulate a bit above average. Some of the pile of cast-off aluminum electrodes were recalled to the colors, and a voltmeter made use of to determine the dud cells. The ones which did *not* sparkle were gradually replaced and each time one of these was turned into a sparkler, the *general* sparkling became lessened.

Things now went forward apace, and in a short time I had a rectifier that gently glowed the prescribed QST blue-glow all over on twenty-five hundred volts. It was a good rectifier, just as old Betsy was a good spark gap, and I believe it will stay with me for a long time to come.

Then it became necessary to consider the filter business. Some elephantine inductances were obtained and what seemed like a king's ransom was laid out for a carload, more or less, of those one Mike paper condensers that come in the square tin cans. These were supposed to stand 1500 volts. In order to hold my 2500 volts it meant two of these condensers in series in order to get even a half Mike capacity. In order to get some real he-capacity, I found that it took quite a little working capital. But we found the capital, and put in the condensers. My thermo-ammeter jumped up over half an ampere when I put this big capacity across the line.

My sixty-cycle hum still persisted in nearby receivers, and at this date I am figuring on one of Goldberg's filters as shown in April, 1923, QST. If I can

make it work, there will be at least one amateur station in this country with a non-interfering D.C. plate supply that comes out of a chemical rectifier. You other ginks will have to show me that it is not the only one in the world.

The next thing on the program is some kind of an electrical sponge which will sop up the pulses made by a key when it makes and breaks. If that can be fixed, then I am going to ask somebody something pertinent about this Quiet Hour stuff. What's the necessity of making me quit transmitting if my transmitter is inaudible on all wave lengths but my own?

Even as things stand today, I am inaudible in 99.9999999% of the country. It is only in those few stations that are within a few rods of my house that my transmitter can be held even with those single circuit things they *call* tuners. What kind of a think-tank must the guy have who wants to impose compulsory quiet hours, anyway? I wonder if he ever had a pair of phones on his poor bean. Doesn't he know that a lot of the broadcasting only begins at eleven P.M. and that the big doings are mostly after midnight? Of what use is it to the Night Hawks, the Boiled Owls, the Hoot Owls, and all the other late sitters to have amateur radio quiet between seven and eleven? Not one bit. I say, let them leave it to our A.R.R.L. voluntary lid. Then we will have amateur co-operation instead of amateur boot-legging. Then let us amateurs get busy and find how to make our C.W. quiet on all waves but our own, and there will not have to be any quiet hours, and the good old days will have come back.

Well, son, it's long past ten-thirty, and here goes for some DX.

CUAGN OM 73 GN

The Old Man.

## Some Tuners That Work Below 200 Meters

By A. L. Budlong \*

No experienced amateur attempts good 200 meter transmission with a sending set designed for 600 meter work—if he has such a set he chops off the extra helix turns and shortens up the leads. Is it not just as foolish to expect good AMATEUR reception from a tuner that reaches up to 800 meters? Don't be too satisfied with your tuner; try making a REAL amateur tuner, one that goes from 260 meters on DOWN.

**I**N the following article no attempt is made to give the design of a theoretically perfect 100-meter receiver. Rather it is intended only to give the results of some experiments and from these results to leave it to the individual as to the circuit to be used.

### Antenna

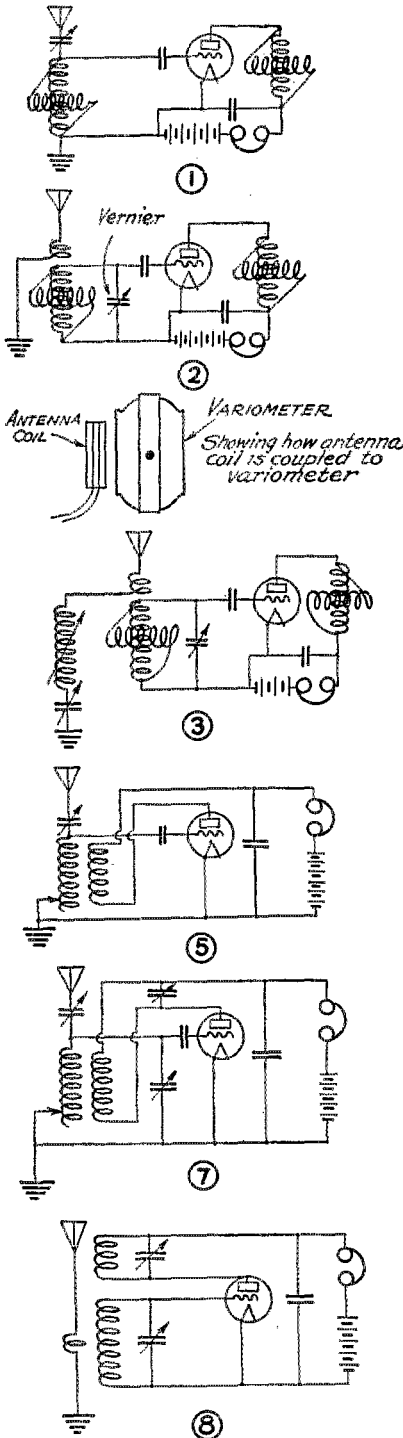
A forty-two foot single wire, thirty-five

feet above a tin roof at the high end, coming down to ten feet high at the low end, and with a twenty foot lead-in, was used. The tin roof was used as a ground, the ground lead being about twelve feet long.

### Circuit

*Set No. 1.* This is a variometer set adapted for 100-meter work. The variometers were Atwater-Kents, with the rotors and stators in each variometer con-

\*1727 First St., N.W., Washington, D. C.



nected in *parallel*, instead of in series. A single-circuit hook-up was used with a three-plate vernier as the series condenser. This set worked very nicely over a range from about 90 meters to 250, and oscillated quite freely over the entire range. Some difficulty was encountered in making the set percolate on 90 meters, however. At this wave the plate variometer was at minimum, although the tuning variometer still had four or five degrees of scale to go down. A UV-201, one of the new DeForest tubes, a VT-1, and an Audiotron all gave good results with this set, the UV-201 and the VT-1 being the best when it came to 100 meters, however. By placing a .00025 fixed condenser around the plate and tuning variometers the set gave good results up to about 600 meters, but with the condensers in place the set would not oscillate below about 340 meters. For this reason I think it would be better to shunt the variometers with a .0001 condenser when it is desired to hear the broadcasters. This size will probably be sufficient to take the set up above 400, and will make oscillation somewhat easier on the lower waves, when the condensers are in the circuit.

Set No. 2 is No. 1 with the addition of untuned primary consisting of two turns of No. 20 S.C.C. placed at one end of the tuning variometer. The vernier condenser was shunted across the variometer. Except for the possibility of sharper tuning, no differences were noted. The tuning range of the variometer in the secondary circuit was still about 90 to 250. Oscillation was easily secured with all four kind of tubes. Signal strength about the same.

Set No. 3 is No. 2 with the addition of an antenna loading inductance—not coupled to the secondary variometer—and a .0005 variable antenna series capacity. Results were a noticeable increase in signal strength over No. 2, and some increase over No. 1. Tuning was very sharp. This was the best yet. It might be well to say here that when operating the set around 100 meters, and trying to find resonance in the primary circuit, one should have the tube *just* oscillating, and then when the primary circuit is tuned to resonance the familiar zero beat phenomena will be noticed. But if the tube is well over into the stage of oscillation, or anywhere except on the critical edge—if you want to call it that—you can tune with the primary condenser forever and never find resonance. In this respect the operation of the set, or any other three-circuit tuner, is much more critical on 100 meters than we are accustomed to when working on 200 or above.

Set No. 4. This was No. 3 with the entire primary coupled to the secondary with about three-inch coupling. No differences were noticeable between this and No. 3. Personally, I prefer No. 3, but this is more prejudice than anything else. The

results and operation of the two were the same to all intents and purposes.

*Set No. 5.* Here we changed our method of attack, and used a variocoupler with a primary consisting of 56 turns No. 22 S.C.C. and a diameter of 4 inches. The rotor had 30 turns on a standard 3½ inch ball. A single circuit was again used with the vernier condenser acting as the series condenser. This set was an excellent oscillator all the way down to 100 meters, and a shade under that. The rotor however, was too large. When tuning to 100 meters, 14 turns were used in the primary inductance and about half of the series condenser. The maximum wave length with all 56 turns in use was barely high enough—about 235 meters.

*Set No. 6.* This was No. 5 with half of the tickler winding removed, and seemed to be just what was wanted. The set oscillated with a VT-1 and UV-201 with but six turns in the primary. Pittsburgh's (i.e., KDKA) 100-meter wave came in nicely with seven turns and most of the condenser in, so I imagine the low point is in the neighborhood of 35 or 40 meters. However, the tickler proved to be a little small for 200 meters and up.

*Set No. 7.* This was merely No. 6 with a .0005 variable across the tickler and a .00025 variable across the tuning inductance. This set is a sure-enough kicker, going from, say, 40 meters to 450. The variable across the tickler gave oscillations very easily over the entire upper range, from 200 up, and it was merely left at minimum when it was desired to work the lower waves. With the addition of .0005 variable across the tuning inductance, instead of the .00025, 600 meters should be secured easily. All the tubes functioned and no trouble was experienced in getting the set to percolate.

*Set No. 8* is No. 7 with the two-turn primary, which was simply wound on top of the primary of the variocoupler at the "low" end; the primary of the coupler then being used as a secondary. There is nothing to recommend about this circuit, in my opinion, and I prefer No. 7.

*Set No. 9* is No. 8 with the addition of the primary load and series antenna condenser. This proved a very fine circuit, but I see no reason why No. 7, the single circuit, will not afford sufficient sharpness of tuning. No. 9 is noticeably sharper on the broadcasts, however.

*Set No. 10.* This was Set No. 7 with the tickler disconnected and a tuned plate used, instead. Forty turns on a four-inch tube, tapped at the 5th, 10th, 20th, 30th, and 40th turns, the whole shunted by a .0005 variable comprised the plate inductance. This worked very nicely on all the variocoupler hook-ups mentioned, and went down to 60 meters without trouble. However, I think the tickler hook-ups are pre-

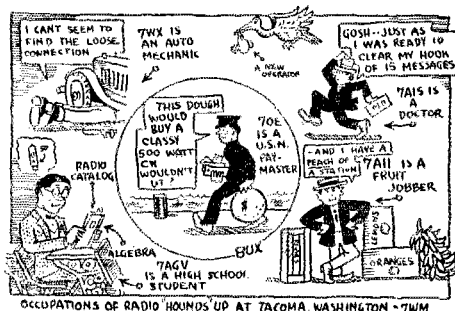
ferable to a tuned plate on the lower waves. Take your choice.

### Summary

Looking back, we find the tickler slightly more desirable than the tuned plate, and a single circuit satisfying the requirements of a 100-meter set very nicely. As a starter, I suggest a single-circuit tickler hook-up, with a primary of 60 turns on a 4-inch tube, tapped at the 5th, 6th, 10th, 20th, 30th, 40th, 50th, and 60th turns, and a tickler of 20 turns on a 3½" ball; three-plate vernier for a series condenser, and .001 across phones and B battery. This should give good results between 45 and 260 on the average antenna, I think. If a larger series condenser is used the taps on the coil, after the 10th turn, can be more than ten turns apart, but a vernier is almost a necessity in the set, and I like to use it as the series capacity and thereby eliminate one condenser. However, antenna conditions differ, and it won't hurt to experiment with the series capacity.

If the broadcast wave lengths are desired, have a .00025 fixed condenser to switch in across the tuning inductance, and perhaps a .00025 fixed or variable across the tickler. Hard tubes seem to be more desirable on the low waves than soft. As for the antenna, you will undoubtedly use the one you now have, but I am going to cut mine down to a 25-foot single wire.

In closing, let me give an instance of one thing that at least appears to be convincing proof of the efficiency of the low waves. Pittsburgh now transmits on 100 meter simultaneously with their 360-meter transmission, and every time for the last month that I have listened for Pittsburgh here in Washington, during daylight, the 100-meter wave has come through with at least twice the audibility of the 360 meter wave, and on several occasions has been easily readable on one step audio when the higher wave could not be received at all, except for a faint carrier wave. Try it yourself. Perhaps short waves will be the solution of daylight transmission.



OCCUPATIONS OF RADIO HOUNDS UP AT TACOMA, WASHINGTON - 7MM

## U.S. Will Send Standard Waves for A.R.R.L.

In response to our request the Radio Section of the Bureau of Standards has arranged some schedules on which standard waves that fall within the amateur range will be sent with a powerful tube set. Every amateur should take advantage of this chance to cure the present uncertainty as to wave lengths.—Editor.

**D**URING the months of July to October inclusive there will be sent from station WWV, Radio Section of the Bureau of Standards at Washington, D.C., some special signals for the purpose of allowing all within the station's range to calibrate wavemeters and receiving sets. Altho Washington is anything but a centrally located point, the equipment at WWV recently installed by friend H. J. Walls has been reaching out so well that the west coast will have a good chance of using some of the signals. Even the longer waves, on which radiation is less effective, have been received in excellent fashion half way across, communication with Minnesota University is very reliable, and we know from experience that a schedule is a great help in finding a new station.

### How to Use the Signals

Information as to ways of using standard wave lengths to calibrate a wavemeter may be found in the article "Laboratory Oscillators" in *QST* for May, 1923\*, page 47. It is only necessary to regard the receiving set as taking the place of the circuit "WM" and the new wavemeter that is to be calibrated as occupying the place of "X." The receiving set is tuned to the incoming standard wave from WWV. The receiving set is tuned to the signal and the rest of the procedure carried out as stated in the article. Since WWV does not send very long it will be well to mark the settings of the tuning condensers and all other adjustments of the tuner. Later, when WWV is finished with sending, the process can be carried out as suggested above. All

Eastern Standard Time	Signal	Wave length in Meters	(Kilocycles)
11:00 to 11:04 p.m.	General Call (i.e., "QST")	705	(425)
11:04 to 11:08 p.m.	Test		
11:08 to 11:11 p.m.	Announcements by key & voice		
11:15 to 11:19 p.m.	General Call	600	(500)
11:19 to 11:23 p.m.	Test		
11:23 to 11:26 p.m.	Announcements		
11:30 to 11:34 p.m.	General Call	450	(666)
11:34 to 11:38 p.m.	Test		
11:38 to 11:41 p.m.	Announcements		
11:45 to 11:49 p.m.	General Call	352	(852)
11:49 to 11:53 p.m.	Test		
11:53 to 11:56 p.m.	Announcements		
12:00 to 12:04 p.m.	General Call	300	(1000)
12:04 to 12:08 p.m.	Test		
12:08 to 12:11 a.m.	Announcements		
12:15 to 12:19 a.m.	General Call	240	(1250)
12:19 to 12:23 a.m.	Test		
12:23 to 12:26 a.m.	Announcements		
12:30 to 12:34 a.m.	General Call	200	(1500)
12:34 to 12:38 a.m.	Test		
12:38 to 12:41 a.m.	Announcements and finish		

Later schedules will be entirely in the amateur wave-band.

### The Sending Set

The set at WWV employs a 50-watt master oscillator designed for great steadiness as to frequency. The output of this oscillator is amplified by a quartet of quarter kilowatt tubes and fed to a fine cage T antenna 90 feet high, a beauty that any amateur would envy. Before each transmission the wave length is very carefully checked and little difficulty is met in keeping it constant.

\*These copies available from Circulation Dept. at usual price.

of this amounts to calibrating the receiving set first and then using it as a wavemeter to calibrate the regular wavemeter.

### Precautions When Calibrating Receiving Sets

In all receiving sets now available the tuning is changed somewhat by any adjustment of the tickler, tuning switches, antenna condenser, filament rheostat, or anything at all. Therefore, take no chances but get all prepared before WWV's

schedule with a log sheet and a pencil to take down these adjustments. Then when you hear WWV, loosen the coupling as much as possible and tune the secondary circuit very carefully to WWV's wave. Now note down the exact position of every movable adjustment on the set. Don't trust to memory; it is no good for the purpose. If you happen to be using a Reinartz tuner don't overlook any of the switches and if your tuner has any vernier condensers or vernier variometers don't overlook them.

Now as long as you have the same antenna and don't lose the log sheet it will be possible to use the receiving set as a wavemeter. But the average amateur does not leave either the receiving set or the antenna unchanged very long so it is well

to use it at once to calibrate a wavemeter, just as suggested above. Information on making a good amateur wavemeter is given in QST for September, 1921, on page 14.

**Special Note**

Don't forget to let A.R.R.L. headquarters have a detailed report on your results with suggestions as to further schedules.

**The Schedule**

WWV will begin with a schedule that runs from 200 to 700 meters and on later schedules will work toward the amateur wave-band. Reports on the reception of the signals should be sent to A.R.R.L. headquarters *immediately* after the schedule so that changes can be made if necessary. Don't let it go for a week after the test.

## Why Inflict Keying Thumps on Your Neighbor?

By S. Kruse, Technical Editor

The Bureau of Standards figures published in last QST prove that amateur interference with broadcast reception has been grossly exaggerated. However, it is not ALL due to the fact that the amateur is a convenient goat upon whom to load the sins of the arc lights, X-ray machines, trolley lines, elevators, commercial radio stations, battery chargers, telephone ringers, power wires, super-regenerative receivers, and Old Dame Nature's thunder storms. Nor is it ALL due to the fact that the broadcast listener usually has a single circuit tuner of the vintage of 1904. Are you sure, O.M., that some of it does not come from YOUR station?

**I**F we were able to push all the tuneless single-circuit tuners off the edge of the earth we would still find that there existed a little amateur interference on wave lengths above 200 meters and an analysis would show that there were two kinds of this interference, the so called "humps on the wave" and the "keying thump." The first of these is easy to locate—just have a friend listen to you and see if he can hear you above the working wave

(tuned to 200 meters) is held down there will be no sound in a nearby non-oscillating receiver, not even when the receiver is tuned exactly to the sending wave. But if the receiver be quite close to the sending set and the key is slowly worked up and down it will be noticed that a faint "thump" or "plop" is heard as the key goes down and another "plop" when it comes up. These "plops" are the so-called "keying thump." They can hardly be heard in an

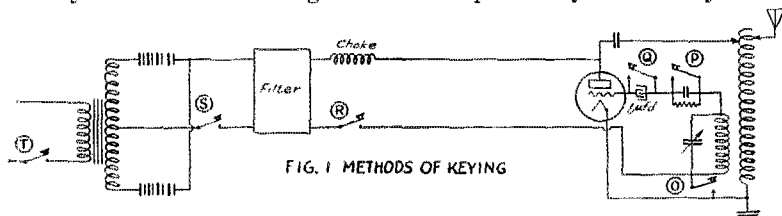


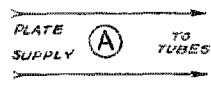
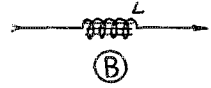
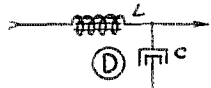
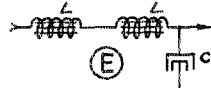
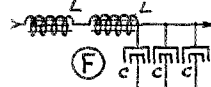

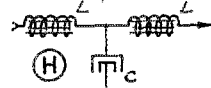
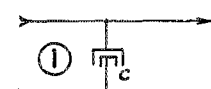
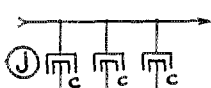
FIG. 1 METHODS OF KEYING

while his receiver is NOT oscillating. If he finds a hump, look around for the troublesome re-radiating system and detune it or remove it—often a single-wire receiving antenna is making the trouble. *And don't assume that you are O.K. because no one has kicked yet.* The second difficulty has some mysterious habits and these are what we propose to clear up now.

**What is the Keying Click?**

If the key of a pure C.W. sending set

oscillating receiver, hence the average amateur never knows that he is causing them, but it is quite possible and quite frequent for them to raise an awful fuss in nearby *non-oscillating* receivers, no matter whether these are tuned to the amateur's working wave or not. Of course the constitutional disability of the single-circuit receiver to eliminate strong local interference makes it the easiest victim but even a very good inductive tuner will be affected seriously

FILTER CIRCUIT	RESULTS	
	Key in negative supply lead to left of filter as at S in Fig. 1	Key in common lead as at O in Fig. 1
	Very bad at start and stop	Violent thump both ends
	No thump at start Thump and arc at stop	Very bad thumps both ends
	Faint start thump. Faint arc and thump at stop	Bad thump both ends
	Very faint thumps at both ends No arc	Very bad both ends
	0 thump 0 arc	Very bad both ends
	0 thump at start Faint thump at end	Very bad
	0 thump 0 arc	Very bad
	Strong thump at start Faint at end	Very bad
	Strong thump at start None at end	Very bad

NOTE - In all diagrams L is one coil of an Acme 500 M.A. 1.5 Henry double choke. C in all cases is a "73"  $\mu$ f.d. condenser rated at 1500 v.

FIG. 2 EXPERIMENTS AT 1WC

although far off the tune of the sending station, just as long as that tuner is not oscillating. Since every amateur these days has many neighbors with non-oscillating broadcast receivers this is a real nuisance and must be stopped.

**What Causes Keying Thumps?**

Any system of keying a tube set so as to change the antenna voltage suddenly, or to start and stop the oscillations in the antenna suddenly, will cause keying thumps. This is a rule that applies to any sort of C.W. set, arcs and alternators included.

**How to Prevent Keying Thumps**

In the days of sparks we gave up direct-coupled spark sets to keep the abrupt changes in the primary current from being repeated into the antenna system. Just as surely we are going to give up the present direct-coupled tube sets to prevent the key-thumps and such like things from getting into the antenna. It is satisfactory to use either *very loose* inductive coupling or else loose capacity coupling as described in "Capacity Coupling to Operate the Antenna on its Fundamental" in QST for June, 1923.\*

As long as direct-coupled tube sets are being used it is necessary to take care not to make keying clicks in the tube circuit, for they are in the antenna immediately. This means that we must never start and stop the oscillations of the tube suddenly and that we must not use a keying system that throws the plate voltage on the antenna suddenly. Let us examine our usual keying methods. Fig. 1 shows at O the most common way of keying, what we call "keying in the common lead" or "keying in the center tap." Now this is a lovely way of keying (for the sending operator), for it stops the plate current instantly without harm to the tube. With loose coupled sending sets that would do no harm but with direct coupling the antenna current *also* stops with a bang and every B.C.L. for blocks around says "Damn these amateurs!!!"

At P and Q are shown our usual methods of keying the grid circuit. The scheme at P makes a fine heavy thump for it stops the plate current almost as suddenly as does a key at O. A key at Q is not quite so bad because it takes the large condenser an appreciable time to charge to blocking voltage. The trouble is that while the thing is making up its mind to stop the plate current, there is a very splendid chance that the tube will stop oscillating and blow up with a smart Fsst!!! This is not a good idea.

Finally if the key be put at R it can be seen at once that the plate voltage goes on with a bang and off with another bang—naturally there is a strong thump.

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



Apparently all of our pet ways of keying cause keying clicks. Then why don't all stations have them?

**Why Some Stations Do Not Have Keying Thumps**

Sets with alternating plate supply rarely have a serious keying thump; that is the only thing that can be said for the old grumble-factories. The reason is that the key is usually placed in the primary of the transformer and there is a slight lag between the closing of the key and the building-up of the plate voltage. Now let's apply that idea to some respectable plate supplies.

In Fig. 1 if we put the key at T the results will usually be very good if no filter is used, but if there is a filter (and most good stations are beginning to use filters) the building up of the plate voltage will be delayed too much and the tone will tend to stagger and wobble before settling down. If the key is placed at S the filter should slow down the rise and fall of plate voltage by just about the correct amount, and the signal will have the proper "snap" without the disagreeable thump. It will not matter a great deal whether the apparatus to the left of the filter is a transformer and rectifier, a generator, or a storage battery.

**The Experiments at 1WC**

Beekley of 1WC had decided to do his very best to make a "real C.W." station that would cause no interference. Accordingly the plate transformer was replaced by a fine 700 volt storage battery, with the result that the note of 1WC was something to make an operator feel good all over. But to our consternation this storage battery rig turned out a keying thump that jammed non-oscillating receivers at almost any wave below 600 meters. Evidently this new D.C. supply was too "ready to go" and something should be done to slow down the application of the plate voltage to the tubes. With Mason of 7BK listening at 10A we began to send "blind" tests, using the various arrangements shown in Figure 2. The results can be summed up by saying:

- 1—No matter what was in the line there was still a heavy thump when the key was in the common lead—this method is out.
- 2—A choke alone stopped the thump at the beginning of the dots and dashes but caused violent arcing at the key. (See Fig. 2 B.)
- 3—A condenser across the supply stopped the thump at the end of the dots and dashes. (See Fig. 2 I & J.)
- 4—A correct combination of choke and condenser cured both thumps completely when they were properly proportioned. Circuits F and H were best.

**General Conclusion**

To prevent the keying thump entirely we must use loose-coupled sending sets or else key in the supply lead and place a small filter between the key and tube as shown at F and H. The main filter may not give the proper results and should not be depended on. In any case—*make sure YOU are not sending out a key thump.*

**Corrections**

In the article "A new method of Controlling Regeneration: The Four Circuit Tuner" which appears on pages 29-32 inclusive in the June, 1923, QST, there was an unfortunate omission on page 31. The last sentence in paragraph 1, column 1 should have read..... "When the capacity of the variable condenser is increased this 'fourth circuit,' or absorption circuit, extracts more energy from the grid circuit and when the capacity is decreased it takes less energy from the grid circuit."

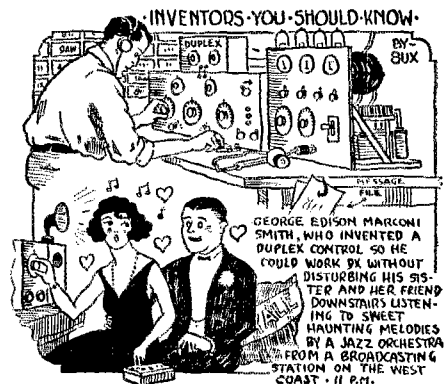
On the same page under the heading "List of Parts" there is an error in the first sentence which should read "A—Primary winding, one turn of heavy copper wire wound directly over the absorption circuit, one quarter inch from the outer end." Both Fig. 4 and the photograph on page 29 will show that this is the correct reading.

**ELECTRIC FILTERS**

(Continued from page 22)

circuit. There is always some frequency at which the current in the load will be constant, independent of the resistance of the load. For a single-section low-pass filter this point will be at a frequency equal to the cut-off frequency divided by  $\sqrt{2}$ . With a number of sections there will be a number of such points, the number being equal to the number of sections.

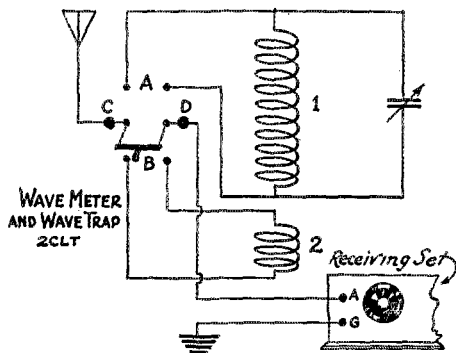
(To be concluded)



# A Wavetrapped and Wavemeter for C.W. Reception

By Arthur F. Evens, 2CLT

THE increasing number of stations, both broadcasting and amateur, is causing tremendous QRM in this city. At the same time also one is met by the everlasting question "What is my wavelength?" The interference situation and the demand for information as to the wave length of the station with which I am working is met by the circuit shown in the attached figure. When the double-pole double-throw switch is in the position A, the coil No. 1, together with the variable condenser, constitute a wavetrapped. By adjusting the con-



denser so that the trap circuit is adjusted to the wavelength of an undesired station, that station's intensity may be much reduced or its signals possibly eliminated. When the switch is in the position B, the coil 2 is placed in series with the receiving set primary. The loading effect produced by the small coil No. 2 is not important. Its main effect is to couple the antenna circuit loosely to the trap circuit which now becomes a wavemeter circuit. Assuming that we are receiving a C.W. station, it is now possible to vary the position of the condenser until the circuit consisting of this condenser and the coil No. 1 is in resonance with the antenna circuit which is tuned to the incoming station. A click is then heard in the headset. If the circuit consisting of the variable condenser and the coil No. 1 has been calibrated in wavelength, it may be used to indicate the wavelength of the incoming signals. If the sending station which is being measured does not happen to be C.W., the scheme can still be used. The station is tuned in as strongly as possible, the receiving set is caused to oscillate (which, of course, will mush up the tone of the sending station) and the wavelength reading is taken in the same manner as before. If a wavemeter is available, it is

of course not necessary to construct the trap circuit at all. It is then only necessary to provide a coupling coil (coil No. 2) which may be placed near the coil of the wavemeter; after that the proceeding is the same as has been outlined. Those who do not own a wavemeter of the proper range will be interested in the construction of my wavetrapped circuit and coupling coil. The panel on which the apparatus is mounted measures 4x7". Both coils are wound on the same tube which is 3½" outside diameter. Coil No. 1 consists of 25 turns of D.C.C. wire beyond which there is a blank space of 1/8" and then four additional turns of the same wire which constitute coil No. 2. The switch is one of the small D.P.D.T. switches which are used in Clapp-Eastham amplifiers. The variable condenser is a .001 microfarad affair, equipped with 180 degree dial. This dial should be of white celluloid or matte finished metal so that calibrations may be marked on it. It is good, however, to have a scale of degrees on the other half of the dial. Nothing additional is needed except the binding posts, C and D. The wave meter (and trap) circuit has a wavelength range of approximately 140 to 500 meters. It is important to keep the resistance of the coil L<sub>1</sub> very low, hence the wire used should not be smaller than the No. 22 double cotton which has been recommended and no dope should be used on it excepting collodion or airplane wing dope. Collodion dissolved in ether and alcohol may be obtained at a drugstore. It is usually sold as "flexible collodion." It can be painted on with a brush and dries almost immediately, not changing the appearance of the coil very much.

It is best to operate the set with the switch normally in position A. If the trap effect is not desired, the condenser may be set at zero point. The trap is then ready for instant use. When someone requests a wavelength reading, the switch is thrown into the position B. Neither the wavetrapped nor the wavemeter will appreciably affect the operation of the receiving set.

It has at times been found an advantage at this station to connect an ordinary receiving loop from the antenna terminals to the ground terminals in shunt to the other apparatus. This loop is not a directional receiving device but simply tends to lower the body capacity effect when tuning C.W.

This outfit is in operation at station 2CLT at all times. I shall be pleased to demonstrate it to anyone who will call at 246 Emerson Pl., Brooklyn, N.Y.

## A Filament Lighting Transformer from an old "Thor"

A FILAMENT lighting transformer can easily be made from an old Thordarson spark transformer of the "flexible" type. The one used to make the filament transformer here described was a one kilowatt type "T," which most amateurs of a few years standing will remember. The type "T" had a magnetic shunt in the shape of an extra core-leg above the primary. This shunt was hinged and had a wing-nut and spring arrangement to hold the magnetic leakage tongue (shunt) at any desired adjustment. This arrangement worked very well except at close settings (small air gap) when the rattle was terrific.

Accordingly in converting the transformer the spring was removed and the shunt set right down on the top of the main core and secured there by U-shaped straps of iron hooked over the shunt. These U-shaped clips are held in place by the bolts that hold the transformer frame together. It is then possible to clamp the shunt down solidly by driving wedges under these straps or by driving the tops of the straps apart so that they slant.

The secondary is removed by dropping out the lower core leg and sliding the coil off. A new low-voltage winding is then put on in one layer. For a single 50-watt tube there will be 12 turns of No. 14 cotton-enamel or double cotton tapped at 6 turns and for one or more 5-watt tubes there will be a 9-turn winding tapped at  $4\frac{1}{2}$  turns. There is ample room for larger windings and the transformer core and primary can easily handle any filament load that you are likely to put on them.

Now comes the adjustment and this is where this transformer has the bulge on others. The voltage at first will be too low so the U-shaped clamps are slackened and a sheet of writing paper is slipped under one end of the shunt, which is then clamped down again. By adding sheets of paper the voltage may be raised to 12 volts with the 12-turn winding, or 9 volts with the 9-turn winding. The voltage should be made a little too high and then reduced to the proper value by means of a ten ohm rheostat in the primary circuit. The tubes then may be connected directly to the secondary. On no load this transformer draws 2 amperes and consumes 50 watts.

You have now put the old spark set where it can do no more harm and at the same time have made a filament transformer that will be large enough for your greatest hopes of the future.

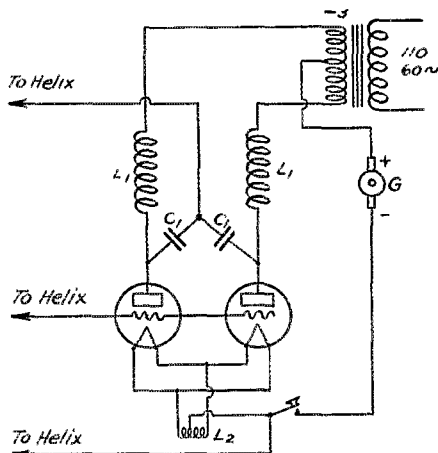
(Note—In winding new secondaries for Thordarson spark transformers it is convenient to know that the 110 volt primaries have the following number of turns—Type

T, 1K.W., 110—Type R, 1K.W. 130— $\frac{1}{2}$  K.W., 160— $\frac{1}{4}$  K.W., 440. Refer also to "Strays" on page 68 of January QST for information on the making of plate and filament windings for other types of spark transformers.—Ed.)

## Using a Transformer as a Booster for a D.C. Plate Generator

IF you happen to have a D.C. generator with a voltage that does not strike you as making the plates of the tubes hot enuf the stunt shown below will help.

The idea is to let the transformer supply a part of the voltage and to let the generator add to this. The advantage of the idea is that the 120-cycle ripple is reduced, the voltage never falling below that of the D.C. machine. Now even with



- L1—Radio chokes, each 4 inches of single layer number 28 double cotton covered wire on a  $2\frac{1}{2}$  inch pasteboard tube. Keep Chokes away from each other and a foot from the helix.  
L2—Secondary of filament transformer.  
L3—Secondary of plate transformer.  
C1—Blocking condenser, about .002 microfarad.

a "straight" self-rectified set there is a tendency for the tubes to carry on across the zero voltage point and this tendency is of course greatly increased by the D.C. machine which acts, not only in the way just mentioned but also as a choke in the common lead. This stunt is being used by several fellows with good results; the note is said to be very pleasing.

While a self-rectifying circuit is shown it is also possible to use the D.C. generator with a set using electrolytic rectification. In that case the generator is connected in the com-

(Concluded on page 50)

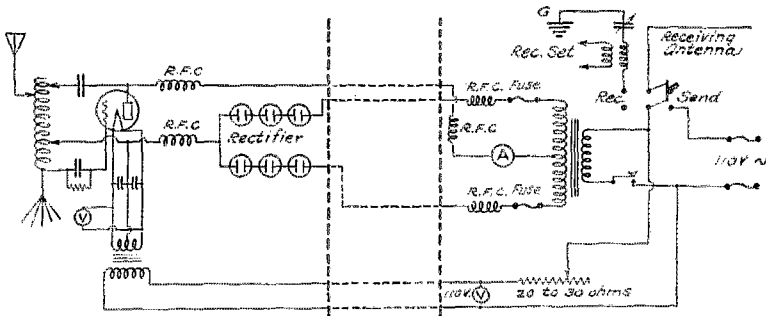
# Distant Control for Amateur Transmitters

By C. C. Whysall, 8CMI, 6TV

(A Paper Presented at the Third Annual Ohio Radio Convention)

**M**OST amateurs want their apparatus in the same room as the receiving set. Some, however, like myself, are unfortunate enough to have a back yard completely filled with trees, bushes, or garages, etc.; or maybe the only possible lead-in entrance is obstructed by some kind of bush or shrub. What, then, shall we do to increase efficiency in cases like this? The answer is simple: Erect the sending an-

ment line should be at least number fourteen. The filament transformer is placed in the immediate vicinity of the transmitter but the high voltage transformer is placed near the receiving station so that the plate-current meter can be placed in the high voltage line. The usual filament voltmeter is placed in the low-voltage filament line near the tubes and another meter is required in the operating room for the purpose of adjusting the filaments. This



RECTIFIER MAY BE PLACED EITHER IN OPERATING ROOM OR NEAR THE TRANSMITTER  
IF IT IS PLACED IN OPERATING ROOM, ONLY FOUR CONTROL WIRES ARE NEEDED

tenna in a good location and use remote control.

The advantages of this system are several. For one thing, a location may be chosen which is comparatively free from trees or houses. The receiving set need not be in some dark corner of the attic or coal cellar but may be in the most comfortable and convenient place in the house.

Here's how the thing is done. Construct your antenna and counterpoise system in the chosen location and set up the receiving set in its chosen place. The transmitter may be housed in a packing box about four by four feet. The box may be made weather tight by covering with roofing paper, and one side should be hinged so that the set may be reached. The whole thing may set on a framework of two by fours at whatever height is convenient. My own set is housed in a small garage at the rear of our yard.

The installation of the distant control wiring is decidedly simple. Three wires are required to carry the high voltage and two more to carry power for the filament transformer. The high voltage wires may be as small as number twenty but the fila-

meter should be an A.C. meter reading to at least 120 volts.

Only one switch is required—a double-pole double-throw porcelain switch is O.K. It serves to disconnect the receiving antenna and apply the power, or vice versa.

A couple of six-ohm rheostats are required for adjusting the filament. A glance at the diagram makes the position and purpose of the parts clear.

The extra R.F. chokes near the hi-volt transformer are to keep the induced R.F. current from getting into the house wiring.

This system has proven itself both convenient and efficient at 8CMI as evidenced by the fact that during the past six months the station has been copied by over one hundred pacific coast stations and has been heard in Hawaii, Alaska, and Panama a number of times. I am so well satisfied with it that I am going to install the same kind of a set at 6TV when I go back, in June.

I will be pleased to hear from any one who has any improvements to suggest or questions to ask. Address me at Marion, Ohio, until June first, after that at Los Gatos, Calif.

# EDITORIALS

## of the AMERICAN RADIO RELAY LEAGUE



### The Status of the Amateur

OF all the messed-up situations we've ever heard of, the one relating to what's-what in amateur regulation is the worst. A big part of our daily correspondence at Headquarters just now relates to it, we are bombarded by queries on every hand, we hear folks supposed to be in authority saying things we know aren't so, and it seems up to us to tell everything we know and to tell it so plainly that everybody else will understand it.

Amateur regulation first got disturbed when Secretary of Commerce Hoover called a "radiotelephony conference" which met in Washington on the 28th of February, 1922: The special purpose of this conference was to propose what ought to be done about a new radio law and what that law ought to have in it. The Conference decided that the new law ought not to contain any wave length assignments but ought to be a framework saying that the Secretary of Commerce had power to assign wavelengths any way he saw fit; and it also made recommendations to him how it would be well to assign the wavelengths to the different kinds of stations. It was recommended at that time that the amateur band be changed from "not exceeding 200 meters," to give us from 150 meters to 275 meters, and instead of the 375-meter wave for special stations, 310 meters was to be used. And the band from 150 to 275 meters was to be chopped up into smaller bands according to the kind of sending set a fellow had, whether spark or C.W. or phone. But nothing ever came of these fine plans, for Congress killed the proposed new law (the White bill) and that was the end of it. And meanwhile the old law of 1912 governed.

And so just this past spring Secretary Hoover called another "radiotelephony conference," convening on March 20th, to study things all over again and see if a way couldn't be found to do the things they wanted to do under the old law, since they couldn't have a new one. Most of the things folks wanted changed of course related to broadcasting, and every other kind of radio user was at that conference on the defensive, to keep from being stripped to the bone in favor of broadcasting—the

army, the navy, the amateur, the post office mail, the ships, the commercial services. This time the hue and cry was to cut down the amateur. "Cut the amateur down to 200 meters," they said, "and make him and all the ship and shore stations keep entirely quiet between 7 and 11 o'clock every night." "No," we said, "we're supposed to be allowed up to 275 meters when new arrangements go into effect." "But," we said to ourselves "the need for more cycles for broadcasting really is immense, and since the thing has to be right next door to us anyway, we might as well be philosophical about it. We really don't need that high a wavelength, as we're used to operating around 200 meters, and so we're willing to drop down to 250 meters." We told them that. "No, no," they cried, "broadcasting needs it all; 200 meters for the amateurs." And so we took stock again and figured up that we had an awful lot of cycles, and that a spirit of co-operation was in the air, and that we could show that the amateur knew how to co-operate, and so we said we were willing to consider 225 meters as the upper limit for the average amateur. And after a lot more talk it stopped there, for we had been reasonable and had shared, and they couldn't push us any farther. Then the conference looked at the cycle table to find the nearest even figure and it was 1350 kilocycles or 222 meters, which took away 3 more meters, and then the Department of Commerce thought there ought to be a little hole in between us and the broadcast stations and they knocked off a couple more meters, and that is how the figure of 220 meters came to be arrived at.

*This conference didn't have a bit of power, you understand; it was merely a body of experts from all kinds of radio interests (including our president as a representative of our A.R.R.L.), which had been asked to study radio problems and report. But when a report had been made up of what the majority agreed upon, the Department of Commerce announced that they accepted the report in full and would follow the recommendations.*

Then we asked the Conference what about our 375-meter "Z-wave," which the previous conference had talked about cutting to 310 meters. But broadcasting was to start at 222 meters and go up to 545 meters, they allowed, so how could there

be any special waves for us amateurs? We said we had to have a few dozen special stations at least, to use in places where it was a hard job to move amateur traffic. Absolutely impossible, they said. We might have a very few; where did we need them worst? That was easy, of course—we needed them most in that vast area of few-and-far-between stations between the thickly-settled Mississippi Valley and the thickly-settled Pacific Slope—we needed them down the Rocky Mountain territory, where only a few stations exist that are good enough to work both the coast and the valley, fellows like Hood of 7ZO and Falconi of 5ZA and West of 7ZU who are real gateway stations on our transcontinental routes. And we needed a higher wave because it had to be a different wave, a quiet wave, and not at all because a longer wave was necessary to get out, as had been the case with the old 375-meter sparks. Finally we got the big idea over to them, and expressly for the purpose of amateur transcontinental relay work we secured a recommendation that there be some such licenses authorized, to be located only in the Rocky Mountain territory, to use a wavelength somewhere between 222 and 286 meters, and, unfortunately, limited in six in number for the whole A.R.R.L. And that's how that funny-looking recommendation happened.

Now ordinarily most hams believe that all amateur radio amateurs were created equal, and the democracy that pervades our ranks will make some fellows hesitate to go after one of the precious six specials because of envious criticism and because he doesn't want what the rest of us can't have. But this is a special case, really, and we're all going to be glad to see a half-dozen of our own good fellows getting to use some such licenses because of the help it will be to every mother's son of us in getting our stuff thru. One such license has already been assigned to a lad who is not in the Rocky Mountain territory at all, but because everybody loves him for who he is, nobody is going to have a word to say; we mention it merely to emphasize that the general scheme is to have them as half-way stations over the hard jump from coast to valley, and we hope the rest of them are assigned there and that our Traffic Manager gets a shot at recommending who get's the quiet waves. When the Department of Commerce is going to start them we don't know.

About all of the old 375-meter Z-licenses have been called in and reissued either for 220 meters or with 220 meters as the maximum wave. That's the end of higher waves for amateurs east of the Rockies, except under X-licenses for experimental work—broadcasting drove them out of existence.

Now about these quiet hours, about which

there has been the greatest inconsistency. We amateurs saw things coming while they were yet a long ways off, and that's why we establish first the Rochester Plan, a scheme of local agreements for a quiet period, and then our "Voluntary Lid," which has been more or less respected according to the territory. At the last "radiotelephony conference" it was at one time proposed that amateurs be prohibited from operation between 7 and 11 P.M. We objected, strenuously, pointing out that we were already practically voluntary quiet hours, and that an ounce of voluntary co-operation was worth a ton of prohibition. As a result, the conference made no recommendation in the matter. As subsequently reported in *QST*, several weeks later the Department instructed or authorized Supervisors to stamp all our licenses to the effect that we could not transmit between 7:30 and 10:30 P.M. The League immediately sent its Vice-President to Washington to appeal, and as a result the instructions to Supervisors were changed so as to apply only on "new" licenses. Then it became apparent that some of the Supervisors considered they were issuing a "new" license whenever they renewed one or reissued it because of a change in apparatus, so that old-timers were getting the rubber stamp stuck on their papers and everybody was afraid to let their license get out of their sight. Meanwhile our Board addressed recommendations to the Department, in accordance with practically unanimous amateur sentiment, and urged that we be permitted to observe our own quiet hours. We have recently seen the officials of the Department again, at which time their position was that, while they were authorized under law to limit our operating hours, they would recognize our plan of voluntary quiet hours for all amateurs now under license, but would require it by license endorsement on all "first" licenses hereafter issued, that is, new licenses to new amateurs; the idea being that a newcomer in the amateur game may not know of our A.R.R.L. and our plan and has not yet learned co-operation. We have been unable to convince the Department of the wisdom of waiving the compulsory requirement in all cases. We are assured, however, that the arrangement outlined will go into effect with the issuance of new amateur regulations in the near future. Meanwhile those Supervisors who have erroneously interpreted "new license" to mean "renewed license" or "reissued license" have endorsed the proviso on the licenses of some lads so unfortunate as to have their station tickets expire or need change while this matter has been in the air; and there seems to be no relief but to await the coming of the new regulations, when everything will finally be set down in black and white and mistakes rectified.

Meanwhile we have a jumble of different kinds of quiet hours. Our national voluntary plan calls for 7:30 to 10 P.M., the rubber-stamped licenses call for 7:30 to 10:30, and some towns are following the Rochester Plan but on daylight saving time. It's a mix-up. And some of our members aren't observing anybody's plan but their own, and therefrom grows a problem. Opinions are wanted from you fellows. What shall we do about those of our number, fortunately not so many, who continue to disregard quiet hours and bang right away thru 'em? Their action is eminently unfair to the good amateurs who QRX, and it's a cinch the Department won't stand for it long and then something's liable to happen to all of us. Any suggestions?

After the second Hoover Conference had hammered us amateurs down to 222 (220) meters for a top limit, it developed that 150 meters had been specified as the lowest wave with which the conference should concern itself—the lower waves were “reserved.” Consequently, even tho the conference did assign 130 m. and 143 m. to the Navy, their recommendation for us amateurs reads from 150 to 220 m. What of our time-honored right to all the waves from zero to 200 meters, we asked. Nothing to it, we were told, take a look at the law. And sure enough, the law doesn't say that we can use any wave below 200 m., as many of have thought, but that the Department can assign us waves on which to work so long as these waves don't exceed 200 meters. And the Department said our assignment was to start at 150 meters. This is something we weren't looking for, something we don't understand, and something we don't like at all. We want those short waves, want them badly, we feel that we have a moral right to their use, at least “non-exclusively,” and we consider that we have shown ourselves better fitted for their development than any other radio interest. To us it seems decidedly un-American to “reserve” anything without plainly stating for what purpose the reservation is made, and it is difficult to understand how the conference meekly accepted the “reservation” without question. All we can find out is that somebody expects that maybe some day some corporation may get an order for some short-wave installations for harbor tugs and millionaires' house-boats, which to us is no reason at all why we amateurs should not be given their non-exclusive use. But the Department is adamant, and it looks like orders from “higher up;” the Chief only says we've got enough cycles and ought to be satisfied. We are assured that experimenters seriously interested in the development of waves under 150 meters can get X-licenses for that purpose without diffi-

culty, but there the matter of shorter waves rests at this writing.

The first Conference had talked about sub-dividing our “allocation” as a helpful method of reducing interference in our own ranks, and when the second Conference had put us down for 150 to 220 they started setting the gang saws to split that up for us into pretty little subdivisions. The amateur element at the conference, aided by the Department, succeeded in halting this procedure just after it had been recommended that sparks be assigned between 176 m. and 200 m. It was agreed then to leave the matter to conference between the Department and the A.R.R.L. And so, as we told in the last *QST*, our president called a meeting of our Board of Direction to consider what our recommendations would be, *and before this meeting every Director was asked to find out what amateurs in his part of the country wanted. This they proceeded to do, by broadcasts, by thousands of circular letters, and by traveling around and interviewing clubs. Those that couldn't come to the Board meeting sent in long written reports, and when finally the Board got together it had the most representative survey of amateur opinion that had ever been made; and we are particularly happy to be able to say that the western half of the country especially had been pretty thoroughly solicited. All these amateur problems were thrashed over at that meeting and when it adjourned a set of recommendations had been framed, which, while it did not give any part of the country everything it had wanted, was a composite of the average thruout the country. It was this seeking of compromises, of common middle ground that would be acceptable in the 7th district as well as in the 4th, which eventually led to the recommendations reported in our last issue: that all the modulated types of amateur sending sets be fenced in between 176 and 200 meters (the band the conference had already specified for sparks), with only pure C.W. working on our more valuable shorter waves below 176 and on the waves above 200 meters.*

Now the last Conference wanted to extend our band up to 220 meters and make it available to the whole amateur world. But the law, which is still in effect, says that no amateur can work about 200 meters except with a special license, and that only an amateur of above-ordinary ability and with several years experience can be granted such a special license. So we're going to have two kinds of station licenses even tho the Conference didn't contemplate that, and the ones going above 200 are still going to be Z-calls. It was because the law requires holders of Z-licenses to have special qualifications that our A.R.R.L. proposed the establishment of an Extra First Grade Operator's License—its

possession could then be a criterion of fitness for such a station license. Twenty words a minute and two years experience under license and a clean record in obeying the law are the contemplated requirements.

We took all these things down to the Chief at Washington and chewed them over with him. We said that we particularly wanted to avoid having our licenses specify a single wavelength or a couple waves, and that we wanted to be able to operate at will on any wavelength in thru the entire band that our kind of transmitter was eligible for, say anywhere between 176 and 200 meters if we had an unfiltered C.W. set or anywhere between 150 and 200 meters if we had a pure C.W. set, and that we'd like our general amateur license to be in such form that it would permit us to operate any kind of set on any wavelength as long as we kept within the limits for the different kinds. And that we'd like our special licenses, which are to be issued to those of us who can qualify for an Extra First op's license, to permit us to roam at will with pure C.W. anywhere between 150 and 220 meters and at the same time authorize the use of modulated senders provided we kept them between 176 and 200 m. The Chief thot this idea was all right, and we also got his approval on other questions mentioned above. We had accordingly hoped that new regulations could be out before this writing, but we have just been advised by the Department that copies of the proposed new amateur regs. have been supplied the various Supervisors to get their opinions and that the matter is held up for some slight rehashing. Just how long this will take nobody knows, nor what will happen to some of our ideas in the rehashing process. The Department is aware, however, of the turbulent amateur conditions existing in some inspection Districts as a result of misinterpretations and misunderstandings, and they say that the new regulations will be released just as quickly as they can be finally determined upon. It will be great when this happens, for we shall at least know what is what.

We think that in general we amateurs must admit that we have no very great complaint. We do not like compulsory quiet hours on anybody's license, and we still hope to convince the Department of the desirability of granting us the non-exclusive use of waves below 150 meters. The proposed sub-division is certain to reduce our intra-amateur QRM without hurting anybody, particularly as the months roll on, and the "blanket-license" idea, if it is approved, will be an immense help. As to the loss of higher wavelengths and the proximity of low-powered broadcasting to our own band, we will have to make the best of these things—there simply wasn't any way of stopping them.

The new regulations ought to come out any day now.

## The Good Old Summer Time

WHAT'S perhaps the chief fundamental of a true amateur? We would say that it is that passionate devotion to the art of radio which impels us always to keep within twisting distance of a dial, within hearing distance of our beloved signals. We just naturally have to be in touch with radio twelve months in the year.

During the cold months we are in our element, actively engaged in transmission and reception under the most favoring conditions. But summer, with its attendant QRN and the green out-of-doors, sort of puts a damper on radio—at first. For maybe a couple of weeks we revel in outdoor sports, clearing our brains and putting ourselves in first-class condition after a confining winter. But soon, being true amateurs, we become restless, feel a peculiar *lack*—life isn't quite complete. What's the matter? Quickly it dawns—*amateur radio*. Joyfully we turn again to our station, only to find the shack hotternell and QRN beastly. But what to do?—we can't stay away any longer.

You fellows who haven't yet discovered the answer, listen! How are you fixed for efficient operation when fall rolls around? Do your transmitter and receiver embody the latest refinements and improvements which you were too busy to make during last season? We thought not. Well, here's the answer, and double-barrelled at that, for it embodies one of the chief joys of amateur work—the business of building things. Get back to radio by overhauling, rebuilding, and refitting your station and set, have a regular "summer shack cleaning" and get in shape for better DX than ever when the crisp, clear nights come once more.

We're ready to help you all we can. Our technical department will aid and advise. *QST* will each month give you practical dope of real helpfulness, and our advertising department will spread before you the best in apparatus and parts with which to make your aim of the best station in your Division surely come true.

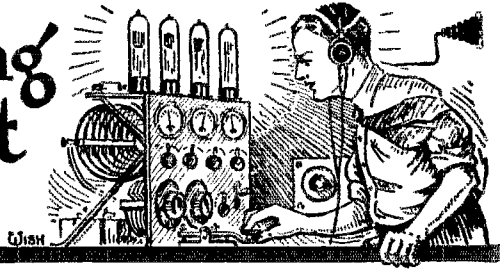
Go to it, O.M.; we're behind you all the time!





# The Operating Department

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



Our message traffic took quite a drop this month. Much of the decrease is due to a great drop in the number of "Rubber Stamp" messages which were being passed around. Most every division reports an usual number of tube blow-outs. What seems to be the trouble—too much plate voltage? The Central Division comes back with the leading traffic handler in 8IJ, who takes first honors.

J. P. Weirick—8IJ  
Loudeville, Ohio  
Central Division  
1022—messages

One of the "old guard" John M. Clayton, 5ZL, because of ill health, resigned as manager of the Delta Division. In the election which took place, W. G. Hutcheson, 5DA, received the largest number of votes but had to decline the office because

during the past year and it has reached such proportions that it becomes necessary to publish a list of men making up the personnel. In October QST will appear this list in detail. Divisions will be shown by states and each district of each state will be defined by counties. Names and addresses of D.M.'s, A.D.M.'s, D.S.'s and C.M.'s will appear with the call of each ORS's, by district, state, and division. The regular activity report will be excluded because the space will be needed to show the complete list. However, the monthly traffic report will appear as usual. Don't forget to report your message traffic.

The "Brass Pounders' League" got an awful jolt this month! It is to be expected that our traffic will fall off during the summer. One can't be expected to sit in a hot shack handling messages when he can be outdoors enjoying himself. We know the season is here—let's forget about mentioning it again in any reports. If a station fails to report we shall not include any more of it. We want to give representation to the

## Message Traffic Report By Divisions M A Y

Division	C.W.		SPARK		TOTAL	
	Stns.	Msgs.	Stns.	Msgs.	Stns.	Msgs.
Atlantic	173	13492	15	526	188	14018
Central	180	21693	16	1741	196	23434
Dakota	52	3846	4	117	56	3963
Delta	11	1068	—	—	11	1068
East Gulf	42	1845	5	120	47	1965
Midwest	88	9265	18	1183	106	*10448
New England	83	9673	3	205	86	9878
Northwestern	40	2933	4	42	44	2975
Ontario	31	1838	1	38	32	1876
Pacific	19	2015	2	196	21	2211
Roanoke	38	2607	—	—	38	2607
Rocky Mountain	29	2114	2	226	31	2340
Vancouver	10	535	—	—	10	535
West Gulf	61	5015	2	18	63	5033
Winnipeg	7	713	1	44	8	757
Hawaiian	3	9	—	—	3	9
<b>Total</b>	<b>867</b>	<b>78661</b>	<b>73</b>	<b>4456</b>	<b>940</b>	<b>83117</b>

(\* Includes Iowa report for April.

C.W. Messages, 78,661—95%

Spark Messages, 4,456—5%

**Total, 83,117**

of business pressure. The second largest vote was cast for W. W. Rodgers, 1106 Union Ave., Memphis, Tenn., who has been appointed manager of the Delta Division. Within a very short time the old Delta will be back on its feet and we know it will be up with the headlines in traffic work.

Alaska, thru 7MN, has finally broken thru to the states. A.R.R.L. Headquarters received a relayed message from 7MN, operated by F. H. Stephens of Chicago, Alaska. Two five-watt tubes did it, but two fifty-watt tubes will be in operation by the time this reaches you. This makes way for some splendid relays for the winter-Alaskan-Porto Rican Relay. Keep it in mind when the time comes we'll do the trick.

The Operating Department has grown steadily

who do report and in the future, no space is to be used for excuses—results count.

Probably nothing has caused more real genuine enthusiasm than the up-to-the-minute news items sent out from A.R.R.L. Headquarters thru the Official A.R.R.L. Broadcasting Stations. Throughout the country about one hundred and twenty-five of our best transmitters are being appointed to broadcast amateur news of the latest order as it is received at Headquarters. All Official A.R.R.L. Broadcasting Stations start at 12:00 A.M. local time each Sunday and Monday morning. If you haven't heard these broadcasts, you are missing something. Listen for any one of the following stations in your vicinity, at the above time:

## OFFICIAL A.R.R.L. BROADCASTING STATIONS

1BAC	3BMN	7ABB	8ZW
1BDI	4BC	7AGF	9ABU
1BKQ	4BX	7DH	9APS
1BSZ	4EB	7JF	9AVZ
1CKP	4HS	7ZO	9AZA
1CPO	4HZ	7SC	9BAV
1GL	5ADB	7TO	9BBF
1IX	5XA	7ZN	9BUN
2AWL	5XAJ	7ZU	9CFY
2BRB	5ZAK	7ZV	9DGV
2OM	6XB	8ATP	9DKQ
3APR	5ZAV	8AWP	9DWM
3ASP	6APL	8BDA	9MC
	90X	9ZY	

The above list of stations will be completed in time for the next issue of QST when all calls will appear.

## BRASS POUNDERS' LEAGUE

Call	Mgs.	Call	Mgs.
8IJ	1022	1GNI	432
8BHN	986	2AIF	423
8CYT	841	8AFL	418
3ZO	783	9CTF	418
9VM	584	1BVB	417
9DQU	580	3BMN	416
9AHH	571	7GP	412
6ZZ	564	9CZL	408
8BVR	560	2CPK	407
9AOU	504	3BLP	403
5VY	501	8GZ	403
		2BMR	401

ATLANTIC DIVISION  
C. H. Stewart, Mgr.

Reports from Northern N. J. are going down. This is to be expected—summer weather is again with us and no doubt the large decrease in messages handled is because of the discontinued relaying of QSL crd. mgs., etc.

The census of reports from various stations throughout northern N. J. shows a great many stations are out of commission because of blown tubes.

R. M. Morris, 2CQZ, has been appointed city mgr. for Elizabeth, N. J. to succeed Mr. Muller, 2JZ. The general opinion of amateurs in the section of Elizabeth is very much in favor of Mr. Morris taking over this work.

Reconstruction of a great many stations has started and a large number of antennas are being re-designed due to the mighty important information furnished on antennas in the May, 1923, issue of QST.

One of the big losses to this section in relay work is the retiring from the game, temporarily, of Curtis Engel, 2BBB, who is preparing to enter college in the fall. 2KZ is another C.W. station in this section who has been playing with I.C.W. waves. 2AJF is not operating as regularly as B4, but operator EB is doing the brunt of the relay work from that station.

Few reports have been received from Southern N. J. Let's have some concentrated effort to liven Southern N. J. up a bit. What say, fellows?

**EASTERN NEW YORK:** Wow! for the first time in the history under the newly reorganized system, Eastern New York beat out Northern New Jersey! This is a signal victory. Month by month Eastern New York has gradually been creeping up with their figures. This should not be considered by New Yorkers as a good showing however, as reports from a great many New York districts are slim, and a number did not report at all. The New Jersey report was away off for some reason also.

One 2DI will probably be shooting traffic over

by the time this goes to press, as the Dr. is only waiting for the ESCO generator to arrive.

Census of New York reports show a great many held back with school work induction, blown tubes, rebuilding, and changing transmitters to lower waves.

**WESTERN NEW YORK:** Western N. Y., under the direction of Mr. Woodworth (better known as SAWP), is moving more smoothly than ever before. SAWP is receiving support and cooperation from amateurs throughout Western New York, which is F.B.

A great number of official relay station appointments have just been issued to various stations in recognition of the efforts of these stations in handling traffic.

Western N. Y. stations have suffered considerably from antenna trouble and empty sockets. 8NB is one of these sufferers. SBUM is out of business on his spark set because of a blown transformer. B. C. Belden, Supt. 16th New York Dist. is heart-broken over poor report from that district, from 1400 messages in March to 204 in May is too much. One reason is that many of the hams are high school fellows who have knuckled out to hard work in order to get through exams.—Hi.

There has been very little activity in this state during the past month due to heavy static. 3BSS managed to put fourteen messages over and 3AIS seventeen messages making a total of thirty-one messages from this state.

3AIS has also recently constructed a new counterpoise raising the radiation 1.5 amps. making a total of 3.4 amps. in the antenna. Good DX can now be accomplished if the QRN is not too bad.

3WF still heads the list in number of messages handled. 3GZ, 3MF, 3TE, 3APT, and 3LG also deserve credit for keeping traffic moving through the bad QRN that has been prevalent during the past month. 3TE and 3MF have been appointed official stations. 3FQ, 3GL, 3BKS, and several others have been heard handling traffic. 3BMO is doing excellent DX on 15 watts. It is hoped that 3SF, the one remaining DX spark of Baltimore, will soon see the light, and become converted to the use of bottles.

Local DX men are, with one or two exceptions, observing the quiet hours, and this spirit is to be commended. As a result, there is very little friction with the BCL's.

It has been noticed that there is a noticeable decrease in the number of "rubber stamp" messages.

**DISTRICT OF COLUMBIA:** This month has seen a great deal of QRN set in, but most of the gang have been sticking to the job and putting traffic through. Two Government messages were started from 3ZK and our neighbor 3IW, bound for Little Rock, Ark. and were traced to Kansas City within a few minutes, 8IJ acting as a capable relay. Stations in this vicinity are requested to keep a sharp lookout for these messages as more are expected and must get through. Some of the best stations did not report this month which leaves our total low, but good work is being done. 3LR has a 500-watt near completion. There is a general trend toward D.C. C.W. here which seems to get through QRN nicely and good relaying through Washington is expected through the summer months.

**EASTERN PENNA:** A decided drop in station reports was noticed for this month and many reports from traffic officers missing.

Dist. No. 1. 3HH is increasing 50 watts per month batting out on 150 watts at present.

Dist. No. 2. Quite a few stations are off the air due to tube trouble but an increase in message traffic was reported. 3BNU increased to 50 watts but it did not last long.

Dist. No. 4. 3ZO dropped to three figures but during the past six months has handled a total of 7318 messages. 3AUV works consistent DX on 10 watts. A new 25-watt set is completed at 3MB.

Dist. No. 5. 3CCU, 3BGG, 3ACY, and 3BRF keep things moving in fine shape and are consistent reporters.

**PHILADELPHIA:** Dist. No. 1. 3BUT and 3KD will be off for the summer. 3KD is leaving for

Colorado where he will keep a sharp ear for Eastern stations.

Dist. No. 2. New stations being added to this district giving in good reports are 3AKL, 3TA, 3UD, 3RMS, and 3CAH.

Dist. No. 3. 3OE is working consistent DX. 3DS will be off the air for the summer. 3BJY is re-building a new outfit with prospects of 100 watts.

WESTERN PENNA: Dist. No. 7. 8XE and several other good stations are working quite regularly all the time. Conditions for relay traffic have been reported by Supt. Crossley as being a lot more reliable.

Dist. No. 8. This district still lacks some leaders and has reported very little. 8AKI reports handling 16 messages.

Dist. No. 9. The 9th Penna. district now consists of Beaver, Allegheny, Washington, and Westmoreland counties; while the counties of Greene, Fayette and Somerset formerly of the old 9th Penna. are now known as the 14th Penna. district.

8CEJ using both spark and C.W. has continued to hold up his regular amount of traffic in spite of the unfavorable weather conditions. 8CEI continues to handle his share of the 9th Pennsylvania's traffic, having taken care of 360 messages. 8OW reports only a few messages, but as has been reported many times before this station is not a traffic station but more of a real amateur experimental plant. 8UDX is one of the new stations reporting traffic. 8BRL has been out of the running for the past 30 days on account of scarlet fever and the gang send their best wishes wishing him a speedy recovery. 8CI has thrown the old spark away and depends on C.W. only. 8CI works regular schedule with 9HV getting very consistent results. 8AIO has handled 20 messages which indicates that the station is always in proper condition for handling League traffic. 8ACF will soon be on the air again after a complete overhauling. 8CVX, using one 50-watter has managed to handle 66 messages along with taking care of a lot of school work. 8LJ has been handling traffic in the absence of 8ACF and reports a total of 41, using one 5-watter on 180 meters. 8CKO is working DX consistently. 8EW has been entirely out of the game during the past period on account of alterations at his home. 8CQX is working with one 5-watter between 140 and 180 meters and has been carrying on quite consistent DX. 8VN is still using the 5-watt set on the low wave lengths and has succeeded in working 7BJ of Vancouver, Washington. 8VQ has been on very little during the past month. The aerial at 8VQ blew down and this had something to do with inactivity. 8ZD has finally gotten back on the air again although the aerial and counterpoise have been changed considerable. He uses only a single wire aerial with a two wire fan counterpoise with one 50-watter. Most all of the stations worked with the old set have been worked from the new station.

Dist. No. 11. All stations have forgotten to send in their reports.

Dist. No. 12. This district has improved slightly over last months report but still requires a lot more cooperation among the stations to improve relay conditions. Stations reporting are 8AG, 8QC, 8BRC, 8CH, and 8VH. On account of the size of the district No. 12, the A.D.M. thought it advisable to divide same, creating a new district, the 13th, out of the three lower counties; Mercer, Lawrence, and Butler. The 12th district will now consist of Erie, Crawford, and Venango with Dist. Supt. K. B. Lloyd at Erie in charge.

Dist. No. 13. This is a newly formed district and has therefore no individual report for this period. All stations interested in building up an organization in the 13th district should get in touch with J. H. Leighner, 8ALF, the new appointed Dist. Supt.

Dist. No. 14. This is the new district formed the sub-division of the old 9th Penna. Dist. and is in charge of Thomas W. Scott, 8BJV, of Connelville.

8BIV is working on regular schedule Tuesday and Friday morning 2:30 to 6:00 A.M. and handles traffic between eastern and western stations. 8AAF, first operator at this station, has been

sick during the last period but has been able to make a very nice showing. 8BUT has been having some trouble getting out due to local conditions, but is making a showing now. 8BRM handled only a small percentage of his usual traffic. 8BDU has been shut down for some reason not reported. 8ABS is the BANNER station this period. 8WR is shut down. 8ALT, our star radiophone station has been very busy with school work on account of the coming exams., but with working only on Saturday night schedule, he handled 30 messages. 8BSJ has been busy at school and has only been able to handle a small amount of traffic. 8AYZ, our new relay station in Somerset handled 23 messages but he has been handicapped by the lack of power on account of his location.

### CENTRAL DIVISION R. H. G. Mathews, Mgr.

Altho a certain decrease in station activity is to be expected in the summer months, special efforts will be made by the division manager and the assistant division manager to keep the interest alive and the traffic moving. A fall off is already noticeable in the current report. There is no longer any excuse for closing down our stations because of summer static as by the use of C.W. transmitters and present-day receivers excellent long distance work can be done even in the hot weather. This being the case it is reasonable to assume that greater interest will be manifested this summer than ever before.

NORTHERN INDIANA: No report on station activities for this month. The message total is: District No. 1, 26 C.W.; Dist. No. 2, 50 C.W., and 6 Spark.

SOUTHERN INDIANA: About everybody shut down for summer. Nothing of interest to report.

ILLINOIS: Dist. No. 1. The summer slump has begun to have its effect on the traffic total. Ten out of twenty three ether busters have shut down. 9CFK and 9VM continue to hit about three hundred.

Dist. No. 2: 9BJT forgot to report on the 15th. Not wishing to miss out he used the long distance phone to report—two messages for the month. 9CCM and 9DDY will have the commercial juice next year as a power line is being installed.

9DYN is now QRW with plow and planter. 9CA, spark, was reported heard 4 times on the west coast.

Dist. No. 3. All C.W.; district continues to perform creditably. Six of the boys are re-building; 9BLU, 9CLZ, 9DU, 9BYX, 9AIH and 9MC. 9EAC will hold down Carrolltown alone this summer. 9CXT will be on all summer but 9AWQ is leaving for Chi and 9DPV has signed off for awhile. 9CMC reports school QRM. 9TV has a good report. 9CMN reports QRM horrible in Granite City.

Dist. No. 4. QRN and spring fever have had their effect on this district. Message totals are dropping but the regulars are still on deck. 9BLL lost a bottle and is afraid of losing more so he has deserted. 9BHx has a new cage with 2 amps. of A.C. C.W. in it. 9DQU continues to hit 500 but is back on 20 W. 9CZL goes over the top to the brass pounders league this month. 9BPW is another 1000 miler on 5 W. 9BXD is initiating an OW into the mysteries and promises a new station next fall. 9EFW and 9BIT very QRW outside, this month.

Dist. No. 5. Heretofore known as the dead spot in Illinois, now comes through with the best average of active stations despite the summer lethargy that afflicts us. 9CE using Ford coils as chokes and homemade mica cond. got reports of pure D.C. for their efforts. 9BDA reports QRN very bad so all his work is daylight. 9DMW reports working 1100 miles including Can. 3KN, 5BW, and 1AWB in the same night. We welcome 9DBN, an ole timer, back to the fold. 9AMS, C.M. of E. St. Louis reports beaucoup QRM from St. Louis thus explaining the message deficiency.

Dist. No. 6. Poor month; reports scarce. Glad to note 9DVL clips off 300 and that 9BHD, 9WX, 9DVW, 9EJH, 9CEB, and 9AKU have not deserted

the ship. 9ACW reports local QRM in Waukegon which seems to indicate there is an opening for co-operation. What say, 90F?

**MICHIGAN:** Dist. No. 1. The total for this month has fallen off a little, general QRN is blamed. However, traffic seems to be getting heavier in the morning hours and all stations are asked to use these hours as much as possible.

Regarding Upper Michigan would say that traffic, while not steady as yet, is getting very good from this district to the upper part of the state. 8ATX works 9BOH in Hancock, Mich. quite well. 8AHO worked 9BOH very well which indicated that 9BOH seems a good station for work with lower Michigan. 8DAT has a noon schedule with 8AMS, the latter doing his best to get C.W. working so he can handle traffic with Upper Michigan. 8DAT finds not enough traffic with north route, however, he promises to stick if only a message a month. 90% of the stations in this district (those who have been reporting steady for the past month) will be on the job all summer. In the hot weather some station will be QRV each night and morning in each city especially where there is more than one station.

FUNNY CALLS BY BUXX		
J.A. PLUMMER AT RUTHERFORD N.J. USES <b>2KW</b> FOR HIS CALL - NOT POWER	WE WONDER IF M.F. HARBOD ORLANDO FLA. WEARS GLASSES <b>4II</b>	E.H. MAYO'S CALL (BARB, CALIF.) <b>6BIT</b> SOUNDS LIKE 75¢
F.H. SCHELLE'S CALL <b>1MO</b> SOUNDS LIKE A COW SINGING	R.N. MACLEARY COLLINGSWOOD N.J. <b>3BVD</b> IS ALL SET FOR SUMMER	G.C. FORLER ENUMCLAW, WASH. <b>7II</b> HIS CALL SOUNDS LIKE "COME ELEVEN"
THE CALL OF A.C. TRANTHAM MUSKOGEE OKLA. <b>5MF</b> SOUNDS LIKE A CONFECTIONER	WE WONDER IF THEY KID A.R. STACY AT SYRACUSE, N.Y. <b>8BUM</b> ABOUT HIS CALL	R.M. PLANCK PEORIA, ILL. <b>9COD</b> PAY ON DELIVERY

8AND is in a new location (Police Headquarters—Hil) and can now hear stations better than through the window QRN in the old location. Most every night after 11 E.S.T. and days at 1:30 P.M. 8AND will work on schedule with Pontiac for south traffic.

Dist. No. 4. 9BOH and 9CE were vying for the highest honors with 9CE in the lead—we have two real good men here. We also have two others that are budding in; 9CWI and 9BMQ; both are showing a great interest and are tuning their set for DX. 9DRR is our old faithful for east bound traffic. He is QSO New England while others are west. 9BMQ has opened up the Menominee route. 9OL is inactive because of school QRM.

**OHIO:** The number of messages reported for Ohio has dropped decidedly. Some stations have been out of commission for at least a part of the month for remodeling. Other operators found their school work too heavy to devote their set for time to relay work. Increasing static has in all probability retarded traffic considerably.

Dist. No. 1. This district is coming along in fine shape. Mr. C. E. Nichols, 8AA, Lima, Ohio, is taking hold of matters. We have with us a new station, 8BSI, who sent in a nice report. 8QK will be off the air for awhile for removal to new location. 8AA has been out of commission due to demolished antenna and tubes gone west.

Dist. No. 2. District No. 2 holds the star stations for the state this month. 8IJ is the lucky fellow with 1022 messages. 8EXX handled his bunch during the first week of April, school and other things keeping him away from his set the rest of the month. SYAE was off the air most of the month because of lack of action at the radio inspector's office.

It is with regret that the A.D.M. announces the resignation of C.M. Chas. C. Whysall, Marion, O. Mr. Whysall is preparing to leave for Los Gatos, Calif.

Dist. No. 3. This district is the leader this month, both in number of stations reporting and in number of messages handled. 9DAE has a schedule with 8AXN from 4:00 to 7:00 A.M. three times a week and from 6:00 to 7:00 on the other four days. 8TT was on only 8 days during the month. After over-hauling his station he got the sixth district the first night. The Akron stations continue in doing their usual good work with only a slight decrease in traffic. 8BWA has been dismantled.

Dist. No. 4. District No. 4 seems to have almost gone asleep. The number of messages reported are only a fraction of the usual activities in this district. Superintendent L. E. Farrow reports that several stations are being rebuilt which accounts partly for the small number of reports. 8DAG has been sold and Mr. Pyle is taking up his new work as radio inspector. 8DAG was climbing rapidly toward the brass pounder's League but seems to think it more attractive to be a radio inspector. 8CF is with us for the first time.

Dist. No. 5. This district is to be congratulated this month inasmuch as most of the stations reporting are in the 300 or better class. 8AJX is suffering with bum auralitis. 8BBH is mourning the loss of a tube that went west. 8TJ has been happy by having his spark set put back on the license by the inspector. 8TZ gets around QRN by working in the afternoons thus handling 35% of his messages in the daytime.

Dist. No. 6. 8ZV reports no messages but is busy assembling a new 500-watt pure C.W. set and when finished will have regular nightly watch if traffic warrants. 8AL has two commercial and one amateur licensed operators in charge. 8CRC and 8ABE are both too busy with school work to handle as much traffic as they would otherwise.

**KENTUCKY:** Station activities: QRN is heavy and is keeping the traffic total low. 9DR1 leads this month with 223—keep up the good work Phillips. 90X blew one of his 50's and his actual will be at half-mast for the rest of the summer. Plumm has been our most consistent worker during the past season and rates a much needed vacation. 9EP is on regularly but says he can't find enough traffic to handle. 9ASE is QRW at school. "Hot stuff when he is on! 9LH too QRW for traffic. 9CY is on the air with a new 100-watt transmitter and has worked Iowa with key and voice. 9EI is experimenting with aials. Using 125 V. "B" Bats, and a five-watter he worked 1AJP and several others. 9APS had the plate of his new 250 come loose and is having it replaced. 9DK seems to be a very consistent worker. (F.B. OM.) 9ARU is to be commended for his good work. 9BEH is installing a new mast. 9CON has been doing very well at the present time he has plenty of empty sockets.

#### DAKOTA DIVISION

N. H. Jensen, Mgr.

Atmospheric conditions have continued to be quite satisfactory during the past month, and while traffic has dropped off somewhat, there still exists considerable activity in the division. We have a very good organization going now, so let us keep it going fellows during the summer months the same as we did during the past winter.

**MINNESOTA:** Dist No. 1. Only about one-half of the stations sent in reports. Even though this report was held until the very last day in hopes that some stations would be in a little late, it did very little good. From what reports were received, it appears that traffic is moving throughout the district with fair regularity. Canadian traffic is still a stumbling block. The volume of traffic seems to be falling off and stations are complaining that "they are getting hard to raise." The traffic honors for this district for the month of May go to 9DUQ. He handled practically all the traffic in Duluth. 9GW has been out of commission due to having blown a 50-watter. 9ADF has closed down for the summer. 9BAV and 9BAF continue to handle a large volume of traffic. 9EAU deserves a great deal of credit for

the large number of messages handled. He has daylight schedules with 9DUQ, 9EGF, 9DTR, 9EGR, and 9CZE. 9DCC and 9CMJ report a fair amount of traffic. We regret the loss of station 9AOR who has moved out of the district.

Dist. No. 2. Dist. Supt. Goldberg says that traffic and activity in his district is dropping off somewhat, but he believes that 20% of the decrease is due to the fact that stations realize that the "Tnx for Crd." type of message is "debutique." A number of the stations in the Twin Cities will stay on the job all through the summer. 9DGE, having sold his 250-watter, is polluting the pre-supper time period with 1 K.W. spark, but is getting 10 watts for DX again. 9BTL has blown out both of his five-watters and is now on with a 70-watter. 9DYZ is on the air at last with 250 watts and sink rectifier. (Some code practice would add to the efficiency of the station.) 9AXX is having trouble getting out with three and sometimes four 50-watters. 9AUA is putting 450 watts into his tube (50-watter) and wonders how long he can get away with it. 9APW has put in a series condenser for cutting down QRH to 210 meters or less. Wish some of the high-wave gang would do the same. 9ZT worked the west coast 32 times, which shows that relay consistency of distant operation is possible. One night 22 states were worked.

**NORTH DAKOTA; FIRST IN EVERYTHING—THE FIRST 100% C.W. STATE!** There is not a single spark left in North Dakota and that it is the first 100% C.W. state. 9AHC is busy with graduation work at present. 9ABU reports consistent work up to 1000 miles, but says that his wife takes up too much of his time in the summer. 9DLF was discharged from the hospital just in time to mail his report. 9ADZ is having his home re-decorated and therefore did not handle much traffic. 9DLI has a 50-watter, and 9AAU has fallen and bought a 20-watter.

**SOUTH DAKOTA:** Dist. No. 2. 9CGA takes the lead this month in handling traffic. 9DWN has continued to do good work the past month and is also on regularly with 5 watts D.C.C.W. 9BRI has been reported consistently by stations over 1000 miles in spite of the QRN during the past month. 9PI reports no traffic handled. 9YW has not been on much the past month. The D.S. Leland Thompson, Winner S. D., would be glad to give some dope to any of the gang who would like to try R.F. amplification with a loop for summer work.

### DELTA DIVISION

By way of getting some information as to what is going on in the Delta Division, let it be said that the following reports came direct to Headquarters. Mr. W. W. Rodgers will send in his first report next month and no doubt the Delta gang is eagerly waiting to see something about themselves—T.M.

**TENNESSEE:** Memphis seems to be the center of amateur activity in the Delta Division at this time. We welcome our new stations and wish them many messages. We have at present the following active stations on the air in Memphis: 5NZ, 5ZABA, 5PF, 5PV, 5ZB, 5EK, 5MO, 5NV, 5AHJ, and 5BW. Our high power fiend, 5ZB (ex-500, has the only 250-watter here, but is having considerable trouble with his power transformers. Our silent wonder, 5IK, has found the YL's more interesting than the ole key knob and we hear that he has junked his set as a result. (He'll be back—C.M.) 5NZ is still going strong with his 100 watts and handling his share of the traffic. 5PF is doing unusually good work on 5 watts, radiating 3 amps, and working the first district with ease. (F.B. OM.—D.S.) 5EK and 5MO are still with us and are very consistent in their work. 5ZABA has gotten up a new mast and punches some awful holes in the ether here. (Steinmetz pse. note) 5PV, 5NV, 5BW (with C.W. and Spark), and 5AHJ complete the list of Memphis boiled owls. 5NV, Mr. Maurice Brooks, has been appointed city manager of Memphis and is doing extra good work in his new position. (Wish we had more like him—D.S.)

Nashville: No traffic is going thru Nashville

on account of a series of disasters to the stations. 5FV had a swell 60-foot tower up and ready—and then a mule became entangled in a guy wire and blooie—no tower. 5AAB's suspension rope broke, so he is ND now. 5ER and 5AM have been off for some reason not made public. (Come on you fellows, let's have some real traffic in this district.—D.S.)

**Chattanooga:** 5HL reports 304 messages for April. This is the only station in Chattanooga working during April. We regret to report the death of the father of 5AAG during April. For this reason 5AAG was silent during the entire month. 5AMF is a new station at Cleveland, Tenn.; owner Mr. J. D. Slaughter with twenty watts C.W. This is the first station in Cleveland, Tenn. Neal Taylor, 5LU, has returned to Chattanooga after a trip around the world. Neal (Buck) Taylor was an operator for a time at 3YE.

### EAST GULF DIVISION B. W. Cochran, Mgr.

Report of operation for May, 1923.

Traffic has been moving through the division exceedingly well this month considering the severe static. Much credit is due the gang as practically all their work has been accomplished by piercing the heavy blanket of QRN that covers our division each year from April to September. Summer work means operation in the early hours of daylight and moving traffic in jumps.

**SOUTH CAROLINA:** A.D.M. Etheredge has been seriously ill for several weeks but is now convalescent and 4EG will soon be heard again. 4DX will probably install a set of 50 watts and will help move the traffic. 4JK leads the state in traffic handled. He is off the air now as is 4LK; a serious loss for our summer work. 4FQ and 4PV continue to handle considerable traffic.

**ALABAMA:** Mr. H. S. Brownell has been appointed Dist. Supt. of Dist. No. 1 and Mr. D. J. Connolly, City Mgr. of Birmingham. 5AGJ is on the air regularly and handles quite a bit of traffic. 5UP is on most every night and is reaching out very well. 5MJ has a new set ready. 5CP is doing good work. 5BQ is reaching out and handling traffic. At Anniston most of the work is being handled by 5VV. As soon as school is out 5GP will open up with 50 watts. 5ACM will have a 10-watter going. Another station to open is 5ON. 5ZAEA and 5XAE have managed to get a few messages through but static is very bad. The outstanding station is 5XA. During the summer only two of the ten operators will stick and they expect to keep the station open.

**GEORGIA:** 4HS has moved the most traffic on both spark and C.W. He has remodeled his spark and now has a sync. gap. His low power C.W. set is reported from every district. 4DG worked but one week and handled quite a few messages. He has closed for the summer. 4MY has installed a 100-watt set to help out the spark through the summer. 4JL has been doing fine daylight work. 4MB is remodeling his set. 4BI with loop modulation on a fifty-watt fone has reports from Ontario and most eastern states. 4YA is closing for the summer. 4HW is going strong and handled a lot of traffic. 4DO is getting to all districts with 20 watts and is doing fine daylight work. 4CY is reported in Honolulu. 4DF is using C.W. during the summer. With his new 100-watt set, 4DN is getting to every district regularly. 4NA has gotten his 50 to percolate and is handling traffic. Atlanta has but two spark stations left; 4MY and 4HS, and they are seldom heard now. All Atlanta stations QRX from 7:00 to 10:00 P.M. At Savannah, 4EL is doing most of the work. 4BY is the only other station on the air now. 4FD and 4GN have closed down for the summer. 4BW, 4BK and 4AS are heard occasionally. 4AG reports static so bad he can't keep his fones on. He is going in for daylight work. With the completion of a 100-watt set, 4FG will be ready to work. 4FB is tied up with college exams, and has but little time for DX work. 4GP is reaching out very well. 4LV is doing excellent work. 4BQ is off for the summer. 4DB and 4MR clear Atlanta traffic to the north and west. 4MJ has got his 100-watter percolating. 4EB is re-

ported heard in the Indian Ocean off the coast of Ceylon. 4OD is reaching out and has handled a few messages.

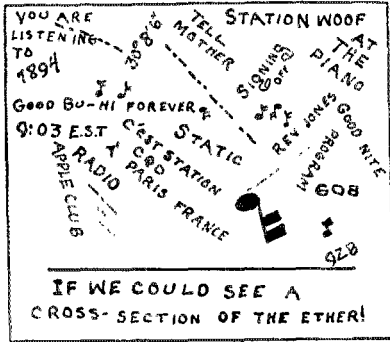
**FLORIDA:** A.D.M. Clark reports a decrease in activities and messages, but does not blame the already over-abused "summer season" for it. Thunder showers and lightning have been prevalent throughout the state almost daily, and many of the gang are tied up with exams, and graduation preparations.

Dist. No. 1. 4FS evidently thinks it is still winter time, for he is not standing idle and offering QRN as an excuse. 4HZ has rebuilt and reports considerable improvement and better DX than with his old layout. 4MT has been out with antenna trouble.

Dist. No. 2. 4IZ, 4JI, 4JZ, 4JY, 4AR, and 4ZH are the main traffic handlers. 4NU is aboard a ship.

Dist. No. 3. 3BC is the only active station in the district, but his spark reaches out in spite of summer WX.

Dist. No. 4. All we have from this district is a bunch of promises. 4DP is still getting his 100-watter into shape. 4BS and 4DP have been scouting around among their men and assure us that several good stations are under construction.



**HAWAIIAN DIVISION**  
K. A. Cantin, Mgr.

Members of the Hawaiian Division are preparing for relay work with the mainland this coming winter and as new stations are erected they are lined up for future A.R.R.L. routes.

Dist. A. Honolulu, Oahu: Very little activity although reception of mainland signals still QSA. 6ZAC's 100-watt "record breaker" has been sold and will be on the air soon under the call 6CME. T. P. Traugott has been appointed publicity manager for this district.

Dist. B. Hilo, Hawaii: R. Smith, 6CEU, has been appointed district superintendent for Hawaii. He has received favorable reports from the coast on the reception of his signals and will be QRV for business shortly.

**MIDWEST DIVISION**  
G. S. Turner, Mgr.

Our message total has dropped "ker-plunk," but don't worry, fellows, its only to be expected this time of the year. We have had our fun and made a few records for the old Midwest during the past season and now we can afford to rest on our laurels. However, one thing I want to ask and that is that you continue to perfect our organization and that reports come forward regularly.

How about daylight routes now? You route managers show yourselves. Now is a good time to show the other D.M.'s what a valuable asset to their organization a D.M. can be. Yes, we are the one and only division that has such an office as I'm backing my rep. on you, I'm sure you'll do your job justice this summer. Make 'em all set up and take notice.

**NEBRASKA:** During the past month the A.D.M. has done a large amount of traveling over his territory. A little more cooperation is requested. The writer was in Lincoln a short time during May with R.L. and found the situation very favorable. They have a cooperative organization of amateurs and broadcast listeners. 9BWM, 9BXT, and 8YU have been the most consistent stations in this territory. Mr. Ray Norene, 9CPB, (better known as pre-war 9CA) has been appointed route manager of Nebraska. The C.M. of Omaha reports 9ASO now on with 100 watts but still hanging onto the old spark. 3CPB continues to handle the traffic on a five. 9ALK is now on with C.W. 9EW contemplates a new antenna system. Mr. Chansky complains that some station operators shy at a report as if it were an income report instead of radio. BK7, an experimental station at Ft. Cook on 550 meters, stands a good chance to take old AD7's place.

**MISSOURI:** Most of the fellows were heard practically every night trying to get through the QRN, but nothing doing. The A.D.M. was personally on the job at least some part of the night and found OM static doing his utmost to discourage traffic. 9BZH is making his last report as he is leaving for school. He handled 101 on C.W. and 74 on spark. Our old stand-bys at Sedalia only handled 30 messages last month; 9BMN 5; and 9EPB 25. At 9CKS things fared better; he accounted for 134. 9DAE, the "old reliable" reports his temporary C.W. moving to Butler, Mo. Jack will try to continue his schedule with 9BRW and 9AYL. 9RR got a new line up to the south via 9CRM. Kansas City is on the job but the message total took a big drop. It is reported that shooting tubes caused the fellows to stop and look, and as a result they are doing nothing but listen these nights. 9AUK sent in a report at the last minute and saved his rep.

**KANSAS:** Daylight is again coming into its own. Daylight organization is not perfect yet, but R.M. 9DTA, says it should not take long. 9AEY is leaving for a stay in California, and 9CCV has been appointed to take his place for the summer. 9CWC is our new C.M. at Wichita, an old timer and a good hard worker. He is starting out fine with his report on time and everything. 9CAC wins all honors this month with 354. 9CFI is second with 314. These are the only stations over 300. 9CWC is now arranging a schedule with 5ZA and will handle traffic west. In some fierce storms 9AOG and 9EHT lost their aeriels. There is a new station at Wichita; call 9REZ.

(APRIL) IOWA: Seems we took a slight slump in traffic this month. From 7000 to 3000 is quite a drop. 9AHH is special star station this month, handling 571. 9AOU, a close second with 504. Other stations over 300 are 3DOF and 9JL. 9BIF, C.M., reports good work being done at Des Moines. Credit is due to: 9CLQ, 9CSY, 9DAI, 9BIF, and 9BRS. 9BES and 9BIF are now partners; also 9AMI and 9DKY. The last mentioned now have a 150-watt set. 9ARZ's mast fell and now is out for awhile. 9BWN is putting in a C.W. set. 9BXJ handled 30 messages on his receiving set. (You can't keep a good man down). 9BSG is going to install 250 watts. Other good stations doing good work are: 9CBZ, 9AMI, and 9CLQ.

(MAY) IOWA: Traffic has again fallen off. 9DKY and 9AMI combined are the star stations this month. They handled 160. Does not take much to be a star station now. 9AMI will soon have a 100-watter and 9DKY a 50-watter. Yep, dissolved partnership. 9BIF is thinking of installing a 250-watt set. 9AHH was only active station in his town out of the gang during May. 9BXT has junked his spark for a 50-watt bottle. 9JL was only active station in Ft. Dodge. The following are new fists just lately heard: 9AED, 9CNE, and 9CWF. Bailey says not much doing now. He only heard from 9BGT, 9DJJA, 9BCD, and 9CS. 'Smatter? Have you noticed our classy 6'l' paper? Write me for a copy.

**NEW ENGLAND DIVISION**  
I. Vermilya, Mgr.

**MAINE:** Sorry to say, this old faithful state

has this time fallen down. No report has been received.

**NEW HAMPSHIRE:** H. E. McLane has certainly pulled his territory out of that rut in which we still find his neighbor Vermont. Mack has brought the total from six or seven to nearly a thousand. 1MC is moving and will have a new C.W. set; likewise, 1AEQ. Strange to say, 1CM has batted out 67. 1GL joins the brass pounders' League with 414.

**VERMONT:** Although we know R. P. Slayton puts all the energy he has forth to accomplish results, a train can't run without a track. We really feel sorry for such a state of affairs as Vermont is in. This should be a wonderful country for a broadcast listener to live in. No dots and dashes to disturb the atmosphere at all. 1ARY sent 40 on C.W. and 5 on spark and that's the total noise raised. Slayton reports the summer as being a big contributing cause.

**MASSACHUSETTS:** A. S. McLean and Phillip Robinson never fail to turn in good reports and the D.M. wishes to thank these gentlemen through QST. 1RR is doing very good work and the only thing we have against him is his stone crusher. Word comes that old 2CHI and 8IK have moved into our midst, and we welcome these Knights of the Key.

1COT reports 260 messages which is very good work for this time of the year. These were all done during daylight. 1CPN handled 333 while 1BSZ swung out to the tune of 314. 1AWW shines out with 207. 1CNI stepped on it for 432. You have to go some to keep up with this bird. 1SN works regularly with Canadian 2BN. He has been heard in Hawaii on 20 watts, which is going some. 1DY went and got married, and after that excitement dies down, we expect to hear some C.W. from the old shack. 1CPI handled 233 which is very pleasing. 1ADN has been doing very good work on a 50-watter. He worked 1500 miles and passed 203 messages along. 1BFA takes the booby prize. He handled two messages, but he says they got there, and that's doing something. 1CMP handled 266. 1BBM who holds all Cape Cod down by himself handled 51. If it wasn't for him, Cape Cod wouldn't have a transmitter.

1ZE wishes to announce that he has two calls now, and in case the second one is heard before it gets in the call book. The new call is 1XAL. Voice signals from 1XAL have been heard in France.

**RHODE ISLAND:** This little state still stays in the lead. If we could only transplant half of the talent of Rhode Island into Vermont. 1GV is also moving. 1AQU has been doing some really excellent work and deserves special mention for his whole hearted efforts to move traffic along. 1AWE is still doing good work with his 100-watt set. 1BES hasn't been on much due to the failure of a 250-watt tube he has been using. 1II has just recovered from the measles. 1BVB seems to be the only station in the Western section that is doing any work. He is on week-ends and will continue so for the rest of the summer. Newport seems to be rather dead this month. Guess its these balmy days. However, there are a few. 1BQD and 1APG are doing excellent work. 1AQU handled 250 which is a very good showing.

**CONNECTICUT:** New London has been rather dull for the past two months. 1MY is working a noon schedule with Worcester, New Haven, and Hartford. It is quite noticeable that during the noon hour there are a bunch on the air. We have noticed the following 1ZE, 1AMR, 1BMK, 1BVB, 1AQM, 1VK, 1BSZ, and 1MY. 1BY put up a new aerial and counterpoise and now he works nines on a 5-watter.

The New Haven bunch are still lost. Guess they haven't found Marty yet. 1AJP has been heard in New Zealand two feet from phones. 1QP is moving his set to Camp Kewple.

#### NORTHWESTERN DIVISION

B. B. Bliss, Jr., Mgr.

General operation conditions have fallen con-

siderably during the past month. The coming of the summer QRN and the restriction placed on the gang by the radio inspector as to operating hours, are the chief causes of this reduction.

**WASHINGTON:** A re-division of the state has been made which we hope will result in a much better degree of efficiency and cooperation than heretofore.

Dist. No. 1. Two new stations have opened. 7AJK and 7NS. 7AIO on spark has been keeping the standard and is doing good DX. 7JS is off again on account of blowing four tubes.

Dist. No. 2. All stations in this district have been off more or less on account of changes and tube trouble. 7ABB has installed a M.G. and is now after another tube. 7AFH and 7EQ are both repairing stations. Seattle: Spring-fever has hit Seattle a hard blow so the stations are



not on so often as might be wished. 7JU has repaired his pole and will begin to radiate ohms soon. 7FD is coming back with 100 watts. All stations are trying to get straight C.W. so that they will not cause too much QRM.

Dist. No. 3. The voluntary-lid policy is being observed in this district with the result that there is a very noticeable decrease in the amount of traffic handled. On account of not being on the air in the late hours a number of the stations have been making some experiments along the line of antennae and toward securing a better plate supply. 7AIF has found it impossible to be on the job and is certainly missed.

Dist. No. 4. The district around Gray's Harbor is being reorganized and no report is obtainable.

Dist. No. 5. Traffic in this district has been on the move the past month. All stations have been on the job most of the time and report QST and DX easy. On account of the close proximity of a Cottrell plant to most of the stations it has been impossible to get the results that could be obtained were this nuisance eliminated. BTZ is on the air nearly every night with 100 watts and reports working many stations in the central and eastern states. 7GP is still on the job with a new M.G. set and two transmitters.

Dist. No. 6. Many new C.W. stations are on the air and are active in handling traffic. 7LY with 5 watts is getting DX right off the bat. 7AJV has been guilty of fishing instead of traffic this month. 7BJ has a new antenna on 75-foot poles and is reaching the eighth district on three five-watters. 7BJ admits that it is almost as exciting to run the bottles on 1500 volts as to raise the DX itself.

Dist. No. 7. Mr. Frank Mueller, Jr. of Wenatchee, Washington is the newly appointed D.S. There is a chance here to work up some good inter-district routes so give Mueller a hand, gang.

Dist. No. 8 and 9. There is no report this month on account of sickness of 7GE, the D.S. Here's hoping for a speedy recovery O.M.

Dist. No. 10. Spokane is entitled to a City manager, and League members in this city are requested to send in recommendations for men able to handle this appointment.

The loss of 70E, who has resigned as a director, will be keenly felt by stations in this state (and all others—D.M.) as Mathes has been the most active of any amateur in connection with the welfare of the amateurs in the seventh district.

**MONTANA:** The amateurs throughout Montana are hostile over the compulsory quiet hours and the loss of waves below 150 meters particularly as so much progress has recently been made on these low waves. 72F has had sickness. 72U is going to spend the summer in Bozeman at school. 7NT is a new station operating in Butte. The active stations in this state are: 7AGF, 72U, 7HM, 72L, and 7HS.

**IDAHO:** Dist. No. 1. 7JF is still off the air but has been greatly encouraged by 7AGU, the new Moscow station, getting 3.4 TC amps. into his antenna with only a 10-watt set. Both 7JF and 7WG had trouble from wind storms. 7JF's pole is bent double at the top. 7JD in Moscow is installing a one K.W. spark. (Lord help the BCL!)

Dist. No. 2. 7IO and 7LN are now left to pound brass in Nampa as 7CG is moving to California where he will have a 50-watt lantern to keep in touch with his old friends back in Idaho. 7IO is strong and steady and is being heard all over the western and central parts of the U.S. 7LN is also reaching out but is having trouble with broken insulators in his guy wires. Old 7HJ has been issued a special and is now signing 7ZL. Other active stations are 7PJ and 72N.

**OREGON:** No report received from the A.D.M. who no doubt has been too busy organizing his state to make out a report.

#### PACIFIC DIVISION

J. Vance Wise, Mgr.

This month's report from the Pacific Division will be rather abbreviated and incomplete because the writer, the A.D.M. for the state of California, has fallen into the job of compiling the report rather suddenly, due to the departure of J. V. Wise the "old reliable 6ZX" for the high Sierras to spend the summer. This surprise is more than compensated for by the fact that the writer has the pleasure of announcing to the readers of QST that the aforesaid 6ZX has joined the Benedicts and will make a honeymoon of it in the mountains. Let us hope that radio has gained another OW.

Well to get back to business, 6ZZ, Mr. Gooding of Arizona reports that after getting off to a record-breaking start for the month, the demon QRN has slowed everything up in his state. He hands 6OD a pretty compliment on his ability to take traffic without a break through all kinds of QRN and QRN. 6ZZ has not found anything to beat the Reinartz as yet. 6HV is on the air handling traffic. 6ABK is temporarily off on account of moving. 6BSQ handling business OK. 6NX is now using a 50-watt and doing good work. 6AME is doing good work on pure C.W. using storage batteries for plate supply. 6BRU is having some tube trouble but is on the job bucking QRN. 6HP of district No. 6 says very little doing this month partly due to bad spark QRN. Don Koch of this district has handled 50 messages leading the district. 6BPL says the stations in his district are having trouble getting eastbound traffic through on account of lack of stations in Nevada and Utah. 6BGY and 6TU will soon have 100-watt sets. Both have been doing good work with the low power. 6LV is having static and aerial trouble but turns in a good report. 6ZH reports a scarcity of stations reporting for his district, probably on account of static. He says he can't work anybody but sixes. In the northern part of California stations 6LU, 6BUA, 6BTZ, and 6APE are heard regularly. 6CC has not been on much this month but is still working east OK and invites traffic for east of the rockies.

#### ROANOKE DIVISION

W. T. Gravely, Mgr.

Fellows, the warm season swooped down on us

this last month, and caused a slump in traffic as the report shows. However, the old timers are sticking on their keys with regularity though not handling as much traffic.

Daylight communication is fine and those of you who are not performing in this respect are missing something.

3BMN—C.W.—416

Raymond J. Carr,  
Petersburg, Va.

**VIRGINIA:** Dist. No. 1. Mr. Louis Ballou succeeds Mr. Kubiak as Dist. Supt., but hasn't had sufficient time to get things under way. Mr. Kubiak is reported as improving.

Dist. No. 2. Mr. Raymond J. Carr, Petersburg, succeeds Mr. Selp as Dist. Supt. 3BMN is hammering out traffic with regularity. 3ABS, new man, shows pep. 3AOT, also a new man, is hitting on all six. 3ATB and 3AUU are remodeling. 3SG has 5 watts and getting out in good shape.

Dist. No. 3. 3CEL changed from BCL to a real brass pounder in a few months and hits the high spots. 3NF has been re-assigned to G. R. Shafto, Rio Vista, Va., and is punching out in great shape. 3MO has his antenna up and is doing fine work. 3AJG, 3JT, and 3BIJ are all doing nicely.

Dist. No. 4. Mr. O. M. Selp takes over this district, and while 3TJ is the only active station, he may be relied upon.

Dist. No. 5. 3IW has three operators on and maintains a nightly watch from 10:30 to midnight. Much traffic is cleared. 3CDY and 3CER are both preparing to handle lots of traffic.

Dist. No. 6. 3BHL, 3ALB, and 3GBZ are performing, and there are other new stations coming up.

Dist. No. 7. Mr. H. L. Keller, Staunton, succeeds 3ZAA as Dist. Supt. and all reports should be sent to him in the future.

Dist. No. 8. 3APR continues his daylight operations and handles considerable traffic. 3AEV and 3BZ are knocking off a few.

Dist. No. 9. No reports from the Dist. Supt. which will likely mean a change if there are no developments in the very near future, as the A.D.M. is not at all pleased with the situation in this district. 3BKX is out of commission on account of sickness. 3BHP is having transmitter trouble. 3BIY is still in the air but handling very little traffic. 3RF, QR for YL's and has quit.

Dist. No. 10. 3AOV, did you say C.W.? Let's hear it!

Report shows 3TI, 3JU, 3UV, 3BBT, 3BNE, 3ATS, 3JN, all active, which is a good start. Ballou. (FB)

**NORTH CAROLINA:** It is the same old story fellows! Listen at your A.D.M.'s own words. "Report this month must be meagre due to fact that the fellows have gotten in behind the district men and made them send in the reports." Now fellows, how long are you going to stand for this condition? What is your answer? Let's have your say if you are genuinely interested.

Winston-Salem District shows up fine with 4LJ; 4FA doing consistent work. 4GS has gone in for broadcasting, while 4DC continues to hold down the key at Greensboro. In the eastern district there are 4BX and 4FT, real performers, who can be relied upon. 4NT is heard now and then.

**WEST VIRGINIA:** Very little from this state. SSP is handicapped on account of building operations in the vicinity.

**PORTO RICO:** A.D.M. Rexach says that P.R. was silent during the first two weeks in April, as 4OI, its only active station, had to shut down for awhile. Traffic with the mainland resumed on the 16th and several messages handled. Brother Rexach is now being seized by QRN but is frequently heard pounding away. (More glory to you OM.)

#### ROCKY MOUNTAIN DIVISION

N. R. Hood, Mgr.

"Ah!" says demon static this month, "I certainly knocked the Rocky Mountain Division for a row of Eskimo shacks this month." Behold the



shake up men, look how you pile up on the rack this time.

7DH—C.W. 286 msgs.  
Dr. L. G. Van Slyke,  
Hyattville, Wyoming

6APL—Spk.—207 msgs.  
Brigham Young University  
Provo, Utah

Our five-watt wonder rolled up a total of 286 messages and occupies the coveted seat at the head of the report. 7DH is the bird we waited for, for more than six months to get enough material from the BCL manufacturers so that he could complete his C.W., and now that it is going, we will all have to go some to beat this new set and its op. 7LU has changed from rectified A.C. to pure D.C. with a new motor generator set and in the course of rebuilding no messages were handled. 7AFW, another of our five-watt wonders, fell short this month of his usual total. 7ZO and 7ZV were both more or less out of commission this month due to the new regulation on special amateur wave lengths and new aerials had to be erected so as to get down to the new special station wave length. Both are in full swing now. 7LU is now a special station with the call 7ZD. Activity is nil in the Southern part of the State.

UTAH: Hurray, we knew it was coming some time! Power to you, gang; one of your stations rests in the box seat as the D.M. once said would happen. The Utah Salt miners pushed the Colorado gold hunters off the top seat. Sure looks like things are humping in Utah. (F.B., men.) 6RM is doing good work in his new location. 6AWH has been out of commission pending the installation of a new ten-watt tube set. 6BLH has a new ten-watt set with self-rectifying Hartley circuit and put thru 80 messages for a try out. 6CBU, another new station made a fine showing for the first month of operation slipping thru 111 messages. 6APL reports that this will probably finish up work for this summer as school closes. 6ZT still pounds them out. 6BUH operates both spark and C.W. and put messages thru on both sets. Traffic has begun to slow up a little due to QRN. Hold up the interest men, as we want to go thru the summer with good traffic totals regardless of QRN. The Salt Lake gang kept the tubes pretty hot during the month and will continue to do so. 6ATQ and 6APL in Dist. No. 2, held things down in fine shape this month. 6ZV is still at the brass, but lower than usual.

COLORADO: Well, well, gang, how cum? You put more messages thru than the rest of us combined. But the average is 75 per station. Mighty fine tho as this month was the "cramping" month for school work. All will pass I am sure and then the Colorado totals will take the big jump. Lots of the old standbys deserted the brass this month and the majority of the traffic was handled by comparatively new men. 9BUN reports 217 messages this month on 10 watts disregarding bad QRN throughout Colorado.

A new 100 watt will be installed here. 9BUN is a good example of what properly rectified and filtered A.C. sounds like. Clear as a flute up here in Wyoming, OM. 9CFY at Colorado Springs reports bad QRN and work east almost impossible. 9BTO dropped from his usual total this month. 9DTM slipped from around 300 to 44 messages. Another old standby blowed up. QRN, OM? 9BVO is remodeling and says he will have a real station this time. 9BJI, another old standby, fell off this month. He crammed for school. 9EEA did good work this month and is rebuilding. Seems as tho the spring house cleaning among the hams came a bit early this year. 9CWJ (ex-9BVJ) is a new one in DX circles in district No. 1. 9DHI and 9APF were closed the biggest part of the month due to school work. 9BJK found that 5 watts did as good as ten so keeps one for a standby tube and is QSA both coasts on five watts. 9AMB, one of our 500 hitters, slipped a cog this month and put thru 15. Whatzamatmer OM? 7LU is making the old generator get four amps. out of one five.

A broadcast license, call KFIC, has been issued to 9DHI for the broadcasting of A.R.R.L. matter. It is for the expressed purpose of educating the BCL and the late news as to the origination of most of BCL's QRM was a surprise to them, as the official observers reported very little amateur QRM on broadcast waves.

The southern part of the state is on the job with good totals. 9CDE has a wonder five-watt. 9DFH put through 35 regardless of QRN. 9AUW rolled up 45, and 9EAE with 7.

The following new appointments were made throughout the division since last report: Official A.R.R.L. Broadcasting Stations: 9BUN, 9CFY, 6APL, 7DH, 7ZV. Official Observing Stations: 9EKH, 9CAA, 9CFY, 6RE, 6APL, 6ZT, 7AIZ, 7DH. Official Relay Stations: 9EKH, 6BUH, 6BLH, District Superintendent Dist. No. 1 Utah: Art Johnson, 6ZT. Assistant Division Publicity Manager for Colorado M. O. Davis, 9CDE, La Junta, Colo., and H. C. Wilson to the same position in Utah, 6ZM. 7ZO is a broadcasting station for Wyoming. The quota of three for this state now being filled. 6BKE also appointed as Observing Station in Utah.

**WEST GULF DIVISION**  
F. M. Corlett, Mgr.

Summer, with it's accompanying heat, electrical storms, and the almost incessant QRN coupled with the call of the great out-of-doors, decreased our total messages handled to below half of last months total. It is interesting to note, however, that while there was a falling off in the number of messages handled there was a decrease of only 6 stations reporting indicating that the interest and determination is not waning.

SECTION	STATIONS	MESSAGES
Northern Texas	25	2129
Oklahoma	14	1447
Southern Texas	19	1269
New Mexico	3	170

This traffic report covers the period from April 20th to May 20th.

Official Relay Station appointments were issued to: 5SS, 5KG, 5AER, 5AFU, 5KE, and 5ZAT.

The star station of the division for the month is 5VY, reporting a total of 501 messages. 5AIF, comes next with 340 to his credit.

Four more towns were added to the relay routes of the A.R.R.L. during the month by the following new A.R.R.L. stations: 5AID, 5ALJ, 5AKT, and 5ALI. A.R.R.L. stations were established in the following towns, which have been A.R.R.L. relay points for some time: 5AKF, and 5AKE.

NORTHERN TEXAS: Various kinds of interference is reported, it ranges from the old worn out QRN to school work and OW's. QRN is

**RADIO**  
**5NN**



being overcome with loop reception in most cases and especially on C.W. reception it is improving F.B. A good many are finding time for both school work and radio making excellent grades at school and good averages in relaying. The D.M. is not qualified to express an opinion on the O.W. interference, but believes it can be handled diplo-

matically. Fort Worth stations carry off the honors for active work. 5VA is in the oil field. 5IX is rebuilding and enlarging. 5ZC is trying to keep the rest working and find time to get a C.W. set together. So—route your Dallas traffic through 5JL, 5KK, 5AIC, 5AJJ, 5HY, 5CT, and 5GF. 5IE is also building a C.W., just what the rest are doing they don't seem to want us to know. (A postcard is all that's necessary fellows.—D.M.) Dist. Supt. J. R. Martin, 1517-12th St., Wichita Falls, wants to hear from all the stations in Anson, Stamford, Chillothe, Breckenridge, Grafrod, Weatherford, Chico, and Jacksboro. He is working out some short jump routes and needs your help. 5ZH, out Amarillo way is using a loop 30 by 30 inches, 18 turns (didn't say what) but works 9DTA with it. He is also breaking out with 100-watts PURE D.C. C.W. 5ZH used to have the Panhandle country all to himself, but 5AKF, 5ALJ, 5AID, 5HX, 5ABO, 5XAH, 5ACC, 5DC, and 5ABJ are all A.R.R.L. stations in district No. 5 now. Northern Texas, should make some ideal short-jump relay routes for the Panhandle country. District No. 1 with such places as Denison McKinney, Forney, Terrell, Whitewright, Greenville, Commerce, Mt. Vernon and Texarkana, all with good A.R.R.L. relay stations lets only two station do the work, according to the reports received. 5ACQ comments "this radio is just one round of trouble," and winds up "I'll be back with C.W." 5AER reported no messages relayed on account of heavy QRN.

Dist. No. 2. 5FA, a new A.R.R.L. station, starts out with 188; is on mostly in day time and wants a route south. 5AJT, altho busy with exams, moved 101. 5UY comes forward with a report establishing Cleburne as a relay point.

Dist. No. 4. District No. 4, including Abilene, Putnam, Cisco, Eastland, Gorman, Brownwood, Blanket, Comanche, Dublin, Stephenville, Grandbury, Glenrose and Hamilton, all with A.R.R.L. stations under Dist. Supt. C. B. Baster, must have all gone fishing or something. Not a report received from any of them.

**SOUTHERN TEXAS:** Only three Houston stations reported this month. 5PB, with 90, leading; 5NN second with 67; and 5ZX with a couple. 5VY is the Star station for the division this month. (What happened to 5KP??—D.M.) 5VY works 4FT in daylight; he has been reported from a ship in the Indian Ocean while calling 9BRI—7000 miles on 5-watts. 5VY, 5IM, and 5ACR are on regularly. 5XV just got working again after moving. Will use 100, 150, 200, and 220 meters. 5OC moved 7. 5KG, 5ZAE, and 5VO are holding down San Antonio and managed to move 115 thru thunder storms. 5VO is QSO Houston and Laredo and QSR. 5MT is maintaining a daylight schedule with "BX" about 800 miles, so pass your Mexican traffic to him. 5DR lost his aerial in a storm. Austin traffic moving thru 5RN. 5XAD is moving and rebuilding; going out to the edge of the town to get away from QRM. 5AMA is a new station which handled 102 messages. 5DE is putting in a 100-watt set. 5AKY is a new 100-watt station. 5ADB seems to be the only one who moved any traffic. 5SS has been having receiver troubles. 5YK has a 50-watter going, and will be on only at week-ends. 5JF and 5GE work in the early morning hours, 5GE being on from 4 A.M. to sunrise every morning and 5JF is on from 5 to 6:30 every morning. Both are QSR to 5MT at Laredo who is QSR to "AX" and "BX" in old Mexico. San Angelo stations are sometimes QSR direct to "AX" and "BX." 5ADI is QSR to 5MT.

**OKLAHOMA:** 5SR, now signs 5XBF, if you please, but still moving 'em along. 5ZM takes 'em for Enid. 5VM and 5ZG are holding down Norman. 5GA will take Tulsa traffic and is QSR Hawaii, Canada, Mexico, Panama, and 40 states. (Better clear thru 5GA, fellows.) 5AFU reports QRN fierce as do all the others. 5KE is working a daylight schedule with 5AAH and 5AHD and wants to hook up with some of the stations in the northern part of the state.

**NEW MEXICO:** Alamogordo, N. M., is now open for A.R.R.L. relay traffic. 5LG starts it off by reporting 7 messages handled and 5VG

and 5AKZ are ready to handle traffic for and thru Alamogordo. 5ADO handled 54 and 5ZA 109. This is the largest number of stations ever reporting from New Mexico representing a gain of one relay station reporting for each of the last two months.

#### MARITIME DIVISION Reported by C. C. Curran, 1DF

1BQ is off the air at present. He was using 20 watts and has been reported 2600 miles east of New York. He formed the Eastern leg of the successful Canadian transcontinental tests, and succeeded in working Toronto.

1DD maintains several schedules with American friends and is easily QSA at Montreal and at American 4FT. Cap. is using 15 watts. 1AR is reported QSA in the Yanks first district with his 10 watts.

By the time this is published 1BI will be on with two fifties. 1DT, 1DF, 1DJ, 1DG, 1DE, 1BV, 1EB, and 1EF already have, or will soon have, 5-watters spitting the air.

#### ONTARIO DIVISION A. H. K. Russell, Mgr.

The past month has shown a marked slackening down of interest in radio work, due to several causes, such as spring examinations, some men going to work on boats, and just plain static.

Byerlay reports considerable slackening off in western Ontario. 5AD seems to be off the air at



It won't take a Canadian amateur more than one guess to put a QRA on this. For our U.S. reader's well have to say that this is Commander C. P. Edwards, Chief of the Radio Department, of the Canadian Marine & Fisheries, the "Terrell" of Canada. For further specifications see page 34, November *CST*, '23's Skipper.

exams. 3KO is still going strong and maintaining his schedules with Montreal and Fort William. 3XN is still active, as is 3LW. 3ADT and 3KG are both getting the tubes working in Ingersoll. 3IA is rebuilding his aerial a la Antenna Number of *QST*. The bad news from the west is the word that 3BV has decided to drop out, and has even sold his bottle, etc. 3MN will be replacing him, and Byerlay may be able to help him operate it.

The first report from the new northern Ontario district, which is at present only a 2-man district, is very encouraging. 3NI took quite a slump in traffic handling. Several interesting prospects are in line; 3AEB, 3AAZ, 3FC, and 3WS. 3BG on spark is making an awful racket, and doing fine work. He says it took him 3 years to do it; try C.W. and do it in 3 weeks—hi. He is putting in 20-watts of C.W. and if he does as well as 3NI he will sure show some of us up.

In central Ontario all goes merry and bright. 3BQ is still rolling up the traffic as is 3TA. 3RV is also doing excellent work. 3VW is on the air any day with a coil on a 5'er. In the Niagara district, 3KP has had to leave for awhile. 3TL of the Falls has temporarily taken over his job, and doing very nicely. 3XX is still at it and going stronger than ever. In Toronto things

are a bit slack, with the 5-watters leading the way. 3SI is doing noble work. 9AL is temporarily off the air account buff generator. 30Y blew tubes, and likely is off till fall. 3WG is on a bottle with Lizzie, and doing nicely, thank you.

But LOOK WHO'S HERE! In eastern Ontario is the big news. Two new DX stations, by gosh! 9CC, Henderson of Ottawa, who is QSA and QSO with 3HE any time. Hang onto it OM, we have sure needed you a long time. 3MP in Cornwall who promised things a couple of months ago, is now fulfilling them, and is also working Kingston in daytime.

WINNIPEG DIVISION
P. Socolofsky, Mgr.

OM static is now beginning his annual attack and every night another station seems to drop out of the light. Since the tests some of our stations east and west are not so regular.

SASKATCHEWAN: This has been a top-notch month for us. 8 active relay stations going and four more under construction. It looks like we were going to open this Province up F.R. next winter. 4AJ and 4FV on 10 watts clear traffic from Regina regularly. 4FN, the star Sask. station in the Transcon Canadian Tests—on 50 watts, is on the air early evenings and week-ends. 4HH, 4AO, 4ER, and 4BB are open for QSR in Moose Jaw at most any hour of the day or night. 9BX with 100 watts QRX's to take over any thing that the lighter powered sets can't handle.

VANCOUVER DIVISION
J. T. North, Mgr.

VANCOUVER: 5CN will be off the air, taking a much needed rest. 5GO is now handling most of the traffic. 5AH is well started with an efficient five-watter and is on regularly. 5AK has left for the summer.

VANCOUVER ISLAND: 5CT has not been able to be on very regularly lately hence his traffic total is low. After reading May QST he started to build a new aerial. 5EK has started up with 1/2 K.W. spark and works the mainland regularly.

ALBERTA: 4DQ and 4CL are handling most of the traffic. 4CL is on every night with 100-watts C.W. and is getting out exceptionally well in every direction. 4CW has just gotten into his stride and will be a great help in the future.

PRINCE RUPERT: 9BP is handling the traffic for this district. He works south and east with his two fifty-watters without trouble.

TRAFFIC REPORTS FROM A.R.R.L. OFFICIAL RELAY STATIONS

CENTRAL DIVISION—C.W.: Ohio: 8IJ, 1022; 8BH, 841; 8BRV, 560; 8GZ, 403; 8CF, 367; 8CJZ, 338; 8AER, 330; 8DAE, 324; 8TJ, 321; 8DAE, 315; 8BYN, 309; 8RR, 309; 8CML, 309; 8CWP, 304; 8BBH, 263; 8BWB, 248; 8CUR, 225; 8FU, 215; 8FT, 209; 8VL, 206; 8ANB, 202; 8AL, 187; 8BSI, 152; 8TT, 151; 8CRU, 140; 8BXX, 139; 8RRO, 130; 8AKD, 125; 8ES, 113; 9BLQ, 104; 8BIU, 99; 8CIE, 85; 8YAE, 59; 8PU, 52; 8CWC, 52; 8WV, 50; 8BHO, 48; 8AJX, 42; 8KQ, 42; 8CVC, 35; 8BWK, 41; 8BXH, 34; 8AWX, 23; 8ABE, 21; 8CXP, 20; 8CWR, 19; 9DFB, 19; 8BNZ, 15; 8AZF, 10; 8BWA, 5; 8DBM, 3. Chicago: 9AZP, 96; 9BNA, 66; 9PO, 62; 9CBS, 32; 9AOY, 11; 9ZN, 11; 9CD, 8. Kentucky: 9DRI, 228; 9EP, 128; 9ARU, 105; 9ASE, 84; 9DK, 75; 9BOO, 53; 9EL, 41; 9CON, 30; 9AMH, 25; 9DJN, 25; 9DRY, 19; 9YC, 11; 9AWF, 7. Michigan: 8BXA, 280; 8BGT, 264; 8CGJ, 172; 8YN, 169; 8AAB, 146; 9CE, 140; 9BOH, 138; 8CZZ, 85; 8CED, 82; 8ZF, 81; 8ATX, 75; 8BDR, 64; 8KI, 61; 8CEP, 61; 8BYF, 50; 8ZZ, 46; 8DAT, 45; 8AHO, 43; 9DRR, 43; 8DI, 41; 8AND, 40; 8DBO, 39; 8CBO, 38; 8BBJ, 34; 8CDD, 34; 9DWR, 30; 8CAP, 30; 8CT, 20; 8HK, 20; 9CWI, 20; 9BMQ, 15; 8JJ, 5. Illinois: 9VM, 584; 9DQU, 580; 9CTF, 418; 9CZL, 408; 9CFK, 389; 9BLU, 320; 9CZL, 314; 9DVL, 310; 9BTA, 257; 9CCN, 200; 9AWQ, 199; 9PE, 198; 9EAC, 172; 9BPW, 169; 9MC, 162;

9BHD, 155; 9DZU, 128; 9DCR, 120; 9AIC, 105; 9TV, 97; 9EJ, 90; 9CGU, 86; 9DVV, 74; 9WX, 72; 9DBP, 70; 9EIM, 67; 9CMN, 63; 9CPA, 55; 9CXT, 55; 9DMW, 53; 9DLR, 50; 9CMC, 50; 9DPV, 50; 9BZQ, 42; 9BZ, 39; 9BRX, 38; 9ABE, 32; 9DJG, 29; 9DZG, 27; 9BDA, 26; 9DC, 26; 9AQA, 24; 9DGA, 21; 9DBN, 21; 9AMS, 18; 9GI, 16; 9CLZ, 15; 9AFU, 14; 9EJH, 12; 9BIT, 12; 9CKE, 11; 9CEB, 10; 9BYX, 10; 9BWA, 9; 9DXO, 8; 9AKU, 7; 9BHX, 3; 9EJJ, 2. Northern Indiana: 9EHL, 175; 9ACE, 102; 9DFB, 88; 9YB, 65; 9CP, 50. Southern Indiana: 9HRK, 115; 9AMO, 86; 9UR, 83; 9BDB, 75; 9BUJ, 71; 9EAD, 54; 9DIS, 40; 9BGW, 28; 9BJR, 25. Spark: Ohio: 8CNL, 59; 8TJ, 48; 8BBY, 44; 8CMI, 14; 8DBM, 7. Chicago: 9AAW, 228; 9AOY, 113; 9DIL, 90; 9BEF, 55; 9CFP, 29; 9DMY, 10. Michigan: 9AHQ, 351; 9DHZ, 344; 9BDF, 172; 9CA, 118; 9NQ, 45. Northern Indiana: 9CP, 6.

ATLANTIC DIVISION—C.W.: Northern New Jersey: 2AIU, 38; 2BXV, 18; 2CXE, 112; 2ACD, 112; 2CUV, 12; 2NE, 64; 2CTL, 24; 2BTE, 38; 2CRW, 69; 2CQZ, 127; 2BUY, 91; 2AER, 186; 2OF, 15; 2RZ, 18; 2CXE, 112; 2CGS, 26; 2CKA, 93; 2AJP, 80; 2FC, 97; 2JG, 12; 3FP, 15; 2BZJ, 15; 2ARS, 42; 2BMR, 401; 2BKJ, 51; 2BMB, 10; 2CVR, 9; 2CHG, 9; 2BMS, 193; 2CTC, 10; 2APA, 24; 2CEE, 59. Southern New Jersey: 3BEL, 77; 3ACQ, 22. Western New York: 8AFL, 418; 8PJ, 40; 8ND, 187; 8KU, 3; 8AIL, 256; 8FD, 6; 8QB, 10; 8RV, 85; 8AMB, 40; 8BUM, 62; 8COI, 28; 8AWP, 64; 8CQL, 34; 8DBW, 570; 8COK, 18; 8ADG, 25; 8AZO, 90; 8CUU, 92; 8ATR, 93; 8BCP, 74; 8CSE, 38; 8ASK, 10; 8HJ, 57; 8KAN, 205; 8ASL, 35; 8AXN, 74; 8CTN, 39; 8BUX, 6. Eastern New York: 2CDK, 56; 2BJO, 24; 2AWS, 10; 2CPK, 407; 2AU, 64; 2BWA, 101; 2BNC, 25; 2BCK, 24; 2AVE, 7; 2BQU, 58; 2TS, 44; 2ACZ, 10; 2AIF, 423; 8AVJ, 110; 8APU, 31; 8DDG, 7; 2GK, 42; 8AOT, 20; 2HW, 54; 2ANM, 30; 2BNL, 30; 2CPO, 119; 2CSL, 12; 2CDG, 36; 2AQL, 12; 2CHK, 31; 2VV, 21; 2KE, 267; 2GNY, 180; 2AUZ, 78; 2CJR, 69; 2CTY, 48; 2BRB, 20; 2CWO, 17; 2CGY, 12; 2CLU, 10; 2BXM, 4. Pennsylvania: 3HH, 175; 3BLU, 67; 3BOB, 24; 3AWH, 44; 3ENU, 298; 3CDN, 40; 3BLP, 403; 3HAQ, 30; 3CTZ, 68; 3ATA, 15; 3ZO, 733; 3AUV, 3BDL, 55; 3LP, 4; 3CCU, 129; 3FGG, 32; 3ACY, 111; 3BRF, 166; 3CXC, 24; 3CX, 20; 8BQ, 37; 3BUT, 15; 3KD, 49; 3AKL, 15; 3TA, 46; 3UD, 91; 3BMS, 92; 3CAH, 26; 3OG, 76; 3DS, 44; 3BYJ, 20; 3AWA, 74; 3HD, 41; 3FS, 19; 3BLI, 34; 3AG, 7; 3VH, 10; 8LJ, 41; 8CVC, 66; 8AIO, 20; 8CL, 196; 8DDX, 7; 8OW, 2; 8CEI, 360; 8CEJ, 194; 8CKO, 140; 8CQK, 4; 8VN, 313; 8VQ, 47; 8BJV, 267; 8AAF, 121; 8BUT, 73; 8BRM, 64; 8BDU, 48; 8ABS, 286; 8AYZ, 22; 8ALT, 30; 8BSJ, 22. Delaware: 8AIS, 17; 8BSS, 14. Maryland: 3WF, 275; 8LG, 83; 3TF, 76; 3MF, 37; 3GZ, 50; 3APT, 33; 3TE, 17; 3HG, 132. District of Columbia: 3HS, 374; 3JJ, 131; 3PZ, 69; 3IL, 38; 3BSB, 20; 3ASO, 25; 3BWT, 49. Spark: Northern New Jersey: 3CS, 11; 2JG, 12; 2BQZ, 87; 2BMR, 2; 2OM, 155. Southern New Jersey: 3BEI, 17. Western New York: 8BCW, 4; 8TC, 31; 8BUM, 14. Eastern New York: 2AU, 51. Penna.: 3ZM, 4; 8CEJ, 94. Maryland: 8SF, 30. Dist. of Columbia: 3PZ, 1; 3ASO, 15. NEW ENGLAND DIVISION—C.W.: 1BKQ, 64; 1CJR, 138; 1BDU, 65; 1AGU, 250; 1BVR, 93; 1ADN, 129; 1CQZ, 200; 1VV, 25; 1LK, 14; 1SN, 167; 1SK, 142; 1CNI, 432; 1CIT, 89; 1CPI, 283; 1FD, 85; 1BBM, 51; 1CMP, 266; 1AGS, 56; 1BFA, 2; 1AAC, 113; 1COT, 260; 1ARY, 40; 1CPN, 333; 1BSZ, 314; 1AQM, 241; 1AWW, 207; 1BVR, 103; 1BKQ, 64; 1BLN, 34; 1IL, 27; 1AVV, 25; 1ARK, 25; 1AWE, 79; 1BES, 180; 1BIE, 30; 1GV, 30; 1OW, 40; 1IL, 51; 1BQD, 173; 1CBE, 381; 1BVB, 417; 1ART, 338; 1AMI, 61; 1CPV, 121; 1AP, 207; 1FD, 96; 1AVQ, 78; 1AVJ, 52; 1AVK, 65; 1AWU, 39; 1APC, 145; 1BIV, 150; 1BAG, 6; 1BTU, 15; 1BMS, 25; 1CBS, 61; 1HN, 95; 1UJ, 73; 1RV, 88; 1ZE, 105; 1VK, 197; 1MY, 270; 1AJP, 50; 1AYQ, 26; 1CJZ, 20; 1IV, 139; 1BM, 5; 1QP, 57; 1AYZ, 178; 1IX, 44; 1CQJ, 88; 1BNK, 6; 1ATJ, 28; 1CQL, 241; 1GL, 414; 1AWB, 23; 1BHM, 84; 1BOA, 30; 1CPV, 34; 1FY, 5; 1TL, 8; 1ALJ, 34; 1AMR, 100. Spark: 1CM, 67; 1ARY, 5; 1RR, 133. WEST GULF DIVISION—C.W.: Northern

Texas: 5AIF, 340; 5MN, 194; 5KO, 121; 5AHT, 131; 5QL, 28; 5DI, 47; 5TL, 103; 5BL, 52; 5UY, 12; 5ACQ, 90; 5ZH, 14; 5KK, 135; 5JD, 84; 5UO, 20; 5LL, 61; 5ZADA, 11; 5UN, 40; 5CY, 98; 5HY, 55; 5CT, 22; 5AIC, 102; 5AJJ, 62; 5FA, 138; 5AJT, 101; 5LC, 8. Southern Texas: 5JF, 35; 5KG, 26; 5SS, 139; 5RN, 41; 5VY, 501; 5VO, 68; 5DR, 20; 5NN, 67; 5AMA, 102; 5MT, 103; 5ZAE, 21; 5XV, 3; 5ZX, 2; 5YK, 5; 5ADB, 26; 5GE, 19; 5PB, 90; 5ADI, 1. Oklahoma: 5GP, 207; 5GA, 138; 5AAH, 210; 5ZAT, 238; 5KE, 204; 5AFU, 48; 5KBF, 45; 5VM, 22; 5ZM, 30; 5DN, 42; 5AJB, 53; 5KW, 30; 5AIU, 55; 5XT, 125. New Mexico: 5ZA, 109; 5ADO, 54; 5LG, 7. Spark: Northern Texas: 5ACQ, 17; 5ZH, 1.

PACIFIC DIVISION—C.W.: 6IV, 104; 6EC, 84; 6ZH, 50; 6AHP, 7; 6AOI, 183; 6BIQ, 172; 6LV, 161; 6BGY, 65; 6TU, 128; 6BPL, 185; 6ASN, 60; 6BFL, 48; 6HP, 14; 6BRU, 14; 6NX, 21; 6ZZ, 564; 6HV, 40; 6CC, 180; 6ZZ, 190; 6AHU, 60. Spark: 6ROS, 6.

NORTHWESTERN DIVISION—C.W.: 7GP, 412; 7NE, 147; 7AGF, 132; 7ABB, 119; 7ZU, 119; 7ZN, 108; 7ACA, 101; 7TS, 98; 7ZF, 36; 7ADP, 36; 7JG, 70; 7BJ, 72; 7WS, 69; 7LN, 62; 7AEL, 36; 7JS, 55; 7ABY, 51; 7DC, 51; 7HM, 45; 7AHL, 36; 7ZL, 36; 7AFE, 30; 7HS, 30; 7AFH, 26; 7IG, 24; 7OE, 21; 7ADQ, 20; 7OO, 14; 7CG, 11; 7DU, 6; 7AFN, 28; 7AGU, 6; 7UU, 2; 7LY, 2; 7AIM, 45; 7NG, 1; 7AIV, 1; 7WM, 309; 7KF, 4; 7WX, 322. Spark: 7AIO, 27; 7BG, 10; 7WD, 3; 7OB, 2.

DELTA DIVISION—C.W.: Tennessee: 5NZ, 136; 5PF, 55; 5PV, 40; 5ZB, 30; 5ZABA, 43; 5NV, 90; 5AHJ, 65; 5BW, 12; 5EK, 150; 5DA, 93; 5HL, 304.

ROANOKE DIVISION—C.W.: 3BMN, 416; 3CEL, 313; 3APE, 215; 3IW, 160; 3CBZ, 33; 3REL, 77; 3CA, 75; 3TJ, 53; 3ASP, 37; 3ALB, 23; 3BZ, 26; 3RIJ, 25; 3MO, 17; 3ABS, 15; 3AOT, 10; 3ZAA, 6; 3AHN, 3AEV, 4; 3AOV, 2; 4LJ, 102; 4GG, 4; 4AF, 4; 4FA, 22; 4DC, 17; 4FT, 210; 4BX, 160; 4OI, 14; 8AQV, 168; 8ZW, 78; 8BPU, 45; 8SP, 11; 8BQG, 6; 8BTD, 3; 8CAY, 15; 8AMD, 7; 8ATP, 67; 8ATC, 78; 8CQH, 31.

HAWAIIAN DIVISION—C.W.: 6CCR, 1; 6CEU, 4; 6TQ, 4.

DAKOTA DIVISION—C.W.: Minnesota: 9DUQ, 360; 9BAF, 162; 9EAU, 137; 9BAV, 85; 9DC, 46; 9CMJ, 35; 9DTE, 22; 9EA, 7; 9CIP, 175; 9APW, 136; 9APE, 76; 9DGV, 71; 9AUA, 61; 9CHY, 55; 9BTI, 45; 9BKJ, 35; 9DPX, 115; 9BTL, 104; 9BTT, 76; 9IG, 94; 9EBG, 54; 9AUL, 51; 9DAW, 43; 9AQV, 40; 9CSJ, 23; 9CTO, 25; 9BKW, 20; 9AWS, 20; 9DGN, 14; 9DCJ, 8; 9AWO, 4; 9CVV, 2; 9ZT, 232; 9OXP, 58. Minnesota: 9DSW, 151; 9BXU, 127; 9QF, 111; 9EKE, 90; 9CBW, 37; 9EGG, 33; 9DPQ, 30. North Dakota: 9ABU, 66; 9AHC, 122; 9UH, 73; 9EBT, 119. South Dakota: 9CGA, 226; 9BRI, 203; 9DWN, 201; 9YW, 15; 9AJV, 53; 9DMA, 86; 9MF, 32. Spark: Minnesota: 9EGF, 27; 9BPN, 33; 9DGE, 30; 9CRW.

EAST GULF DIVISION—C.W.: 4HS, 45; 4DG, 35; 4MY, 30; 4JL, 30; 4MB, 29; 4BL, 26; 4YA, 25; 4HW, 20; 4DO, 20; 4CY, 15; 4DF, 15; 4DN, 15; 4NA, 14; 4EQ, 13; 4GM, 12; 4GZ, 10; 4KU, 8; 4ME, 5; 4JK, 117; 4LK, 4PQ, 36; 4PV, 32; 5XA, 147; 5BQ, 9; 5CP, 56; 5XAE, 2; 5ZAA, 5; 5VY, 5; 4JL, 108; 5IZ, 76; 4JZ, 41; 4JY, 32; 4AR, 23; 4ZH, 14; 4HZ, 30; 4FS, 39; 4FB, 228; 4AG, 37; 4EB, 243; 4EL, 122; 4BY, 10; 4OD, 2. Spark: 4EG, 44; 4HS, 45; 4MY, 12; 4XA, 5; 4BC, 8. X

ROCKY MOUNTAIN DIVISION—C.W.: Colorado: 9BUN, 217; 9CAA, 175; 9CJY, 161; 9BBA, 130; 9BJI, 85; 9DVJ, 79; 9BJK, 60; 9APP, 60; 9CFY, 53; 9BTO, 50; 9DPM, 44; 9BVO, 21; 9AME, 15; 9QL, 10; 9CDE, 34; 9DFH, 35; 9AWW, 45; 9EAE, 4. Wyoming: 6DH, 236; 7AFW, 21; 7ZO, 15; 7ZY, 40. Utah: 6BLH, 30; 6CBU, 111; 6RM, 135; 6ZT, 51; 6ZY, 7; 6APL, 207. Spark: Utah: 8BUB, 19; 6APL, 207.

MIDWEST DIVISION—C.W.: Nebraska: 9DNC, 35; 9EAK, 33; 9APN, 47. Missouri: 9ZQ, 97; 9BLG, 140; 9EKF, 95; 9CEE, 14; 9AAL, 5; 9DXN, 70; 9AAU, 57; 9DLT, 75; 9ANO, 48; 9CHJ, 30; 9ALX, 54; 9BDS, 19; 9DCW, 78; 9AWT, 14; 9BIE, 226; 9DZY, 12; 9BZH, 74; 9FFB, 25; 9CKS, 134; 9SS, 20; 9ACX, 73; 9AYL, 224; 9BDZ, 78; 9BKK,

78; 9DJB, 90; 9CYG, 31; 9AUK, 20. Kansas: 9CCV, 181; 9DTA, 117; 9CZW, 241; 9CFL, 314; 9AEY, 26; 9EHT, 100; 9AOG, 134; 9AOD, 47; 9NR, 60; 9CYV, 24; 9CCS, 150; 9CAC, 354; 9CJE, 279; 9ABV, 54; 9DUG, 118; 9AIM, 34; 9BEZ, 19; 9CWC, 136. Iowa: 9AMI-DKY, 160; 9CBZ, 90; 9ASL, 3; 9BGT, 130; 9DJA, 42; 9BCD, 30; 9DOF, 94; 9BZI, 62; 9ARZ, 95; 9UL, 60; 9BPV, 117; 9AHH, 150; 9CLQ, 74; 9CNB, 45; 9AED, 13; Iowa for April—C.W.: 9AHH, 571; 9AOU, 504; 9DXC, 44; 9BIF-BRS, 85; 9BZE, 120; 9BCF, 96; 9DOF, 320; 9DXJ, 30; 9UL, 374; 9CLQ, 190; 9ATN, 189; 9AMI, 232; 9DKY, 175; 9CPD, 20; 9DLL, 50; 9CBZ, 203; 9FK, 16; 9ECN, 3; 9ASI, 7; 9DFT, 17; 9ARZ, 155; 9BCD, 18; 9BFG, 37; 9DMH, 81; 9BGT, 137. Spark: Nebraska: 9DNC, 38; 9AHV, 6; 9AEC, 38; 9BWM, 153; 9BXT, 114; 9YU, 74; 9BWE, 16; 9EHW, 42. Missouri: 9RR, 74; 9BZH, 101; 9BMN, 5; 9DAE, 400. Kansas: Iowa: 9BTX, 119; 9CS, 25. Iowa for April—Spark: 9BEL, 17; 9CS, 15; 9ECG, 20.

ONTARIO DIVISION—C.W.: 3IN, 56; 3OJ, 14; 3EY, 86; 3ZS, 76; 3JT, 17; 3SI, 101; 3JI, 85; 3DE, 5; 3CO, 39; 3HE, 89; 3IL, 20; 9CC, 5; 3MP, 8; 3LU, 2; 3TA, 21; 3RV, 55; 3BP, 186; 3GB, 24; 3KO, 133; 3UJ, 32; 3ADN, 72; 3ACY, 5; 3XN, 127; 3TL, 113; 3KP, 40; 3XX, 102; 3ACJ, 38; 3BS, 34; 3MM, 20; 3NI, 80; 9AL, 93. Spark: 3BG, 38.

VANCOUVER DIVISION—C.W.: Vancouver district: 5GO, 156; 5EJ, 45; 5AH, 36; 5HG, 11; 5AK, 41. Vancouver Island district: 5CT, 65. Alberta district: 4CL, 56; 4DQ, 44; 4CW, 12. Prince Rupert district: 9BP, 69.

WINNIPEG DIVISION—C.W.: 4HH, 302; 9BX, 160; 4FN, 140; 4AO, 41; 4AJ, 15; 4FV, 14. Spark: 4BB, 44.

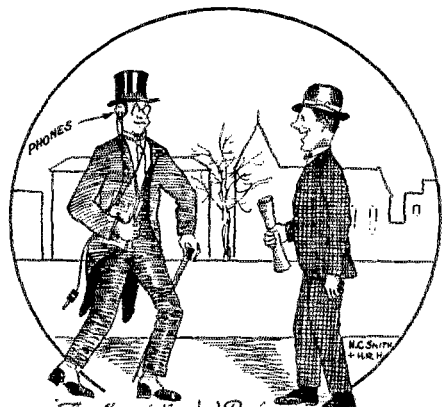
USING A TRANSFORMER AS A BOOSTER FOR A D.C. PLATE GENERATOR

(Concluded from page 33)

mon lead back to the center of the transformer, the polarity being such as to aid the rectified A.C.

At first sight it may seem that the same effect could be gotten by using a bit more transformer and cutting out the generator but that is not entirely correct—the “ripple” is less with the transformer supplying only part of the voltage. At any rate—whether it is crazy or not a few fellows are using such a “booster.”

L. Q.



"The Absent Minded Professor" THE A.M. AFTER THE P.M. B4"



# INTERNATIONAL Amateur Radio

## Transpacifics

Determined not to concede that the Transatlantic tests of last winter were to stand long at the head of the list of great amateur achievements, a group of western radio men have carried out a series of Transpacific tests with Australia. On May fourteenth came the cablegram from Australia that signals were "getting across."

Although a list of the calls of the successful stations is not yet available, we take this opportunity to extend our heartiest congratulations to the successful entrants, and to the committee on arrangements, headed by R. J. Portis of the Long Beach Radio Club.

The tests took place during the month of May. A special code-word of two letters and a schedule was assigned each participant a few days prior to the tests. A.R.R.L. stations thruout the Western states were communicated with and in their usual style they rose to the occasion, tuned up their transmitters, and "put 'er thru."

## Mexican "BX"

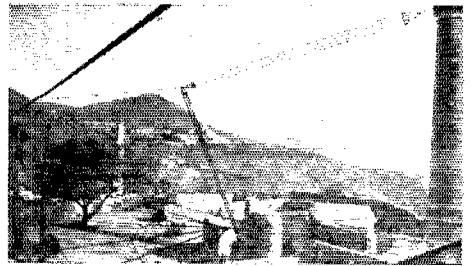
The station of Harold T. Mapes at Guanajuato, Gto., Mexico, known over the air as BX has been in operation since December, 1922, and over forty U.S. amateurs have been worked, the nearest of which is 600 miles distant. 6ZY at Honolulu has also logged the signals of this station. The call 6XXA was used prior to the time the Mexican government assigned the call of BX a couple of months ago.

We are indebted to Mr. Mapes for some dandy lists of calls heard and our suspicions were confirmed when we learned that the operator of BX is an old time U. S. "ham," having operated 3AUC, a pre-war rock crusher. Although an amateur antenna with a typical Mexican landscape in the distance is something we do not see often, it only proves again that where ever there is an amateur, there is bound to be amateur radio.

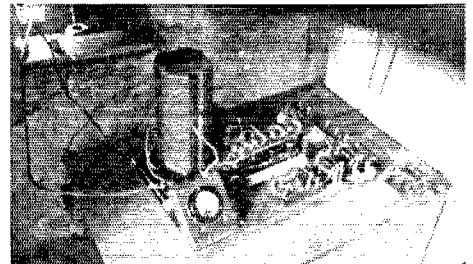
The receiver at BX is quite a novel and complicated affair. We regret that space does not permit its complete de-

scription. It is, however, a combination long and short wave set with honeycomb coils and radio frequency amplification. The latter can be cut in or out of the circuit at will by means of anti-capacity switches. The fact that it is a good receiver is attested by the splendid results obtained.

The station proper is located at the bottom of a deep valley with high mountains about, so the transmitter was placed



on a more advantageous position on top of a hill a quarter of a mile away, and arranged for distant control. As shown in the picture, the transmitter is of the



breadboard type, neatly assembled, and uses four five-watters in a Hartley circuit with 500 volts from a nearby trolley line furnishing the plate supply. The antenna current is three amperes.

We compliment Mr. Mapes on the good work done by his station and are counting on his being a strong link in our proposed "A.R.R.L. route to South America."

(Concluded on page 64)

# The Junior Operator



## Learning the Code

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

By H. F. Mason, Department Editor

**I**N order to become a proficient player in any game—for instance, amateur radio—it is imperative that you devote a large amount of time to practice and training. Once the training is over, however, you are happy because of the infinite degree of personal satisfaction there is in knowing how to play a game and play it well. We'll admit that there is a certain amount of drudgery in learning the code, despite all "learn it quick" methods, but this should not prevent you from partaking of the immense enjoyment which is in store for you, once it is learned.

### The Practice Set

It is, of course, only natural for a person enthusiastic over amateur radio to want to learn the code in the quickest and easiest way. For this purpose every beginner should obtain a "buzzer practice set." This consists of a buzzer, a dry cell, and a telegraph key connected together so that when the key is pressed the buzzer will operate, thus imitating a radio signal. The practice set is well worth the price, three or four dollars, and is indispensable. The buzzer can best be a "nickel plated watch case buzzer" obtainable at most any radio store for about one dollar. One that, when connected as shown in the diagram, will emit a rather high pitched clear note is a great advantage, as will be learned later, in reading the signals.

Care should be taken in the choice of the transmitting key. The quality of your sending, no matter how much practice you have, will depend upon your using a key

that has a good action and is well balanced. As you can use this same key in your transmitting set, after you have learned the code and secured a license, it may be worth your while to buy a good key at the outset. If you are in doubt as to your ability to select a good radio key, the next best thing

to do would be to purchase a standard telegraph key. This type, though used on many radio sets, has the objection for radio work that it is too "light." This will be explained later.

In order that the signals from the practice set will simulate the real radio signals as nearly as possible it is well to connect a pair of head telephones in the circuit. This may be done as shown in the diagram, connecting the telephones across the buzzer binding posts with a small fixed condenser in series with them. The capacity of the condenser

should be around .001 microfarads. Its capacity governs the strength of the signals in the telephones; if the signals are too loud the condenser should be made smaller, and conversely a larger condenser should be used if stronger signals are desired.

### Getting Started

Granting that a copy of the International Morse Code, known also as the Continental Code, is at hand, we are ready, with the aid of the practice set, to begin. Although, strictly speaking, learning how to send and how to receive are two different things, they will need to be more or less combined in the early stages of your schooling.

In connection with this article on learning the code it should be remembered that it is unlawful for you to transmit radio signals into the ether unless you hold a government license. To obtain this license you must be capable of transmitting and receiving at a speed of at least ten words per minute in the International Morse Code. The study of the code is taken up at the early part of this series of articles in order that you may have plenty of time in which to practice and become proficient in the code before applying for a radio operator's license.

The telegraphic code is built up around two units, the dot and the dash. Combinations of these units represent the different letters in the alphabet, and so it can be seen that the correct interpretation or decoding of the signals at the receiving end lies almost wholly on the skill of the send-

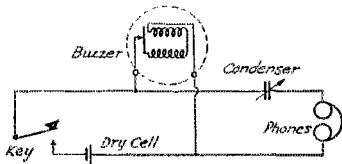


DIAGRAM OF BUZZER PRACTICE SET

ing operator in making the dots and dashes of their proper relative length and spacing; making the signals understandable, in other words. It is very important, then, that the following correct relations be preserved. A dash is equal in length to three dots, the space between parts of the same letter is equal to one dot, the space between two letters is equal to a dash or three dots, and the space between two words is equal to five dots.

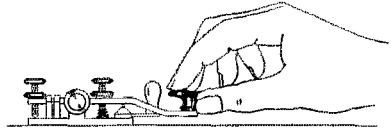
The first step in learning the code is to memorize the dot and dash combinations representing the letters. They must not be visualized as dots and dashes, however, but rather should be "auralized" as sounds. There is no such word as auralized but if there were it would express the correct method of grasping the code. The sound dit-dah (meaning a dot followed by a dash) in the head telephones must impress your mind directly as being the letter A, for instance, without causing black dots and dashes to float before your eyes for an instant—that way madness lies. This is a point that always troubles beginners, but if you learn from the first to recognize the sounds as letters immediately, without reverting to dots and dashes, you will make much better progress. It is very interesting, even the learning, if taken in the right way.

Do not try to learn all of the letters at once; take only three or four a day, and practice on them until your ear is trained to instantly convert the dah's and dit's into letters. Then add a few more letters the next day, and so on until you have learned them all.

Let us digress for a few moments and set ourselves clear on the correct manipulation of the transmitting key. The key should be located with the center of the knob between sixteen and eighteen inches from the edge of the table, on a line with the operator's right shoulder. It is difficult to send well if the radio table is not

of the proper height. The standard height of thirty inches should be adhered to as it will materially help your sending. The back adjustment screw on the key should be adjusted so that the knob will have a vertical travel of about one sixteenth of an inch when the key is pressed. The spring tension is a thing that varies with the choice of the operator, but the beginner will do well to use a fairly heavy spring at the start.

The key must be held correctly as this spells the difference between good and poor sending. With the elbow resting on the table, the key knob should be held as shown in the sketch. The forefinger and middle finger should rest lightly but firmly on top of the key knob while the thumb and third, or ring, fingers rest very lightly on



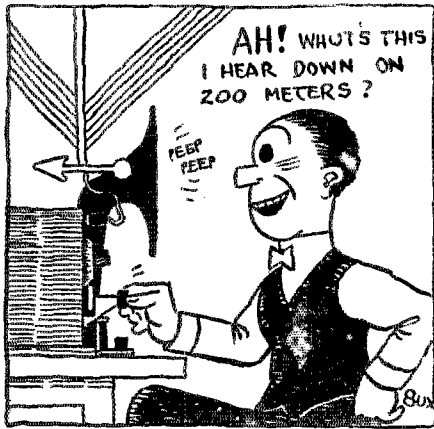
THE CORRECT POSITION OF THE HAND WHEN SENDING

the sides of the knob. Above all things the wrist must be held up off of the table, the higher the better, but at least high enough so that the top of the hand and the forearm will be in a straight line. The grasp of the key should not be tight or strained, as jerky sending will invariably result. Hold the key with the same light but firm grasp that you would use in holding a pen when writing. Generally speaking, the rules we used to observe in school when learning penmanship apply perfectly to the correct way of learning how to handle a telegraph key. By the same token that a good penman always holds his pen correctly, an operator whose sending is clear and even holds his key correctly. After all, the easiest way is the correct way—once you have mastered it.

When operating the key none of the muscles of the arm or wrist should be tense, but at the same time the action of the hand in forming the letters should be under perfect control. The stronger muscles in the forearm should do most of the work; the less capable muscles of the fingers only contributing the fine touches. The fingers should never leave the key knob, and the motion should be straight up and down, not sideways.

It will take quite a bit of practice before you will be able to send the letters correctly without a definite effort. All the while you should be careful to make the dots and dashes and spaces of their proper length. Almost always the beginner will make a C as if it were two N's, and a Y as if it were an N followed by an M. It will be a great

help to you at this stage of the game if you can enlist the assistance of someone who knows the code to point out your mistakes and give you practice in receiving by sending to you on the buzzer. When copying someone's sending always have him send to you just a little faster than you can easily receive. If you are able to copy every letter, you are learning nothing, but if the sending is fast enough so that you only get two letters out of every three, your mind will be quickened and an effort will be made to get that other letter. Diligent practice at the rate of about an hour each day will enable you to acquire a



fairly good knowledge of the code in a surprisingly short time.

#### Gaining Speed (Transmitting)

The worst thing an amateur can do is to try and ignite the air while still at a tender age. Until you are very sure that your hand is becoming accustomed to the correct method of sending, do not try to exceed ten words per minute, and come up to that speed gradually. If you disregard the above you stand a good chance of being cursed with a jerky, non-uniform style of sending that will be very hard for you to rid yourself off; or you may develop a "glass arm," which, as its name implies, may cause you to have to change to some other recreation than amateur radio.

At this point it would be well to say a few words about the sideswiper, fishtail, cootie, hacksaw blade, or double action keys that have found their way into some of our best stations. To the unsophisticated beginner, my advice is to leave them alone, brother; they'll do you more harm than good. After you've learned the code on a good old fashioned straight key and you think you can do better on a "cootie," go to it, but be careful that the quality of your sending does not go down in the process.

The vibroplex, which has a definite field in wire telephony has one characteristic that prevents its more general use in radio. This is unavoidable, however, as it is caused by the inherent difference between the two systems. In radio the key must actually be depressed the whole time a signal is made. In wire telegraph, on the other hand, the spring on the sounder raises the lever and completes the character after the current is broken at the contacts of the key. For this reason, when a vibroplex is used on a radio set, there is a tendency to make the dots relatively too short. This can be corrected to a certain extent, however, by proper adjustment of the key.

As many of our Junior Operators were telegraph operators at one time or another, radio operating is interesting in comparison. In a wire circuit the action is positive, that is to say, each dot and dash that the transmitting operator sends will be faithfully reproduced at the receiving end. This allows constant sending at a good speed, still retaining clearness. In radio, however, many times it is necessary to put the signals through static, interference, and fading or they do not reach the receiving operator at all. Therefore, a heavier and even more clear and distinct style of sending is necessary over radio. This is usually taken care of automatically if a transmitting key of more rugged and heavier construction than the ordinary telegraph key is employed.

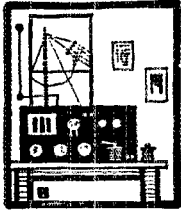
Then there are what is known as "swings" with myriads of variations thereof. The only advice here is to stay on the narrow path and make your sending as near perfect as possible. Do not worry about cultivating an individuality to your sending. That will come with time, and an operator who is noted for his clear and even method of transmission is much more respected by the amateur fraternity than one who owes his fame to the "sloppy way in which he dishes out the code"—and we wonder that some of it can be identified at all.

Do not hesitate to ask other operators for criticism of your sending. Only they are in a position to judge. Send to a person for a few minutes, have him copy on paper, and he can soon tell you exactly wherein you can improve your transmission. If you find you are making mistakes, slow down. After all, if you have an important message to put through, it is not the time it takes to send the message that is wasted, but the time lost by making mistakes.

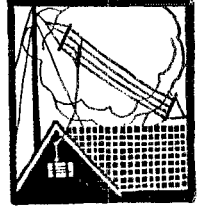
The best test there is for an operator's sending is for you to sit down to a practice set and send straight reading matter at a speed of from twenty to twenty five words per minute, continuing:

*(Continued on page 63.)*

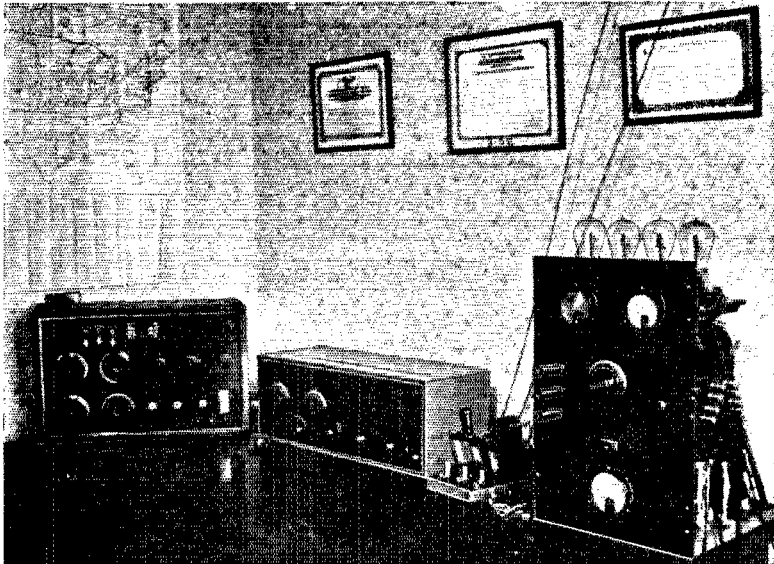




# Amateur Radio Stations



## 3OE, Philadelphia, Penn.



Besides being known as one of the persons responsible for the little books entitled "What I Know About Radio" that have been distributed lately at various radio conventions, the operator of 3OE is the first amateur to give the gang some authentic dope on the use of S tubes\* for the rectification of the plate supply to transmitting tubes.

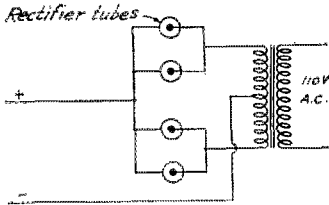
3OE is owned and operated by O. W. Lummis at 450 Benson St., Camden, New Jersey. The station has been on the air all winter of course has cards on hand from every U. S. District, Canada, and Panama, reporting his signals. The transmitter employs four five-watt tubes in a 1DH circuit that is remodeled to provide for phone and chopper. He states that there is nothing about the receiver that is of especial interest, aside from the fact that it works.

The transmitting set which is arranged in the form of a neat panel set puts three amperes into a cage antenna of six wires 65 feet long on two twenty-foot poles placed on a row of slag-roofed houses. A four wire lead-in puts the noise into the antenna. The counterpoise is only 17 feet below the antenna and is a nine wire flat top ten by sixty five feet.

The high voltage rectifier tubes are connected as shown in the diagram. Two tubes are used in parallel on each side of the circuit in much the same manner as jar rectifiers are connected, but without the accompanying mess. The voltage across one half of the secondary of the transformer is normally around 750 but sometimes runs as high as 800 with no ill effects. The tubes each pass about 75 mils, and in normal operation are just too hot to touch. Although some trouble was experienced at first because of the

\*Described in August, 1922, QST—page 11. Available from QST Circulation Dept. at usual price.

tubes not being uniform, no trouble was had in getting those replaced that were not up to standard. The tubes seem to become harder and will stand more voltage the longer they have been in use.



Provided that a well matched set of tubes is used results are, in 30E's estimation, better by far than with any other type of rectifier. He advises the use of this type of tube for any set by connecting a sufficient number in series or parallel or both according to the voltage and current required. Put in one tube for every 50 mills and every 750 volts and then forget your rectifier troubles. As the tubes have no filaments to burn out they will last indefinitely, at least 3000 hours.

Some further information on the operation of S tubes has been gleaned from various sources and it might be well to present it at this time. It is said that these tubes do not work well in parallel because one tube tends to take all of the load and become overheated while the one in parallel to it takes only a small part of the load. Crowder of 3MF suggests as a remedy for this condition, that a tungsten lamp of a size that will just glow red on the current used be connected next to and in series with each tube. Because of the high positive temperature co-efficient of resistance of a tungsten lamp, the effect of these lamps will be to automatically equalize the current thru the different tubes. Another point is that it is better to apply the load gradually to the tubes at first in order that they will become warm slowly. The great advantage of the S tube, however, is that the wave form is good. A kenotron turns out a distorted wave that is very hard to filter, while the S tube and electrolytic rectifiers turn out the wave forms that can be filtered more easily. The efficiency of an S tube is high because there is no filament to absorb power.

## 7ZV, Douglas, Wyoming

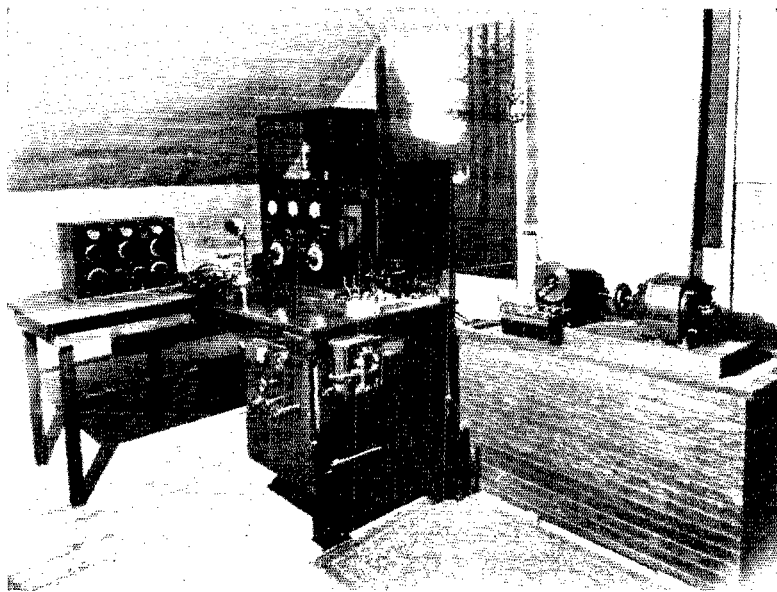
Radio station 7ZV, located away off in the wilds of Wyoming at the town of Douglas, is a 100-watt C.W. and 50-watt radio telephone station; an official relay station of the A.R.R.L.

The aerial is of the inverted L type, 81 feet long, and sixty feet high with fanned leads coming together at the bulkhead insulator, not over five feet from the inductance. The flat top portion has four wires on sixteen foot spreaders. The spreaders are of half inch galvanized iron gaspipe and are supported at two places on each spreader by strings of insulators, the other end of which fasten to the ends of another ten-foot fir spreader, four inches square. These ten-foot timbers are bolted directly to the masts, which are of lodgepole pine and are twenty inches in diameter at their butts and six inches at their tips. They stand something over sixty feet above the ground. The lead-in comes down at a slant which makes it over seventy feet long. The counterpoise is composed of a network of twenty four No. 12 wires arranged in the form of a square, forty feet on a side and located partly under the center of the aerial. It is necessary that a small counterpoise be used at this station in order to get the transmitted wave down to 225 meters without using an additional series condenser.

The transmitter employs two fifty-watt tubes, which are used as oscillator and modulator when fone is used and are switched in parallel when C.W. is being transmitted. The 1DH "sure-fire" circuit is used. The whole set is wired with half-inch copper busbar and special care has been taken to arrange the apparatus so that the grid and plate circuits are very short and direct. The grid leak is across the grid condenser with the key cut into the main grid circuit. The key is shunted by a one-sixth micro-farad condenser which holds the plate milliammeter at zero when the key is up, taking all the strain off of the tubes. This arrangement of keying also eliminates a lot of howling for local stations and actually prevents to a very large extent the so-called shifting of waves and changes in frequencies occasioned by keying. It would be excellent, of course, to key in the plate supply circuit, but the high voltage used on some of the big tubes make this very difficult with D.C. supply. The power supply formerly passed thru a synchronous rectifier but this has lately been replaced with an Esco 1500 volt generator, 250 watts, which is not large enough to load the tubes to full capacity, but at 200 mills the antenna current is five amperes on a Jewell meter and the tubes stay cool.

"We have an A.R.R.L. radio telephone station and keep it in good working order for no other purpose than to boost and spread the gospel of the A.R.R.L. We believe that whenever possible all stations should have phone. A BCL would rather

ceiver and with a low aerial she does the biz better than anything we have ever tried. As stations are so scattered in this part of the county, the broad tuning qualities of this receiver are no hindrance in our case.



listen to two amateurs hold a phone conversation over a thousand miles when he can understand both sides of it than to listen to all the jazz that comes down the pike in a week. Some may doubt this, but just stick up a good telephone set and watch the cards roll in from the BCL's. They can understand what's going on! In addition, the fone is FB for clearing local traffic.

"Sorry to say that we use a single circuit tuner here for all of our best DX. We have tried everything that came along and never have found but one circuit more sensitive than an old 'dumb-bell' receiver. This was one stage of radio frequency and a detector, as recommended by Mr. Godley on page 33 of December, 1922, *QST* for listening for European stations, but it is too unwieldy. We did log a number of distant stations on this but found it no good for relaying and traffic work. The Reinartz is not sensitive enough for DX, same with the S.W.R. and hard to tune, so we just use the 'dumb-bell' re-

"The signals of 7ZV have been logged all over the best part of this hemisphere and our phone has been heard all over the U.S. and most of Canada. Good radio men who know the game and who are critics compliment 7ZV on the good modulation. 7ZV was recently heard by Sgt. George S. Barnett at WVA, Circle City, Alaska, with an audibility plenty loud enough for mill copy, very steady and louder than the regular army radio stations. 3JJ gets 7ZV all over his 16-foot room on one step—fones on the table—and signals from 7ZV were logged in London, England, during the Trans-Atlantic tests last December. In addition, 7ZV has worked stations in every district with the exception of the first."

The station was built and is owned by Mr. Felix Thompson, and is operated by both Mr. Thompson and Mr. Winfred Slau-son, formerly 7ZG of Bear Creek, Montana. Together, they handle scads of DX traffic, and 7ZV is a dependable link in the northern trans-continental route.

## ***1CMK, Holyoke, Mass.***

Station 1CMK is located in the "Summit House" on Mt. Tom, 1280 feet above

sea level, near Holyoke, Massachusetts. It seems to have one of those good locations

where all-around results are better than the average.

Referring to the picture, the right-hand panel transmitter is a ten-watt radio telephone set utilizing a modified Hartley oscillating circuit and Heising modulation. With 400 volts, supplied from an Esco motor-generator, on the plates, the antenna current is 1.2 amperes on voice and 1.7 on C.W. transmission. The left-hand panel is the 100-watt C.W. outfit. Two

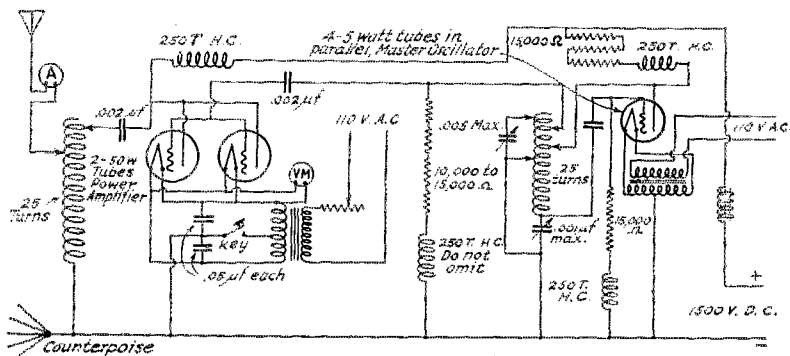
UV-203's are used in a modified Hartley circuit with 1500 volts, chemically rectified to D.C., on the plates. The rectifier has 46 jars, filled with a borax solution. Approximately five amperes are put into the antenna with this set. Owing to hard luck with defective tubes only one fifty-watter is in use most of the time and the antenna ammeter reads usually around three amperes.

In the course of the last three months, experiments have been made in combining the two transmitting units shown in the picture into one set using the master-oscillator power-amplifier circuit. Results have been entirely satisfactory and a wiring diagram of the final circuit adopted for a new set which is being built is shown herewith. This circuit works out very well in practice and all of the station's best DX records have been made when this arrangement was used. The circuit has the advantage that swinging of the antenna does not cause the received C.W. note to vary in the least—the frequency of oscillation is independent of the antenna circuit. An antenna current of 5.5 amperes is maintained with this system.

The antenna system at 1CMK is an 18" diameter cage, six wires, 45 feet long, being 75 feet and 55 feet high at the respective ends. The counterpoise used consists of about 300 feet of No. 10 copper wire in the form of an oblong directly underneath the antenna and averaging ten feet in height.

Signals from 1CMK have been reported heard in England, France, WCOO in the English Channel, Porto Rico, and by 6ZAC. Every district has been worked.

1CMK is owned and operated jointly by P. H. Bloom, "PB," and V. A. Luce, "CSO."



MASTER OSCILLATOR - POWER AMPLIFIER CIRCUIT USED AT 1CMK.

# Strays



Have you started to get ready for this years Hoover cup? For the love of antenna watts don't let the field consist of a half dozen entries this next trip—make a scrap of it.

If you want to see something funny divide a map of the U. S. into the Dept. of Commerce Radio inspection districts and color them all up with little sister's crayons. Wonder who laid the darn things out and where he studied geography.

Get a wavemeter—don't trust the word of your neighbor. He is less truthful than an antenna ammeter.

Anyone know how to pry the Western Electric Co. loose from some of their excellent 50-watters? What do they hang onto them for, anyway?

Say, gang, how many of you can give us some experience with the Northern Lights—their society name is the "Aurora Borealis?" Here we thot that they killed short-wave radio deader than the well-known salt mackerel and there comes along Professor MacMillan who sez that they have been right near the North Pole and copied NAA's time sigs, without any trouble. Is the difference a matter of wave length or are we all wrong in believing that amateur radio stops whenever the "halo on top of the world" blazes up? By the way, did you know that the aurora is a ring, an actual "halo," and that it is possible to get inside of it?

One of the gang that has been working on a static eliminator sez that he is losing faith—the thing failed to stop a stroke of lightning.

At the recent convention at Columbus, the gang passed a resolution that reads as follows:

"Whereas the department in *QST* known as "Calls Heard" has become practically meaningless because of the exceptional distances now commonly covered by all classes of stations, and whereas this department has become too cumbersome to give consideration to the majority of reports received, be it

"Resolved, that it be recommended that this department be changed so that only reports of stations heard over *very exceptional* distances (such as by ships at sea or by foreign stations) be contained in the report."

Remember, fellows, *QST* is printed just as you want it. Any time that you are not satisfied with *QST*, come along like the Columbus gang did with some constructive criticism. We'll admit that the "Calls Heard" department has been sort of up in the air for some time. In the best interests of amateur radio let us have your views on this resolution, so that if a change is made we can be sure that it is done with the consent of the majority.

"4HR's five-watter passed away quietly on Sunday, April 8th, in its old home, the Crosley socket. The funeral was attended by a large number of BCL's who stood about in silent awe as the little giant was lowered into his last resting place in a coffin labeled 'UV-202'. The pall bearers were 4DB and 4PR, while the chief mourner was 4MR."

—The Atlanta Journal.

## Lament

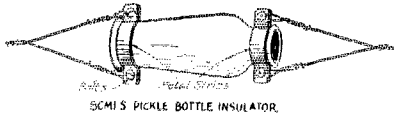
Four little bottles chirping with glee;  
One of them died, and then there were three.

Three little bottles, red hot and blue,  
One more expired, leaving but two.  
Two little bottles carrying on,  
Out goes another, leaving but one.  
One little bottle, oscillating alone,  
Whatin'ell will happen when IT is gone?

QRA of L. M. Dunnam is now 1428 Chapin Street Northwest, Washington, D. C. He has been in Salem and Lynchburg, Virginia, and is now back in Washington.

Now look what they've went and done. Since they've changed wave lengths to cycles we'll have to throw away our wavemeter and get a cyclometer.

8CMI, ex-6TV, has discovered an entirely new kind of glass insulator. 8UE is supposed to be the inventor. It does



not make any difference what kind of pickles came in the bottle, but seriously, this is no joke; it is a real good practical insulator.

Out in KaZoo, Mich. the new Radio Engineer of the local 25c, 50c, and \$1.00 store has placed on sale a whole raft of "Sugar-Comb Reductance coils. "He explained to us that they reduce the radio waves to audibility. I asked him if the sugar-comb coils made the music sweeter; but the poor thing got indignant and declined to discuss the subject further. Please ship me a Wouff-Hong and a Ret-tysnitch to introduce this party to radio in its simplified form. *SCPY-8DKC.*

9AVZ has a fine new card. The printers in Pierre have two stations to keep supplied with cards now.—*The New Oscillator.*

HEY GANG!!

Whaddaya look for first when you get *QST*?

CALLS HEARD

Send in your lists and let the other fellow know how he is reaching out. Get the new dope straight on the first page of Calls Heard.

Wouldn't it be Wonderful IF:

8BZY could find his dog so he wouldn't have to whistle into his transmitter all the time.

Radio dealers could not think of any more trade names.

500 cycle current were available at no extra cost.

Suit boxes were made of bakelite.

Every picture we took of our station would turn out good.

Five-watt tubes were given away with a pound of coffee.

We could tie cans to the tails of all the CQ hounds.

Power tubes grew on Xmas trees.

7SC's pop's pop factory also made five-watt bottles.

The budding two-fer-nickel radio store on our block has put on the market a piece of radio apparatus that will revolutionize the radio game because it is

—"a new and unique variocoupler in which the stator rotates and the rotor remains stationary."

Voice from above, "Try and do it."

*IWC.*

### 6GI Exonerated

6GI states that he operated according to schedule in the 100 meter CQ party except for a slight overlap at the start and finish. It must have been the terrible way in which his signals reached out that caused a bunch of the fellows to notice the overlap and report that 6GI ignored the schedule. This statement was repeated in the circular letter sent out to the participants in the tests, not because 6GI was the chief offender but because he was mentioned in most of the logs. No disparagement was meant—6GI staged a wonderful performance. Friend Wade just became the victim of the old rule that it is always the fellow that reaches out best that reaps the credit for all the QRM. Sorry, Old Timer.

*S. Kruse.*

### The A.R.R.L. Spirit

At a recent convention prizes were given for the best explanation in a few words of the A.R.R.L. spirit. In order that we may all agree what we stand for we print a few of the best ones below:

The A.R.R.L. spirit is co-operation and fairness, co-operation not only amongst themselves but amongst others; and fairness, not only in one way but in every regard.—*8BFH.*

The A.R.R.L. is for the good and co-operation of the transmitting amateur, introducing modern ideas and exerting all its influential powers for the advancement of modern radio.—*8CWS.*

The A.R.R.L. spirit: The organization of the amateur, by the amateur, and for the advancement of radio; and an organization of true Americans striving towards a common goal, the perfection of radio communication.—*8CMK.*

In stations that can only boast of a lone five-watt tube, a radiation indicator made of a flashlight lamp shunting a portion of the antenna lead or connected directly in the lead is often used. This is very nice as the operator can tell at a glance whether the set is perking or not. However, the old adage that you "can't get something for nothing" still holds good and neither can you light the lamp in your antenna circuit unless you do it with the watts that should be in the antenna. The average flashlight lamp takes perhaps one-half a watt, which in a small set cannot afford to be wasted. If you do not believe the above put a small scale

ammeter on the antenna side of the lamp and take readings of the antenna current with and without the lamp. Of course in larger sets the watts consumed by the lamp is proportionately so small as to be negligible.

#### Department of Commerce Notes

With the inauguration of the new radio regulations the Department of Commerce is enlarging its inspection service. The titles of the men in the radio inspection service have been changed to meet the new conditions. Radio Inspectors are now known as Supervisors of Radio, one Supervisor being in charge of each district. The former Assistant Inspectors are now known as Inspectors but there will continue to be Assistant Inspectors, in addition. The title of Supervisor of Radio should not be confused with Radio Supervisor which is a title used only by the U. S. Shipping Board.

On or before July first it is expected that an inspection office for the Fourth District will be opened at Atlanta, Georgia, under Mr. Walter Van Nostrand, Jr., as Supervisor. Mr. Van Nostrand is at present Inspector for the port of Norfolk in the third district. For some years past the administration of both the third and fourth districts has been combined under the superintendence of Supervisor Cadmus at Baltimore, the third district headquarters.

Many amateurs have asked us why a good article on counterpoises was not published in the Antenna Number of *QST*. The truth of the matter is that we have been unable to find anyone who knows enough about counterpoises to write an authoritative article on the subject. (This is an invitation to "kick thru" with the dope.—Ed.)

6ZH, friend Picker at San Ysidro, Cal. has been issued one of the six special licenses provided for in the new regulations allowing him to work on 285 meters.

The article on page 22 of June, 1923, *QST* looked like a bunch of bunk to those of us who have never seen the stunt before. However, just to illustrate that capacity coupling operating a set at the fundamental is OK, 8VN showed us a card just received from 7BJ in Western Washington saying that 8VN's sig's were "vy QRK." 8VN was using at the time, four 5-watters with 600 volts on the plates and getting two amperes into the antenna. The antenna was operated on its fundamental of 192 meters and coupled to the set capacitively as shown in last month's article. Nuff sed; 8VN's dope is F.B.

#### READ THIS AND WEEP!!

Ten thousand miles on a five watt tube! On the morning of the 18th of February while at sea 100 miles southeast of Ceylon, in the Indian Ocean, the operator of the S. S. Gallatin picked up on 200 meters the C.W. signals of 5IM working 9BRI.

5IM was notified and the reception was found to agree exactly with his station log which showed that at 9:00 P.M., C. S. T., on the above date—he had worked 9BRI.

In the same letter reception was reported of 4EB, 6KA, 6ZZ, and 8ANB!

No description of equipment used was given other than the use of a "one note magnifier" which in American Ham terminology means "a one step." The transmitter in use at 5IM at the time was one five-watt tube supplied with 750 volts of chemically rectified current. The antenna current was slightly below three-quarters of an ampere!

What will the next world's record be?

#### Wouldn't It Be Wonderful If:

4FG dropped his rapid-fire bug key down some convenient well, and learned how to push the old straight variety.

4IV's rectifier would stay put five minutes at a time without running up and down the scale playing the "Star Spangled Banner" more than once.

*The Atlanta Journal.*

The Allen D. Cardwell Mfg. Co. will make on order a C.W. condenser similar to their fine variable receiving condenser only with double spacing. Just the thing for use across the grid coil or in the antenna circuit of your transmitting set.



Aha! Take a look, you radio cake eaters—see what 2CQZ got for his birthday. Hi!

Anent 9AOQ's battery charger described in recent issues of *QST*, many are using a burned out tungar tube and a spark coil for starting it. Wm. Macke of New Orleans is dragging eight amperes through a burned out 2 ampere tube without undue heating.

### Help Wanted!

From time to time, as we chronicle the onward progress of amateur radio in the pages of *QST*, a stumbling-block is reached in the form of some technical question that needs to be straightened out and adapted to amateur practice before the game can continue.

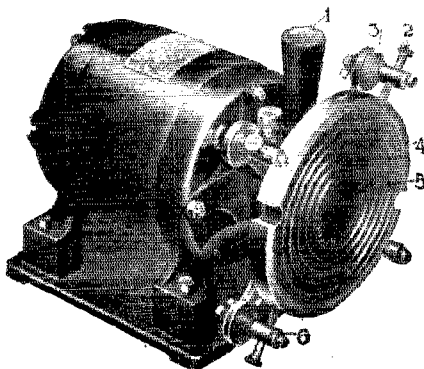
Now there exists in amateur radio a specific brand of amateur who can best be called the "experimenter-ham." They are the fellows who get all of their fun out of radio by monkeying around and experimenting with every new radio device and circuit that makes its appearance. We believe this gang of experimenters would be more than glad to cooperate in some *practical, organized experimentation*.

Just drop *QST* factory a post card with your name and address and let us know if you'd like to help out. We have a whole herd of problems waiting to be solved and we want some of you good "experimenter-hams" to take a crack at them. Give us the dope on your facilities for carrying on these experiments and tell what you'd rather tackle; something on receivers or receiver circuits, antennas, filters, counterpoises, transmitters, or what not. Then we'll stick all of the cards in an index and know who to call on.

There is nothing binding about this; it's just a means of getting all of our brains together to solve these knotty problems, and we know the experimenter-hams will be glad to help. Let the cards fly.

### A Synchronous Rectifier at Last!

Ever since a few of the Los Angeles gang started spreading the news that their "ton of brick" signals were due to a new kind of a rig called a "synchronous rectifier" amateurs throughout the country have been looking high and low for one of the things.



The cut shows a rectifier of this type. It rectifies A.C., from 500 to 3000 volts, for

the plates of the transmitting tubes. The disc is made of moulded bakelite, corrugated on the side. Air insulation is used between the two movable segments mounted on the disc, thus preventing any breakdowns due to burned insulation. Four copper gauze brushes mounted in substantial brush holders make contact to the rectifying disc. These brushes are mounted on an aluminum yoke that may be moved to the correct position by the large knob provided for that purpose, even when the rectifier is in operation. The driving motor is a synchronous motor of standard make, equipped with ball bearings.

Further information regarding this rectifier may be obtained from the manufacturers, the Advance Electric Co., a Los Angeles concern specializing in motor driven rectifiers for various purposes.

### Some Interesting Booklets

As a step towards better co-operation between the manufacturer and the user of his product, several prominent makers of radio equipment are distributing, either separately or as a part of their catalog, booklets containing an abundance of useful information on radio. A better understanding is thus created and the amateur is aided in getting results from his home-assembled set that will be consistent with the capabilities of the parts used to make up the set.

"How to Make Radio Receiving Apparatus," otherwise known as Bulletin No. 125-W of the Federal Tel. & Tel. Co. tells how to construct receiving apparatus using Federal parts. Directions are given for the building of ten pieces of apparatus; from a simple crystal set to one employing six tubes and a loop receiver. In each instance a list of the apparatus used and its layout and wiring is given, supplemented by a photo of the completed set. The illustrations are clear and easily understandable. The booklet is meant for the person who likes to build his own set but who at the same time desires to follow a design that has worked out successfully and been tried before. It commendably fills the need for a good booklet of this type.

"Getting Acquainted with Radio Receivers," written by Paul Godley and published by the Adams-Morgan Company is all that its name implies. The information on its thirty-two pages is presented in a clear and concise manner. The underlying principles of radio reception are dealt with first. The reader is then led on and with the assistance of clear drawings the "works" of *Paragon* receivers are explained. The last few pages are devoted to good practical tips on the care, operation, and tuning of receiving apparatus. Although essentially a booklet for the



listener, many amateurs can gain a goodly amount of helpful information from it.

The booklet of the Rauland Mfg. Co., dealing with both audio and radio frequency amplification also engages attention. It is one of a series of handbooks issued by this company to aid the layman in securing maximum efficiency from his "All-American" apparatus. Some straightforward and interesting facts are presented concerning amplification which every amateur should know. The remainder of the booklet is given over to twenty-two authoritative diagrams of receiving sets which will prove particularly helpful.

Experience has shown that by winding the secondary coil of your receiver with No. 18 D.C.C. wire an increase in signal strength and sharpness of tuning results. Its F.B. fellers.

"You———(this part censored)———," said the youthful amateur as his C.W. set failed to work.

—So. Dak. Oscillator.

**A good storage battery test.** Connect a wire from one battery terminal to the handle of your best pocket knife. Open the large blade and run it quickly across the other terminal of the battery. If the knife becomes a saw the battery is a good one.

**When laying out the winding form for a spiderweb coil it is always a problem to divide the form into the odd number of slots that are required for winding the coil.** Here's a good simple way to do it: lay your watch on the center of the card and make a pencil dot at each four minutes from 12 o'clock right around the dial. As each minute division represents six degrees, you have thus divided the card into fifteen divisions each 24 degrees apart.

—Pop. Wireless Weekly (London.)

Several amateur licenses have recently been suspended for operating on illegal wave lengths or failure to have the station license brought up to date when a change is made in the apparatus. Indications are that the Department is going to be more strict about these things from now on, and it behooves every amateur to be doubly sure that he is on the right side of the fence.

**Choice Morsels**

According to the *Columbus Dispatch*, "F. H. Schness, Traffic Mgr. of the A.R. R.L. directs the activities of 22,000 unpaid broadcasting stations."

A Toledo newspaper prints the following in all seriousness: "There are so many radio outfits in the neighborhood that it is believed vibration caused the street lamp

in the 1400 block in Erie street to fall and break Monday night."

Ad in Lawrence, Kansas Daily Journal World: "Wanted—Man to climb tree and put up antenna."

ONCE upon a time a man died.  
AND there wasn't any clew  
AS to why he died  
EXCEPT a radio message  
SENT thru the A.R.R.L.  
AND there wasn't anything  
IN the message to explain,  
FOR it was perfectly trivial.  
BUT if they had understood  
RADIO Hams  
THEY would have known  
WHY the man died,  
FOR the message *wasn't*  
ALL twisted  
TO HELLENGONE.

—9DRQ



Big Gink—"Say, OM, I've just hitched up two more 250-watters and have been reported over 500 miles away.

Little Gink—"Gee, that's F.B. ar't. Wish I had even a fifty. My li'l ol' five watter has been perking pretty tho lately. The best DX I've been able to get is from a ship 'op' who heard me off the coast of China on the five-watter."

**THE JUNIOR OPERATOR**

(Continued from page 54)

for an hour or an hour and a half. If you have cultivated that clear, easy and correct style of sending that is so desirable, it will take about ten minutes to get your "fist" limbered up, and from then on you can send for a long period of time without experiencing the slightest discomfort. On the other hand, if you have not learned the fundamental principles of cor-

rect key manipulation, you will "blow up" after the first fifteen minutes with a hand too jerky, and a wrist too sore to proceed. Try this sometime and see how you make out.

#### Gaining Speed, (Receiving)

Gaining speed in receiving is more a matter of practice than anything else. In this connection it will probably repay you to hook up a simple long wave receiver and tune in on the long wave C.W. stations. These stations are transmitting thruout the day, and their steady sending gives one a fine chance for practice in receiving. Some of the stations send very slow and some much faster, thus giving the beginner a wide choice.

When you are able to make a good clean copy with pencil and paper, try without the aid of the pencil to understand what is being sent. Copy it in your head, so to speak. Then combine the two methods by copying a word, or a group of words before putting anything down on paper. A good operator seldom starts writing a word until the transmission of that word is finished. In this way he can make a much better looking copy and capitalize the proper names as he comes to them. In addition, it is a good thing to know how to copy a station on the "mill" (typewriter), even though this method is rarely used in amateur work.

Learning to copy a weak station through static and interference, and fading is an art in itself, and to master it takes no small amount of experience. This taxes the skill of the operator to the utmost, as it is often necessary to retune the receiver and go back and fill in missing letters in the copy without actually losing a word of a signal that can barely be read.

In conclusion, do not make hard work of learning the code. Be optimistic and you will make much better progress. It is true that it takes many hours of concentrated study to acquire perfection, but practice makes perfect. If there is anything that causes downright joy in an amateur's heart it is the pleasure of communicating with an operator who really *knows how to send* and who *knows how to receive*. Be one of these.

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## INTERNATIONAL AMATEUR NEWS

(Concluded from page 51)

### QSA but QRN

#### Amateur Signals Heard in Argentine

The following extract from *The Electron*, an Argentinian radio magazine published at Buenos Aires, is quoted almost literally from the Spanish because of its great interest to the amateur fraternity:

"In the radio laboratories at Entre Rios (Argentina) there has been heard on three

different nights, ten stations of North American amateurs. This was doubted a little at first, but on the night of February eighth the signals of five U. S. amateur stations transmitting on continuous waves were intercepted at the Buenos Aires radio laboratories. They were working on a wave length of approximately 200 meters and one of the stations was using a chopper. Although an abundance of atmospheric discharges prevented the reception of the whole of the messages transmitted by these distant stations, the signals were intense. In the latter experiments the apparatus used was a system of radio frequency amplification developed in these laboratories. The North American and Argentinian amateurs are determined to follow up these experiments with much enthusiasm, in view of the results already obtained, whenever the atmospheric conditions permit."

Buenos Aires is approximately 4500 nautical miles or 5100 statute miles south of the United States, the distance being mostly overland. We hope to have some further information soon and surely would like to arrange for some tests with our South American brothers.

#### South Africa on the Air

South Africa is usually thought of as a land of jungles and wild animals, a place of all places where radio could never permeate. We, therefore, were taken by surprise when Mr. J. S. Streeter of Capetown told us that the Radio Society of South Africa is quite a healthy organization that has been in existence for over two and a half years and that now boasts a membership of over 200 persons.

There are three licensed transmitting stations in Capetown and of course a few illicit Ford coil transmitters, according to Mr. Streeter's letter. Licenses are issued by the Postmaster General and permit transmission on wave lengths up to 200 meters on C.W. or fone with a plate input not exceeding fifty watts. The antenna is limited to a single wire 100 feet in length. Mr. Streeter has worked 520 miles to Kimberley on fone, and his C.W. signals are QSA at a greater distance. Several of the up country fellows are building transmitters and so he hopes to be doing some long distance two way work soon.

Although Capetown is 7800 nautical miles from the center of the United States, consider what has already been done, fellows, and we'll venture to say that U. S. amateurs will make themselves heard in South Africa before long. We have given Mr. Streeter the dope on our stations and the hours we work and he is listening for us with a six tube receiver which includes three stages of radio frequency amplification. Who'll be QSO South Africa first?

# Calls Heard



## Our New Policy

Fellows, don't you think we have outgrown our present system of listing calls heard? The number of lists received each month for publication is growing so large that we can only hope to print one fifth of them in the available space. Obviously this is not fair to the other four-fifths of the amateurs who send in excellent lists in expectation of theirs being printed. We must find a remedy for this situation.

Another thing—we all like to see lists in *QST* of calls heard by amateurs across the seven seas. The calls heard by stations in this country are now inadequate in chronicling the "greater DX" now being done by our stations. Therefore, we especially request amateur radio enthusiasts in other countries to put on the phones and once a month let us have a list of the amateurs they hear.

Beginning next month this department will be conducted under a new policy. Only calls heard over a distance more than a thousand miles will be published. We believe this new system will help matters materially and ask your co-operation by sending in only calls heard over 1,000 miles.

It is also desirable for you to follow the rules given below when making up a list for *QST*.

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*; numerically by districts, alphabetically in each district, Canadian and foreign calls listed separately, state whether spark or C.W. and give period of time covered by 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.

R. Slade, Bellfield House, Waimataitai,  
Timaru, New Zealand.

C.W.: Jan. 16th: 5ZAK. Jan. 26th: 9DSG, 6JD, Jan. 28th: 6GL, 6PX, 5SE, 5XAJ, 5XT, 5ZAK, 6BQC, 6IF, 6ZZ, 7ZU, 8BXX, 9ANS, 9BED, 9DPD, 9UU, 9XAC. Jan. 31st: 1BL, 6JD, 6XAD, 7LR, Feb. 4th: 2FP, 6BO, 6TL, 6GG, 6KA, 6VM, 7LR, 8CEL, 9AYU, 9CKP, 9DGE, 9LG. Feb. 25th: 5PX, 6AVR, 6BUN, 6JN, 9CIP. Feb. 26th: 6JD. Feb. 27th: 5ZAV, 6BUN, 6ZAV. Feb. 28th: 5ZAS. April 1st: 5FT, 5ZAK, 6ALK, 6KA, 6ZH, 6ZW, 7BJ, 9BX, 9CMK, 9ZT. Apr. 3d: 6GU, 6GR. Apr. 9th: 5ZAK, 6ARB, 6BUG, 6AWT, 7ZU, 9CVO. Apr. 10th: 6XP, 6RWP. Apr. 22nd: 5AK, 5ZLT,

6ALK, 6ALV, 6AVR, 6BUG, 6BQC, 6CU, 6ESH, 7SF, 9APW.

Mr. Slade did not log Canadian and U.S. calls separately; the above list includes both. All sigs logged on one VT-24 tube.

Frank D. Bell, Shag Harbor Sta., Waihemu  
Otago, New Zealand.

C.W.: 1AJP, 4HW, 5PX, 6ALK, 6AJF, 6APW, 6ARB, 6BNT, 6ZG, 6ZZ, 7BJ, 8QK, 9MC, 9VM.

Last night was a fairly good one for the now popular New Zealand hobby of Yank-logging. Receiver used consisted of two stages radio, detector and two stages audio frequency amplification. 1AJP was readable two feet from phones and 6ALK, the loudest, was readable 100 feet from loudspeaker. We also heard 2's, 3's, and 4's but did not log call letters for certain. Above calls were heard on morning of April 1. U.S. time. No April fool about this, however.

Now that every U.S. district has been heard in New Zealand, 6800 miles away, what'll we do next, gang??

W. R. Burne, 2KW, Springfield, Thorold Grove,  
Sale, Cheshire, England.

C.W.: Night of May 12-13th: 1HE? "hope Wally will get his bottle going soon." 1XM, 1YK, 2AWF, 8AOI, 8CK, 8KG. May 13-14th: 1CK, 2CQZ, 3RF, 9RM bad. Using 4 valves 2hf, det, and 1 lf. 1XM, 1YK and 8AOI readable 15 feet from phones.

WNP, Aux. Sch. "Bowdoin" at Southport, Me.  
Night of May 31, only.

C.W.: (1AW), 1ASI, 1ANA, (1ALI), 1AQM, (1AQY), 1BWJ, 1BMF, 1BVS, (1BDT), (1BJS), (1COO), 1CPN, 1CLN, (1CKP), (1HK), 1PX, 1OL, 1RV, 1ZE, (2AGB), (2BYK), (2BO), 2CKA, 2CUR, 2CHG, (2CTL), 2CNP, 2CVJ, (2FP), 2TS, 2WR, 3AHP, 3AIS, (3APR), 3AVM, (3AV), 3BEF, 3BVA, 3CDN, 3HS, 3H, 3JJ, 3KN, 3NF, 3WF, 3VA, 3TJ, 3ZO, (4FT), 5NZ, 5AGN, 5NZ, 5ZAV, 5ZABA, (8AVL), 8AMM, 8AHO, (8AWP), 8AQV, (8ALA), 8AJX, 8BQL, (8BOA), (8BT), (8CTZ), 8CEI, (8CLK), 8DIO, 8GT, 8KG, 8UF, 9BL, 9CY, 9CFE, 9DHR, (9DK), 9EJT, 9US.

Canadians: 2BN, 3BK, 3KU.  
Sarks: (1CIB), 2BK.

S.S. Edgehill at Sea. (One tube)

C.W.: 2400 miles East of N.Y., 1EZ, 1AJF, 1BWJ, 1CDR, 2ALK, 2BMB, 2BYW, 2CEI, 2CVG, 3HK, 3ZW, 8AWP.

2650 miles East of N.Y., 1AMF, 1BLB, 1CPF, 2ZS, 6ZZ, 8VQ, 8AWP, 8BCY, 9LZ, 9ABM, 9ARZ, 9DHR, 9DQU.

2850 miles East of N.Y., 2BZV, 3JJ, 8APY, 8AWP, 8CJD, 9DRI.

Canadian 2BN Montreal

C.W.: (1ANK), (1ASU), (1AYZ), (1AZJ), (1CGQ), (1ICKI), (1CNE), (1CNF), (1CNI), (1CPI), (1CPN), (1CPO), (1CSW), (1GV), (1IL), (1IV), (1KC), (1MY), (1SK), (1SN), (1WC), (1YB), (1ZE), (2AWF), (2BGW), (2BMR), (2BQJ), (2BSC), (2BTW), (2CBB), (2CFB), (2CGJ), (2CKK), (2CLA), (2CTS), (2IM), (2KK), (2RY), (3AAV), (3BG), (3BQJ), (3BP), (3BVA), (3GZ), (3HD), (3HS), (3IW), (3JJ), (3TA), (3TE), (3TJ), (3VW), (3XM), (3ZO), (4FT), (5ZABA), (8ADA), (8ADG), (8AEG), (8AL), (8AQV), 8ATX, (8AVD), (8AWS), (8BCH), (8BDV), (8BFM), (8BO), (8BRM), (8BUM), (8CFI), (8CGU), (8CJV), (8CJY), (8CTY), (8DBW), (8VN), (8YAE), (8XE), (8ZW), (9AAP), (9BHD), (9BTA), (9BTL), (9BU),

(9CBA), (9CIP), (9CUI), (9DAW), (9DBF), (9DGW), (9DQU), (9DUQ), (9IG), (9UC), (9VM) (9ZT).

Canadians: (3BQ), (3CG), (3CO), (3DS), (3IM) (3IN), (3KO), (3ML), (3NI), (3PG), (3XN), (3ZS), (9AL), (9BU).

Fone: (1SN), (1CPN), (1ASI), (1CNI), (1CPI), (1ANX), (3JJ), (3TE), (8AXA), (3AAY), Cana- dians: (8KO), (3ML).

Can. 3WG, Guelph, Ont. (Apr. 20, May 20.)

C.W.: 1AW, 1DL, 1EZ, 1JV, 1PA, 1UJ, 1AYZ, 1BAS, 1BLB, 1BLJ, 1BWJ, 1CLB, 1CQP, 2ZS, 2ACD, 2AIF, 2AJW, 2AWF, 2AXE, 2AYV, 2BNZ, 2BUM, 2CEI, 2CIM, 2CJP, 2CLA, 2CQI, 2CQZ, 3BJ, 3FQ, 3GZ, 3HH, 3HS, 3IW, 3KM, 3NF, 3TR, 3UD, 3YO, 3ZO, 3AHP, 3AJO, 3AKG, 3BEL, 3BIF, 3BHL, 3BKS, 3BLU, 3BMN, 3BSS, 3BVA, 3BWT, 3CAQ, 3CBM, 3CBZ, 3CCU, 3CKK, 4AL, 4EB, 4FG, 4JK, 4PF, 4YA, 5EK, 5AEC, 5AL, 5BF, 5CF, 5ER, 5GZ, 5IJ, 5KJ, 5LT, 5RJ, 5TJ, 5UE, 5UF, 5UR, 5VN, 5VT, 5WX, 5AAB, 5ADG, 5ADK, 5AEG, 5AFU, 5AHO, 5AIL, 5ALF, 5ALT, 5AMP, 5ASK, 5ATC, 5AUC, 5AVT, 5AWN, 5AXA, 5AXR, 5AZC, 5BBF, 5BCU, 5BCY, 5BDA, 5BDU, 5BEK, 5BGT, 5BJV, 5BIS, 5BLQ, 5BNH, 5BOG, 5BOY, 5BQS, 5BRM, 5BUT, 5CBQ, 5CDD, 5CDI, 5CEI, 5CEJ, 5CEP, 5CGI, 5CGJ, 5CHU, 5CIO, 5CJY, 5CKO, 5CKU, 5CLZ, 5CNO, 5CQH, 5CQZ, 5CUR, 5CTU, 5CUV, 5CUX, 5CYO, 5CDI, 5DFF, 5DJP, 5IH, 5LZ, 5OX, 5UR, 5UU, 5VM, 9ZT, 9AAV, 9AEM, 9AFY, 9AHJ, 9ALX, 9ARP, 9AUL, 9AVL, 9AZX, 9BAK, 9BUJ, 9BWF, 9CPA, 9CPY, 9CRM, 9CTE, 9GTC, 9DBH, 9DCR, 9DGX, 9DHR, 9DIS, 9DLR, 9DQU, 9DSS, 9DVW, 9DYW, NAH (How cum?)

Canadians: 2CG, 3BQ, 3CO, 3DB, 3GB, 3GE, 3GK, 3IN, 3IV, 3KC, 3OY, 3PG, 3SI, 3SX, 3TA, 3XN, 3ZS, 3ADN, 9BC.

1SN, Beverly, Mass.

C.W.: (2ABZ), (2APL), (2BKJ), (2BO), 2BQU, (2CGJ), (2CHZ), (2COL), (2CPA), (2CPO), (2FP), (2IU), (2KF), (2AJG), (3ARO), (3AV), (3BJG), (3BMN), (3BVA), (3CCU), (3IL), (3JJ), (3NF), (3OE), (3SG), (3TE), (3WF), 3ZM, (3ZO), 4CY, 4DC, 4EE, 4FA, 4FS, 4FT, 4JK, 4NA, 5AHC, 5AMA, 5EP, 5FV, 5UP, 5YL, 5ZAB, 5ZABA, 6CBI, DC-7, 7ZU, 8AAG, (8ABG), (8ADA), 8AEG, (8AFV), (8AGQ), (8AIG), (8ALA), (8ALF), (8ATP), (8AWJ), (8AWP, fone), (8BCP), (8BUM), (8BXT), (8BZC), (8CAZ), 8CDZ, (8CEO), (8CQL), (8CTP), (8CUQ), (8DAE), (8DAK), (8HN), (8KG fone), (8LD), 8OE, (8PJ), (8VN), (8XH fone), (9AAP), (9AAW), SPK, 9AAZ, 9AFZ, 9AHH, 9AHJ, 9AHZ, 9AKN, 9ALY, 9APS, 9APW, 9ATO, 9BAF, 9BDB, 9BGY, 9BKJ, 9BRK, 9BVJ, 9CHE, 9CEV, 9CHE, 9CJP, (9CNV), 9CTE, 9CVI, 9CYO, 9DBF, 9DBH, 9DGE, (9DGV), 9DHZ, 9DKY, 9DSV, 9DTE, 9DVW, 9EJT, 9EIL, 9EKF, 9EP, 9EQ, 9OF, 9OT, 9PF, (9QR), 9UC, 9VZ, WNP. Canadians: (2BN), 3BQ, 3CO, 3ADN, 3DS, (3KO), 3ML, 3PG, (3XN), 9BC, 9BU.

1BFA, Arlington, Mass.

C.W.: 1VG, 2CEI, 3AHP, 3BRL, 3CBU, 3CBZ, 3CCU, 3CDV, 3CEQ, 4AI, 4BI, 4BX, 4FA, 4FT, 4FN, 4JK, 4NA, 4NT, 4PU, 5AGJ, 5ZB, 6SA, 6ZZ, 7ZU, 7ZV, 8AGQ, 8AWN, 8ATX, 8APN, 8BCP, 8BDA, 8BYN, 8BZC, 8CGI, 8CKN, 8CKV, 8DAK, 8DGU, 8PK, 8TE, 8VA, 8VN, 8ZO, 9ALG, 9ALR, 9AG, 9ARU, 9AHJ, 9APD, 9AAP, 9APW, 9ARH, 9AFU, 9AMT, 9BWF, 9BKJ, 9BCH, 9CTE, 9CVO, 9CNV, 9CNO, 9CFK, 9IG, 9DSV, 9DDU, 9DRO, 9DIS, 9OF, 9QR, 9XI.

Canadians: 3HE, 3IN, 3TA, 9CC. Spark: 2AJA, 2KK, 2OM, 3HJ, 9AAW. I.C.W. 2FP, 2ZS, 8ZW

2LE

Lerns A. Brandt, Jr., 11 John St., Paterson, N. J. C.W.: 1AF, 1AW, 1AGS, 1AIF, 1AJX, 1ALT, 1AOK, 1AOR, 1AQM, 1ARY, 1AXI, 1AWB, (1BKA), (1BOM), (1BRQ), (1BAS), 1BSA, 1BTR, 1BWJ, 1CAC, 1CDO, (1CKQ), 1CMP, (1CNI), 1CPI, 1IL, 1MC, 1RH, (1RV), (1XM), (1XX), (3ACY), 3AKY, 3ASY, 3ATS, 3BJ, 3BDO, 3BEC, 3BMD, 3BOP, 3BSS, 3RUC, 3BUY, 3CBZ, 3CCU, 3DX, 3FP, 3GR, (3HK), 3HS, 3JJ, 3LK, 3LP,

3MF, 3NF, 3OE, 3PG, (3PZ), 3SU, 3TI, 3TR, 3TZ, 3WF, 3XN, (3XM), 3ZO, 4BG, 4BF, 4BX, 4CO, 4EA, 4EH, 4EL, (4FT), 4GH, 4GL, 4HW, 4KY, 4LA, 4MB, 4NT, 4OI, 4YD, 4YO, 5AAG, 4KY, 4LA, 4LE, 4MB, 4NT, 4OI, 4YD, 4YO, (5PN) 5QI, 5WB, 5XA, 5XAD, 5ZAP, 6KA, 6XAD, 6ZAC, 6ZZ, 7ABB, 8ABL, 8ABX, 8AFL, 8AOL, 8ALF, 8ALT, 8AOL, 8AOL, 8ASB, 8ATX, 8AUZ, 8AWP fone, 8BAH, 8BAK, 8BDU, 8BEO, 8BGT, (8BKE), 8BPU, 8RJS, 8BQB, 8BMG, 8BMY, 8BRT, 8BSF, 8BUT, 8BWK, 8BWy, 8BXH, 8BYN, 8CAA, 8CEI, (8CEJ), 8CHU, 8CNO, 8CJY, 8CKV, 8CQL, 8CQJ, 8CRB, 8CSE, 8CSJ, 8CTN, 8CUV, 8CYO, (8CYD), 8CYU, 8CYV, 8CXP, (8DAE), (8DAT), 8DCG, 8DEN, 8HG, 8IJ, 8JJ, 8JY, 8KG-fone, 8KH, 8LA, 8LC, 8LS, (8NB), 8PJ, (8QK), 8RJ, 8RU, 8SC, 8SS, 8UE, 8VN, 8VQ, 8VY, 8WX, 8XAK-fone, 8XAN, 8XG, 8XEG, 8ZD, 8ZO, 8ZZ, (9AAP), 9AFK, 9AIX, 9AJP, 9AKO, 9AMT, 9AON, 9APE, 9APS, 9AWP, 9AXX, 9BJ, (9BK), 9BRK, 9BRL, (9HTT), 9BUO, 9BUP, 9BVT, 9BYT, 9BZI, 9CCK, 9CDU, 9CHE, 9CJC, 9CP, 9CTE, 9CVO, 9DGY, 9DK, 9DOZ, 9DEX, 9DUQ, 9DYY, 9EP, (9FP), 9EJ, 9LH, 9OX, 9QR, 9UU, 9UZ, 9XM-fone, 9ZI, 9ZT.

Canadians: 2AF, 3BF, 3BQ, 3CO, 3JL, 3OH, (3UJ), 3ADN.

4KL, Atlanat, G. (May 7 to June 6.)

C.W.: 2AD, 2AFP, 2AGI, 2CPD, 2CQI, 2CRA, 3HS, 3IW, 3JJ, 3SA, 3TJ, 3YO, 3ZK, 4AP, 4IT, 4JI, 4MI, 5AH, 5BW, 5DA, 5FV, 5KC, 5MA, 5MO, 5NV, 6NZ, 5PF, 5RH, 5XK, 5ZA, 5AGJ, 5AJP, 5AMF, 5ZABA, 8CI, 8FU, 8IQ, 8KO, 8OW, 8PT, 8VQ ICW, 8XH ICW, 8ZD, 8ADK, 8AGP, 8AME, 8AMP, 8AMZ, 8APH, 8ATP, 8AWZ, 8BBF, 8BDA, 8BJV, 8BQI, 8BYN, 8BZC, 8CDD, 8CEI, 8CEJ, 8CGH, 8CGJ, 8CIZ, 8CJZ, 8CKN, 8CKO, 8CPX, 8CWP, 8CXW, 8CYO, 8DAK, 8EQ, 9UR, 9ZN, 9AW, 9AAP, 9AAU, 9AFG, 9AGS, 9ALX, 9APS, 9AVR ICW, 9AWF, 9BDB, 9BGY, 9BHD, 9BHX, 9BIE, 9BRK, 9BRY, 9BTT, 9BVP, 9BWF, 9BZH, 9CHE, 9CRN, 9CPG, 9CVO, 9AWG, 9DDU, 9DHR, 9DIS, 9DMB, 9DXN, 9ECE, 9EKF.

Spark: 8AAB, 9BHZ.

5ANC, Enid, Okla.

C.W.: 1ACH, 1AW, 1BS, 1BWJ, 1BYN, 1CPN, 1GS, 1GV, 1PM, 1QP, 1RM, 1TT, 1XM, 1ZE, 2AWF, 2CD, 2CJ, 2EL, 2GR, 2IG, 2NZ, 2XD, 2ZS, 3AJJ, 3ARF, 3BJ, 3BUY, 3CAN, 3CGW, 3FQ, 3JJ, 3MB, 3OE, 3VM, 3ZO, 4AAP, 4AV, 4BQ, 4BI, 4CY, 4DX, 4EA, 4EB, 4OB, 4OD, 4OI, 4YA, 4JK, (too many fives) 6ABX, 6ALU, 6APW, 6AQP, 6ARB, 6BGG, 6BJQ, 6BOE, 6BPP, 6BQC, 6BQD, 6BUN, 6CBI, 6EB, 6EC, 6CGW, 6EN, 6IV, 6KA, 6RR, 6WH, 6ZH, 6ZW, 6ZZ, 7AD, 7AFW, 7AIK, 7BS, 7DH, 7BJ, 7OH, 7LR, 7TO, 7TQ, 7WM, 7ZU, 7ZZ, (too many eights & nines).

Canadians: 2AN, 3CO, 3JI, 3NI, 3SX, 3ZS, 4HH, 9BX.

5LG, Alamogordo, N. M. (April and May)

C.W.: 2KF, 3ZO, 5AAE, 5AEC, 5AER, 5AHC, (5AHD), 5AHR, 5AGN, 5AKY, (5AKF), 5AIF, 5AIU, 5AJU, 5AJB, 5AKI, 5AKN, 5AKY, 5AMQ, 5AMW, 5BM, 5CY, 5EK, 5EN, 5ET, 5FT, 5GA, 5GG, 5GJ, 5GN, 5GR, 5HZ, 5JT, 5JZ, 5KC, 5KE, 5KE, 5KP, 5KW, 5MO, (5MN), 5MT, 5NK, 5NN, 5OK, 5OL, 5OV, 5PD, 5PX, 5QL, 5QM, 5RN, 5SP, 5TP, 5UL, 5VM, (5VO), 5VY, 5XAD, 5XAJ, 5XB, 5XD, 5XV, 5YK, 5ZA, 5ZAD, 5ZAK, 5ZAT, 5ZAV, 5ZD, 5ZH, 6AAK, 6AHU, 6ALK, 6ALW, 6ATY, 6AWX, 6BA, 6BAH, 6BAW, 6BEO, 6BGY, 6BLC, 6BJX, 6BJY, 6BOD, 6BQC, 6BQD, (6BUN), 6BUO, 6BUR, 6BV, 6BVF, 6BVG, 6CBU, 6CGU, 6EC, (6CBI), (6BU), 6HV, 6KM, 6MH, 6TW, 6VG, 6XAJ, 6ZAO, 6ZH, 6ZZ, 7ABB, 7AFW, 7HS, 7IO, 7PF, 7LN, 7ZF, 7GZ, 7ZN, 7ZU, 7ZV, 8CF, 8CNO, 8CUR, 9AAH, 9AAU, 9ABV, 9ABZ, 9AEC, 9AED, 9AEY, 9AHZ, 9AHV, 9ALG, 9AOG, 9AFP, 9ARZ, 9ASO, 9AUL, (9AUW), 9AYL, 9AYU, 9BJB, 9BJI, 9BJK, 9BKC, 9BKJ, 9BM, 9BOD, 9BRL, 9BTO, 9BUN, 9BXM, 9BXQ, 9BXT, 9BXY, 9BZE, 9BZH, 9BZI, 9BZZ, 9CAA, 9CAC, 9CAO, 9CBA, 9CCV, (9CCZ), 9CFI, 9CFY, 9CGA, 9CPI, 9CJY, 9CKM, 9CLQ, 9CTC, 9CVC, 9CVO, 9CWT, 9CAN, (9DEZ), 9DGA, 9DGV, 9DHW, 9DJB, 9DN, 9CRW, 9DSM, (9DTE), 9DVJ, 9DWN, 9EAE, 9EAK, 9ECZ,

9EEA, 9EHV, 9EKY, 9FV, 9JF, 9PF, 9QF, 9SS, 9UH, 9UU, 9VE, 9XAO, 9YB, 9ZT. Spark: 5TP, 5UD, 5XA, 6APH, 6APL, 9ASO, 9BOF.

6CEU, 113 Ululani St., Hilo, Hawaii.

Period Unstated

C.W.: 2XQ, 3BMN, 3AP, 3ZO, 3TJ, 4CO, 5IQ, 5ZAV, 5AAR, 5ZA, 5ZQ, 5HZ, 5GA, 5OV, 5CY, 5XY, 5IX, 5XB, 5VO, 5ZAK, 5AIU, 5XAJ, 5AKY, 5ADO, 5NK, 5UL, 5XA, 5MO, 5BEH, 5AJJ, 5XAD, 5VY, 5ZAT, 5EN, 5APX, 5BM, 5TA, 5ZH, 5EK, 5BIP, 5ALX, 5BUN, 5AVV, 5CAY, 5ZN, 5TL, 5BUR, 5BVG, 5AIY, 5IV, 5ATY, 5XK, 5BRU, 5IK, 5BM, 5BJY, 5BAW, 5ARB, 5BUA, 5BVF, 5ARK, 5BIC, 5GF, 5BJY, 5BKO, 5LU, 5FF, 5NX, 5ALU, 5CE, 5ZAO, 5SU, 5AHQ, 5AOL, 5AWX, 5BJJ, 5HP, 5BFL, 5CGW, 5ASJ, 5AKT, 5BQF, 5BON, 5AIB, 5MH, 5VB, 5CEE, 5BUN, 5BJR, 5AQW, 5BUO, 5EA, 5CEJ, 5BUY, 5BOD, 5CBI, 5EC, 5B0B, 5ZZ, 5ZQ, 5AWX, 5BQC, 5BQL, 5CKC, 5EF, 5AGJ, 5KU, 5TC, 6KBA, 5ABK, 5BSG, 5BWP, 5BQR, 5BHK, 5BQW, 5BMY, 5BQB, 5AWT, 5CFS, 5BWL, 5BQD, 5AVR, 5AHV, 5ACM, 5BKI, 5BPL, 5BKI, 5XAD, 5BU, 5BHI, 5BNU, 5CBU, 5DR, 5AAT, 5ABK, 5CLK, 5BBC, 5ASJ, 5BVE, 5CKZ, 5BVS, 5BRS, 5CU, 5APW, 5ZF, 5ABB, 5TC, 5ATS, 5TLN, 5KS, 5NN, 5SF, 5AF, 5Y, 5KJ, 5YA, 5PF, 5SN, 5AK, 5IW, 5ADP, 5AAF, 5ATC, 5BXF, 5BYO, 5ADG, 5CPX, 5CF, 5BX, 5CMI, 5B0Z, 5BZL, 9ASO, 9BKK, 9AHH, 9ATN, 9UH, 9RXC, 9AOG, 9ACD, 9ABU, 9RSQ, 9FS, 9DOC, 9LZ, 9AAV, 9BVL, 9AEY, 9DJB, 9CMD, 9CPB, 9CTG, 9AVZ, 9CVO, 9CCZ, 9ADX, 9CJC, 9DVJ, 9APW, 9CMK, 9ADX, 9BRI, 9APE, 9BRI, 9AAP, 9EKY, 9CCS, 9ARZ. Spark: 9ASO, 7KJ, 5MB, 6AKT. Phone: 5ZA, 5ZH, 7ZU.

Any one hearing my 15 watt C.W. PSE QSL.

9AOR. (Last of March and early May)

C.W.: 1BES, 1CG, 1XM, 1CMK, 1ABF, 1ZE, 1ARY, 1AGH, 1AW, 1BTR, 1CPN, 1CMP, 1BAN, 1CKP, 1CWR, 2RM, 2AQO, 2AQL, 2AAX, 2CXJ, 2APK, 2BJO, 2FP, 2BUY, 2NE, 3ARO, 3AFB, 3APR, 3BTD, 3ALJ, 3ADX, 3AJJ, 3AUW, 3BGJ, 3TB, 3NB, 3IL, 3IZ, 3AKR, 3AEV, 3RE, 3ALN, 3JX, 3BIV, 3BWT, 4JX, 4AG, 4EH, 4NT, 4YA, 4FS 5AA, 5AAR, 5BN, 5DI, 5EL, 5GA, 5GT, 5HZ, 5JF, 5JT, 5NK, 5XAD, 5UN, 5UO? 6's and 7's too numerous, 8AB, 8AGO, 8ARD, 8BFF, 8BOG, 8CYU, 9AAV, 9ACE, 9ASF, 9AUL, 9AMU, 9BXT, 9BZI, 9CED, 9CJC, 9CJM, 9CLQ, 9CUL, 9DAW, 9DXN, 9DYN, 9DZG, 9IL, 9SV, 9VB, 9XAM, 9XM. Canadian: 1BQ, 3ADN, 3JT, 4FN, 5CN, 9BP, 9BW.

Above calls heard on one tube, Gibbons circuit modified. Fone: 5AHD, 5AKI, 5AKZ, 5XAJ, 5XD, 6CBI.

7AAJ, Richard C. Ring, Ashland, Oregon

C.W.: 1CMP, 1BWJ, 2FP, 3YK, 4HH, 5ADB, 5AEC, 5EJ, 5PX, 5ZA, 5ZADA, 5ZAV, 6AAK, 6ABK, 6ACM, 6ACZ, 6AEL, 6AGJ, 6AIO, 6AIV, 6AJD, 6AJF, 6ALD, 6ALK, 6ALV, 6AOC, 6AOE, 6AOQ, 6AOU, 6APE, 6APW, 6AQU, 6ASJ, 6ATV, 6ATZ, 6AUI, 6AUV, 6AVF, 6AVR, 6AVV, 6AWT, 6AWX, 6BAH, 6BBC, 6BBH, 6BCL, 6BEG, 6BEO, 6BEZ, 6BFL, 6BFY, 6BQC, 6BGD, 6BGE, 6BH, 6BQ7, 6BHR, 6BIC, 6BKI, 6BIP, 6BIQ, 6BJJ, 6BJQ, 6BLM, 6BLV, 6BLY, 6RMN, 6RA7, 6BNT, 6BOD, 6BOE, 6BOU, 6BPE, 6BPL, 6BQB, 6BQC, 6BQD, 6BQL, 6BUO, 6BUR, 6BUX, 6BUY, 6BVE, 6BVE, 6BVG, 6BVS, 6BVW, 6BWP, 6CAN, 6CAY, 6CBD, 6CBI, 6CBU, 6CBW, 6CC, 6CDM, 6CEI, 6CEJ, 6CFQ, 6CGK, 6CGQ, 6CHL, 6CIB, 6CJ, 6CKR, 6CKZ, 6CLK, 6CMI, 6CNC, 6GNI, 6CQI, 6CKZ, 6CQ, 6CU, 6CZ, 6DR, 6EO, 6ET, 6FF, 6EH, 6HP, 6HV, 6KA, 6KM, 6KU, 6LU, 6LV, 6NX, 6PL, 6PL, 6RM, 6SU, 6TU, 6VJ, 6XAD, 6ZL, 6ZQ, 6ZZ, 7ABB, 7ABS, 7ACA, 7ADC, 7ADF, 7ADM, 7ADP, 7AEA, 7AFE, 7AFH, 7AFN, 7AFW, 7AGE, 7AGF, 7AGI, 7AGJ, 7AGU, 7AHC, 7AHW, 7AIC, 7AIV, 7AJE, 7AK, 7AKJ, 7AKK, 7AKT, 7AKQ, 7AKV, 7AKY, 7BC, 7BY, 7CA, 7DC, 7DH, 7EL, 7EM, 7EO, 7FV, 7GE, 7GO, 7GP, 7HG, 7HI, 7HJ, 7HM, 7HS, 7IO, 7JE, 7JG, 7JW, 7KA, 7KF, 7KR, 7KS, 7KT, 7LR, 7NK, 7NY, 7PM (7QD) 7QW, 7RI, 7RV, 7SC, 7SF, 7SN, 7SZ, 7TT, 7WA, 7WE, 7WL, 7WS, 7WX, 7ZN, 7ZR, 7ZU, 8BRC, 8CAA, 8IC, 9AAH, 9APE, 9APL, 9AUL, 9BHD, 9BJK, 9BRI,

9BUS, 9BUT, 9BXA, 9BXQ, 9CAA, 9CFY, 9CJJ, 9CTG, 9CVC, 9CVO, 9CZG, 9DFH, 9DGI, 9DGV, 9DLI, 9DQM, 9DTE, 9EEA, 9QF, 9QL, 9UU, 9VE, Canadian: 4AH, 4BQ, 4CL, 4DQ, 4HH, 5CT, 5EJ, Army BT3, AD7.

Spark: 6AOS, 6AQU, 6AUI, 7AIO, 7CD, 7KJ, 7NE.

Dalite C.W.: 6AHU, 6AIM, 6ALV, 6AO, 6AOL, 6AOP, 6AQU, 6ARB, 6AUI, 6AWT, 6BBR, 6BEH, 6BHK, 6BIG, 6BII, 6BM, 6BMD, 6BNU, 6BRU, 6BU, 6CAN, 6CGB, 6CGD, 6EB, 6FY, 6IY, 6OH, 7ABY, 7ACX, 7ADR, 7AFF, 7AFO, 7AHQ, 7BJ, 7DR, 7IW, 7KR, 7NL, 7NZ, 7OH, 7QD, 7QT, 7KR, 7SY, 7TQ, 7ZN, 9RUN.

All inquiries answered promptly. QRK?

SADA, E. Cleveland, Ohio.

C.W.: (1SN), (1YD), (1AWB), (1BDT), (1BLN), (1BSJ), (1CNI), (1CPI), (1CPN), (2IU), (2VV), (2BWR), (2BXR), (2CKA), (2CUR), (3AX), (3GZ), (3HE), (3HS), (3IL), (3IW), (3MF), (3NF), (3OE), (3VW), (3ZO), (3ACR), (3AEW), (3ALN), (3AVA), (3BEI), (3BHL), (3BUP), (3CBZ), (3CCU), (3CHG), 4AB, 4AG, (4AI), (4BX), 4DN, 4EB, 4FS, (4FT), 4JK, 4JL, (4LA), 4LK, 4MY, (5BE), (5DA), 5EK, 5FV, 5KC, 5MO, 5NK, 5NZ, 5PX, 5RH, 5SK, 5UP, 5XA, 5XAJ, 5ZA, (5ZABA), 5ZAK, 5ZAV, 5ACF, (5AEC), 5AGG, (5AGJ), (5AGN), 5AHC, 5AIF, 5AMF, 6BU, 6JD, 6KM, 6MH, 6XBA ex 6KA, 6AAK, 6AHU, 6ALF, 6AUI, 6AWT, 6BRF, 6BVG, 6CBI, 6CGW, (7BJ), 7IW, 7OH, (7SC), 7SF, 7WX, 7ZU, 7ZV, (8UF), too many others, (9DK), (9UH), (9VB), (9VE), (9ZT), (9AAP), (9AAU), 9ABU, (9AFK), (9AHJ), (9AHQ), (9AHV), 9AHZ, 9ANB, (9AOG), (9APE), (9APW), (9ARC, (9ATO), (9AU), 9AUL, 9AVC, (9AVN), (9AWF), 9AYI, (9BAF), (9BET), (9BGY), (9BHX), (9BKJ), (9BLG), (9BRE), (9BTL), (9BZF), (9BZH), 9CAA, (9CAH), (9CBS), (9CCK), (9CFZ), (9COT), (9CGU), (9CJC), (9CKA), 9CMK, (9CNG), (9COF), (9CWP), (9DAP), (9DGW), 9DHB, (9DJB), 9DXX, 9DLI, 9DOF, (9DPX), (9DSS), (9DWN), (9DXK), (9DXN), (9DZY), 9EAK, 9EBT, 9EES, 9EHJ, (9EKF), (9EKY). Spark: 1DG, 2ABM, 3ME, (3SF), (9AHK). Can. C.W.: (2BN), (4CO), (9BU), 9BX. ICW: 1CKP, WNP.

9AHC, Ellendale, N. Dak.

SATX, Pontiac, Mich.

First Week of May

C.W.: 1EZ, 1IV, 1SK, 1SN, 1AJF, 1AMF, 1APC, 1AQM, 1AWJ, 1AYZ, (1AZW), 1BAS, (1BSZ), 1BVR, 1BWJ, 1CMP, 1CNI, 1CPF, 1CPI, 1CRU, 2NE, 2RM, 2WR, 2AIF, 2AKO, 2BUM, 2BYA, 2CEE, 2CLA, 2CPU, 2CXK, 3GZ, 3HD, 3HS, 3IW, 3JJ, 3QV, 3SG, 3SK, 3TE, 3TR, 3VW, 3YO, 3ZO, 3AA, 3ABW, 3ARO, 3BAQ, 3REI, 3BGT, 3BMO, 3BOF, 3BRF, 3BVA, 3BWJ, 3CBM, 3CBU, 3CCH, 3CEL, (4BX), 4CG, 4CY, 4FB, 4FN, 4LJ, 4NA, 4YA, 5EK, 5HL, 5JJ, 5MA, 5RE, 5RH, 5XA, 5ADO, 5AER, 5AFU, 5AGJ, 5AHR, 5AUI, 5ZAT, 5ZAK, 5ZABA, 6KA, 6ALK, 6BBC, 6BBS, 6CBI, 6CGW, 7IY, 7SC, 7ZU, 7ZV, (9CE), 9EP, 9MO, 9OF, 9QF, 9TE, 9UC, 9UI, 9UU, 9VM, (9VZ), 9XI, 9YF, 9AAP, (9ACP), 9AEC, (9AFY), 9AHH, 9AHR, 9AIX, 9AKN, 9ALG, 9AMI, 9APE, 9APW, 9ARS, 9ARU, (9ATX), 9AUL, 9AUW, 9BAK, 9BCL, 9BDZ, 9BDH, (9BIE), 9BKJ, 9BKW, 9BLE, (9BRO), (9BSQ), 9BTT, 9BVP, 9BYE, 9BYZ, 9CCK, 9CEK, 9CGA, 9CHR, 9CLQ, 9CMK, (9CNI), 9CRA, 9CTE, 9CVI, 9CXF, 9DAW, 9DDU, 9DIS, 9DKY, 9DLI, 9DMU, 9DNB, 9DOF, 9DUQ, 9DRI, 9DRY, 9DTK, 9DUQ, 9DZJ, 9EAE, 9EAP, 9EGB, 9EGW, 9EHI, 9EHX, 9EJT.

Canadians: 2BN, 3BQ, 3CO, 3HE, (3IN), 3JI, 3KO, 3PG, 3UJ, 4CA, 4CN, 4ER, 4HH, (9BC)

9AUI, Canton, Ohio

C.W.: 1ALG, 1ASU, 1BAC, 1BIV, 1BKQ, 1BOJ, 1BSZ, 1BWJ, 1CKA, 1CKI, 1CMP, 1CPN, 1CRE, 1DB, 1EZ, 1QP, 1RV, 1VL, 1ZE, 2AFN, 2AFP, 2AGD, 2ANO, 2AUA, 2AXF, 2AYV, 2AF, 2BUP, 2CBG, 2CBW, 2CCD, 2CFG, 2CPD, 2FZ, 2KY, 2VA, 2BQB, 2BQH, 2BZL, 2BE, 2BN, 2CBA, 2CBG, 2ZA, 3ADN, 3ASP, 3AOC, 3AS, 3ASV, 3AVY, 3AHP, 3ASZ, 3ANQ, 3AEF, 3AQR, 3APR, 3ASO, (Continued on page 77)

# Radio Communications by the Amateurs

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## Don't You Agree?

Chicago, Ill.

Editor QST:

When old Saint Peter comes to me and asks me if I ever helped QST out he's going to let that elevator rise just like the ammeter does on a good C.W. set. Did I ever sit down to your set and fool around with the dials about midnight and hear some distant eight or five CQ'in (I call 'em that because the Old Man says that's their names, nowadays) and after five precious minutes spent of waiting for his call, he slops it off in a style that nobody can copy and then he wonders why he don't raise anybody, outside of those who know his fist! Did'ja ever have it happen?

We're always glad to hear a fellow hammer the key nice and steady, and those fellows always get somewheres, but when some bird starts up with his "bug" or "sideswiper" and slops his call, after he has either called you or CQ'd for the last fifteen minutes; don't that make you sore for the rest of the evening?

Another thing; there's a regulation that says that you should call your station three times! Not ten! This means everybody. You seem to think that if you don't call him ten or twelve times, he isn't going to hear you! Foul ball, brother ham. If he is listening in and you toot your horn and he's got a decent tuner, you won't have to pound the brass after the third time on his call. Sign your own and listen in. Just try this tonight when you start the set percolating, and see if you can't clear your messages just as quick, without calling that other station the other seven times. It lessens the QRM for everybody and is a general help all around.

"Till the next issue arrives.

S. D. Clayton, 9BRA.

## Oh My!

P. O. Box 133,  
Ancon, Canal Zone.

Editor, QST:

I note with interest QST's generous offer of "one genuine Brown Derby to the first American amateur to establish two-way communication with Europe." Hi! FB! Say, OM, the brown derby is OK for fall and winter wear, or for a fellow to wear at his wedding, but how about the summer

time? Please let me add to your kind offer of a brown derby a genuine Panama sky-piece to embellish, during the summer months, the dome of the DX hound who first establishes two-way communication with Europe. If on verifying such communication you will cable or write me the name and address of the successful ham together with craniological data (size of head) the said Panama will be forthcoming on next boat. No time limit on this offer.

73's to all the gang.

Carl G. Brown.

## Which Way Does the Current Flow?

Pasadena, Calif.

Editor QST:

In the "high and far-off days" when men were first beginning the fine adventures into the fields of electrical knowledge somebody called the terminals of a source of current "positive" and "negative" and further alleged that the current flowed from the positive terminal to the negative. The names have been and still will be useful to us, but we have had to give up the ancient and honorable assumption that the current flows from the positive to the negative terminal. As a matter of fact, it does nothing of the kind. It flows from the negative to the positive. The basis of proof has been ready at hand for about forty years, and has apparently only awaited the ripening of men's minds that sometimes is necessary before the final acceptance of a new notion.

The basis of proof is in the thermionic vacuum tube. The steps from the old idea to the truth are not many, and are conclusive and striking. They might be set down like this:

1. Edison noticed a clear line on the wall of a blackened incandescent lamp and saw that the line was in the plane of the horseshoe shaped filament and on the side of the positive filament leg.

2. He saw in this the fact that the negative leg of the filament was emitting something which the positive leg screened from the glass wall of the lamp.

3. Placing a plate in the lamp, and connecting a galvanometer between that plate and the positive terminal of the

lighted lamp, he found that a current flowed in the galvanometer. But the galvanometer did not tell him anything of the direction of the current. (Do not let your mind deceive you at this point).

4. The current thus observed must have been carried through the space within the glass by the electrons which we know the filament emits from its own mass; we further know these electrons to be negatively charged. As each carries its freight of negative charges to the plate, a current is the consequence, and its direction can be one only—the direction of the passage of the electrons that carried the charges that make up the current.

5. Therefore, the current flows from the negative pole to the positive, which was to be proved. (Q.E.D.)

At first thought it might seem that so much of previous knowledge had been repealed that our use of the instruments of measurements would be seriously interfered with, but it is not so. We may still call the poles by their old names which are still correct enough to identify them and may still observe current flows by means of ammeters and the like, using the findings with old exactness. All that has happened is that we have learned the truth, and have determined that the forefathers made the one possible wrong guess when the direction of flow was assigned in the beginning.

S. G. McMeen.

### More on Spark Coil I.C.W.

Naranja, Fla.

Editor *QST*:

After thoroughly devouring the article in March, 1923, *QST* I have some suggestions that might be helpful to others who are trying to rig up a spark-tube outfit.

I originally used the circuit of 9DDY given as Fig. 1 in the March issue, and have had many compliments upon the way the set reaches out. I found that the coil vibrator was practically the whole cheese as far as radiation was concerned. Using the vibrator as it was manufactured on my one inch coil, the antenna current was from .4 to .5 amperes. By putting a piece of paper folded once or twice between the vibrator and the core the note could be raised to a much higher and clearer pitch with an increase of about two or three tenths of an ampere. Later I put a single thickness of ordinary writing paper between the spring and the holder of the stationary contact. This gave a still better note and a further increase in radiation, bringing the antenna current up to between .9 and one ampere. I use one twelve volt battery to supply the one inch coil and another twelve volt battery to supply the filament.

I found that the polarity of the coil primary and secondary leads had a big effect on the output. I varied the secondary leads until the best radiation obtained and then varied the primary leads. The polarity of the primary leads changed the output from .3 to 1.0 ampere. Later on I tinkered around and changed the counterpoise lead from the bottom of the coil to the filament lead. This helped to get the wave down to 200 where it belonged. Since receiving the March *QST* I have tried the circuit as shown in Fig. 3 of "Spark Coil I.C.W." At first I was able to get an antenna current of 1.4 amperes, which is quite high, but there have been heavy rains which keep the insulators continually wet and one of my counterpoise wires dropped and now can only get .5 or .6 amperes.

My station is 25 miles south of Miami, so my report from New Jersey gives me quite a record for distance. The Texas reports are from stations over 1100 miles away also. Hoping this dope will be of use to someone else; pass it on if you think so. I am,

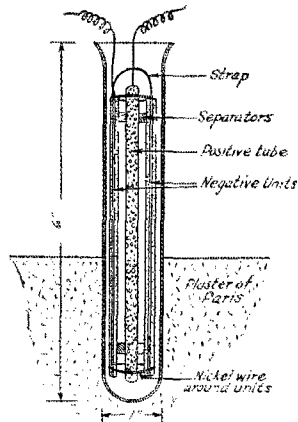
John H. Webb, 4NE.

### More on Edison "B" Batteries

Westwood, New Jersey

Editor *QST*:

I am taking this opportunity to add a few words to the article by Mr. Hall in March, 1923, *QST* which may be of interest to its readers. I believe the Edi-



son type of cell is the practical solution of B Battery problems, and they can easily be constructed at a low cost.

The battery will have a much lower internal resistance and the active material in each cell will be more evenly balanced if two negative units are used for each positive unit. This can easily be done by connecting a nickel wire to each unit as described by Mr. Hall or by spot

welding the wire on to the unit. A better contact is insured by welding. The writer used a small Edison motion picture transformer with eight turns of one inch braided copper ribbon wound around the core to supply the welding current.

Two negative units are prepared for each positive unit and they are assembled with the positive tube in the center. Separators taken from the Edison battery are used as Mr. Hall describes. The three units are fastened together by a turn of nickel wire around the top and bottom of the assembled unit. The whole unit will then fit in one inch test tube.

The writer's battery consists of two hundred cells, assembled in blocks of plaster of paris containing twenty-five cells each and measuring three by six inches. The test tubes were first wrapped with waxed paper and placed two inches deep in wet plaster of paris. When the plaster had set the tubes were removed and the paper forms taken from the holes and the tubes then replaced. This precaution was taken in order that a broken tube could be replaced at any time. I believe by making the battery up in separate sections in this manner the current leakage between cells which is so often encountered in high voltage batteries is reduced greatly as the nearest surface path between the top of each cell is at least eight inches. The solution can be purchased from any Edison battery station at a low cost and is better than any I have been able to get elsewhere.

Morris P. Sherwood.

### A Splendid Idea

Weedman, Illinois.

Editor *QST*:

Most of the Hams have a car of some kind, and whether it be a flivver or a Rolls Royce it would be a good idea to have your call letters on it. Most of us do quite a little touring around the country in the summer and fall. Some of us visit the local stations we work with while others will take more extensive trips. Your call letters on your car will lead to friendly meetings with the amateurs along the route and will help to give amateur radio publicity.

The signs can be made of metal in a number of ways, and can be attached to the regular license number plate, as is often done with signs bearing the name of the city or state that the car hails from. Fasten the signs together with nickel plated binding posts to give a radio aspect.

Everett C. Smith, 9GI.

### From the Other Side

Paris, France.

Editor, *QST*:

I have tried at my station, 8BV, the hook-up of the tuned grid choke which appeared in *QST* for March, 1923. I am glad to tell you that I have been surprised by the efficiency. The antenna current was 0.75 amps. instead of the former 0.47 amps. My set is a regular shunt feedback, working on a very bad aerial.

I believe that the fellow members of the A.R.R.L. will be glad to know that it works. Best 73's.

George Perroux, French 8BV,  
96 Boulevard Montfarnape,

### In Germany

Paris XIV.

Deutsche Telephonwerke und Kabelindustrie, Berlin, Germany, March 29, 1923.

Editor, *QST*:

I am once more back in the land of marks.

You will be interested to hear that Germany is about to make a great drive for the amateur. Two days ago an important meeting was held and a radio club founded. The president is Dr. Eugene Nesper, a radio authority and the writer of many books on radio; one of the officers is Erwin Falkenthal who is in charge of the radio department of this factory. The purpose of the club is to arouse interest in amateur radio and to secure the consent of the German Government to its introduction. The first meeting was simply to form the club and on Sunday I will have some specific facts to write you. I know you will be interested as Germany is about the only European country which gives the amateur no liberty.

I find on returning that the price of tubes has gone sky high. The small detector tubes are very high and the 20-watt sending tube can now be bought here for 7 dollars each.

With best regards,

Tobe C. Deutschmann.

### It Pays to Measure the Antenna

Washington, D. C.

Dear Editor:

This is a story of the way that punk measurements, made with junk apparatus, helps a station to "get out." It is not supposed to show the real way of making measurements—we know perfectly well that it was all wrong.

Three of us had a station at Washington, D. C. The inspector called it "3ABI" and the thing decided to live up to the joke; with 90 watts of perfectly good C.W. it refused to go as far as 3SU's flivver coil. Sumpin simply hadda be done and we decided to measure the antenna. Maybe



a flock of capacity and resistance curves would show us something.

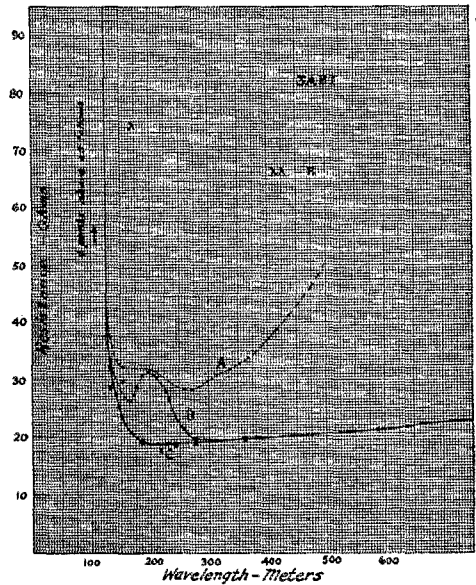
We didn't have the things that were needed and had to fake almost everything as follows—(a) We faked a C.W. "driver" by hooking the regular 25-watt tubes to a flimsy coil wound on a Dutch Cleanser box, with wire swiped from the telephone company. We hooked this thing up in what Parker called the "Maniac circuit" and ran it on the 60 cycle line as usual. (b) We faked a radio frequency resistance by stretching three feet of No. 36 German silver wire between two binding posts on a rubber strip. We cheerfully assumed that its resistance was the same as the D.C. resistance given in an ancient copy of the Electro Importing Co's. catalogue. This was no worse than a lot of other things we did in the next four hours. (c) We borrowed a Weston 115 MA thermo-galvanometer while the Navy Department was looking the other way. (d) We had a good wavemeter—the only good thing in the layout.

We decided to make some wave length curves first. We connected the regular helix, with only two clips on it, into the antenna circuit by grounding one clip and running the other one thru the U. S. Navy's thermo-galv. to the antenna. Then we started our "A.C.C.W." driver—and the needle of the galv. wrapped itself around the pin. Next someone reached for wavemeter and the driver "went off the reservation." We got the power switch open in time—almost; only blew one tube. After two hours of this sort of foolishness we decided to play rummy until the last street car had gone to Chevy Chase Lake and the line voltage got settled.

At 2:30 we started again to run wave length curves for the N.G. antenna. This was a stately job 'cause we had a whole herd of ground connections and a couple of counterpoises and had to make a separate curve for each one. But at 4:00 A.M. we had our curves and at once learned something—the "steampipe ground" and the "tinroof ground" gave the same curve. We hunted around and found that the steampipe went up thru the tin roof and was brazed to it; so we canned one "ground." Also it turned out that counterpoise B would not tune over 130 meters even when all the helix was in—so we canned it. Now we were down to one antenna, one steampipe-tinroof ground, one buried wire ground, one counterpoise over the tin roof, one backyard chin-high counterpoise.

It seemed that we might get further if we knew something about the resistance of this junk so we set up for the "resistance variation" method, because that was simplest and we were sleepy. (See the article "How to Measure Antenna Resistance and Capacity, by A. F. Murray in

the antenna issue.—Ed.) When the curves were done everyone had oysters under the eyes and the first church bells were ringing. Every solitary curve had a beautiful broad hump at 215 meters—one that reached down to 180. We hunted for resonant circuits, found it was the neighbor's antenna, and as he was in



A—The first curve  
B—With good c.p. and good ground  
C—After neighbors antenna came down

Florida the trouble could be cured at once. Fine!! Then we looked at the beautiful new hump-less curves and saw that the tin-roof curve and the counterpoise-over-the-tin-roof curve were the same, except that the c.p. curve showed more resistance. (Counterpoise hounds are welcome to try explaining this.) So we canned the counterpoise over the roof.

Another look at the wave length curves showed that the two grounds tuned alike so we hooked them together and that got it down to a ground connection and a counterpoise connection. We tried hard to make one of them admit that it was no good but they both insisted on being fair. There was gloom in camp until one of us happened to see that the wave length curves for the ground and the one remaining c.p. ran entirely parallel between 150 and 260 meters. Fine again! Now all we had to do was to hook a loading helix in the c.p. lead, adjust it to tune the same as the ground, then connect the top of this counterpoise-loading-helix to the grounded clip on the regular helix and—one ground connection for any wave from 150 to 260.

Of course we had lost a night's sleep but look at the results—we now had 4 nice, large, fat amperes, and it meant something too, as we got lots of cards right away.

Of course someone in the gallery is going to get up and yell 'Aw you cudda done that without any measurin' at all. "Not so, not so!" Three of us had wasted a month juggling eleven clips, fellows from 3ZY, NSF, and other places had come over to take a shot at the thing, and the general result was one entire ampere with the tubes looking like baby blast furnaces. Now with our curves we had put FOUR TIMES as much current into the antenna and the tubes were a nice dull red. Besides, how else were we supposed to find out that we could consolidate half of our alleged grounds and junk the rest with improved results? And how were we to know that it was right to pull down a neighbor's antenna?

Just as I said at the start—these measurements are "haywire," but they paid. What's your antenna resistance—and why?

73.

3ABI.

### Re "How to Determine the Best Wave for an Antenna"

Dayton, Ohio.

Editor, *QST*:

Since writing the article which appeared on page 32 of the May, *QST*, I have studied the problem from the experimental end, and have done the first real work that has been done as far as I know. By accurate measurements we proved that the best point is slightly off the fundamental, exactly as predicted in the article. The "ideal" antenna that you describe should be worked *below* the fundamental but since there is no such thing as an ideal antenna it is idle to discuss it. The fact that there are eddy currents set up in an antenna and that these currents increase rapidly near the fundamental forces one to work at a slightly higher wave length.

If you could correct the impression that the method is good only when there is absorption I would greatly appreciate it.\* I have proven to my own satisfaction that the correct place is slightly above the fundamental in case there are no humps and I think it might be well to make a statement of that fact.

I was also interested in the remarks of Dr. Goldsmith (Page 33, May, 1923, *QST*). He is evidently thinking of high power stations where the length of the antenna is very great compared to the

\*This impression was created by unfortunate editing of one paragraph in Mr. Gunn's article.—Tech. Ed.

height. His remarks are quite worthless when applied to amateur antennas or any type where the vertical height is comparable to the horizontal portion. I think he would be convinced of his error if someone familiar with the problem would point out the facts to him.

I was also interested in the "phoney" explanation of the louder signals at the moment when the filament are turned off. The apparently strange phenomenon is easily explained if one is familiar with the operation of a magnetron. The filament which carries a fairly large current sets up a strong magnetic field close to the filament and bends back toward the filament a good portion of the electrons that are shot off from it. This condition increases the space charge near the filament and when the current is turned off there occurs a sudden rush of these electrons toward the plate since the electric field has not been changed but the restraining magnetic field has been removed. A moment later the filament starts to cool and the emission drops so that the period of loud signals is very brief.

Yours very truly,

Ross Gunn,

Associate Radio Eng. for U. S. Air Service

### Seriously Speaking

Port Arthur, Texas

Editor, *QST*:

Dog-g-one! Jump on the blooming bums again! Have two inch spikes in your shoes when you do, too.

Damn 'em!!

When messages are given to a ham located in the same town that the message is for, and then the message doesn't get delivered or foned in, why that ham ought to get—yes, he ought to get hell! Gawd-nose it ain't much trouble and considering the way these guys grab for messages, want 'em, holler for 'em, take 'em for any place and then don't even put those thru that come to their own town—B-r-r-r! Also G-r-r-r!!

But seriously, it's a heluvanote not to deliver them, fellows. Think of me. I drove every bird I know for messages, and even got a lot of free publicity for the service in hopes of increasing my message total, with the result that within a week or two after getting them I was dodging around corners and using other avenues of escape from those that gave me the traffic so that I would not have to explain the inexplicable. On every side I was besieged by the same question:

"Why haven't I heard from my message? Didn't you send it?"

Lord! I was even pursued in my dreams with this Nemesis query.

Think of it—messages sent direct to the town they were due for and then not

arriving. I tell the bird who gives it to me that it will get thru; and it surely ought, but doesn't, whereby we lose a source of several messages and the League and I receive an awful knock and earn and deserve a knocker. It makes me feel such a fool to boost the League and then have some lazy ham cause the boost to be mere empty words.

Why, I can get traffic from the local hotels and the local business colleges, not to mention the great multitudes; but I shudder to think of the disappointment that might come, not to mention the re-primination. I don't ask for messages any more and hate to get any for the western coast or for the large cities in the east for I have had *one message get thru in six months.*

C'mon, you hams, and back the thing that's making you useful. If it wasn't for the QSR work the great majority of us wouldn't have a thing to do, and here some of you are doing the death of that by just plain damfoolish laziness.

Them's my sentiments.

—5XV.

**Faded!**

Toronto, Canada.

Dear Eddy:

Omitting most of the adjectives applied to these blanketty, blank, blank plagues, I will just say that "fading" causes our best wireless operators to wear a wild look; in other words, "go bugs." I will give you my own experiences with fading. This

As fading results in that sinking feeling, "take bovril." However, when the signals commence to die away the only thing to do is to move the set nearer to the transmitter. A good method would be to mount the radio table on casters and run along the railway tracks towards the transmitter. By pushing the set along the track you can neutralize the fading effect; perhaps.

Yours in despair,

Ernest Crane.

**A Master Oscillator**

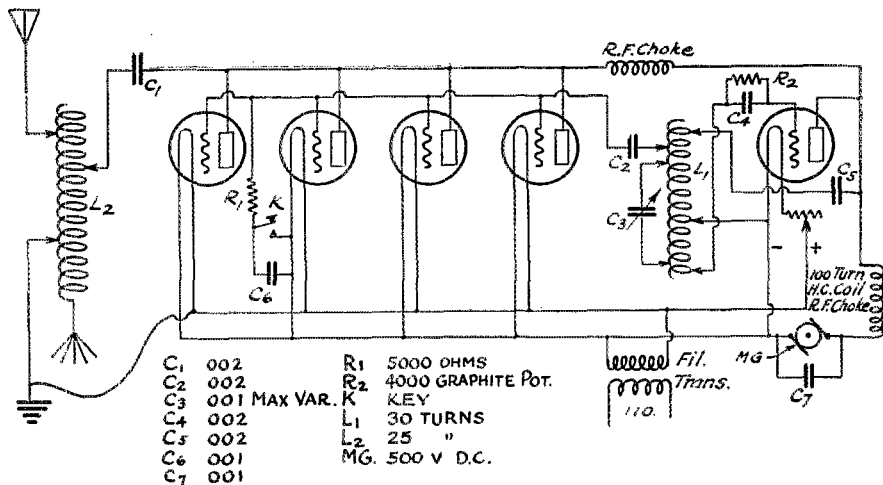
LaCrosse, Wisc.

Dear Editor:

I have been experimenting more or less in the past few weeks with the master oscillator circuit on low powers and will say that it is the real stuff. I am using a small set of this type exclusively now for relay work and have discontinued the use of my 500-watt self-rectifying set until I find time to build it over into a set using a master oscillator.

The small set in use at present employs one 5-watter as a master and four 5-watters as amplifiers. During two weeks the signals from this set have been reported strong in every district—have not had time to hear from Hawaii, England, and Japan—Hi!

This set puts 2.9 amperes into my antenna on a wave of 245 meters. The antenna resistance is 5.7 ohms at that wave



--- usually occurs in the winter, spring, summer, and fall, and when you have just tuned in a ham away over in the Rockies or are getting the ball scores from NIX. It also happens when the dark gentleman in the crap game covers your last two-bits and rolls a natural.

making an antenna input of 48 watts. With one five as an amplifier (instead of 4) the current is 1.7 amperes.

Adjustments on this set are as simple as can be and as one using it, I venture to say, I will never go back to the self-excited circuits. As Ballantine says

—"it certainly is a pleasure to work with it."

Sincerely yours,  
Ben A. Ott, 9ZY.

### An Inductive Neurodyne Receiver

San Diego, Calif.

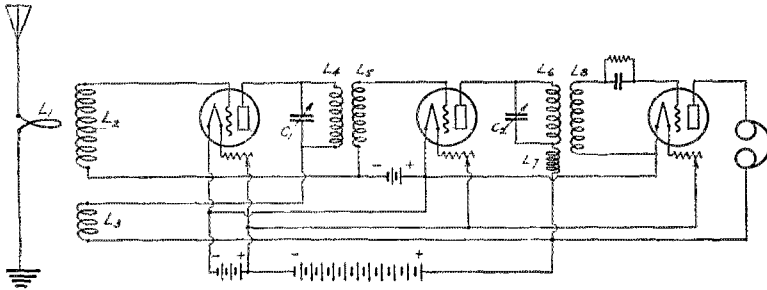
Editor, *QST*:

I am enclosing a hook up which has been startlingly successful and is the result of experiments with the neurodyne. Mr. Roy K. Freeman whose address is 2105 Locust Ave., Long Beach, Calif., is the author of this circuit. It functions in his hands better than the capacitive neurodyne and has some arguments in its favor.

This circuit is easy to construct and works on 200 meters to "beat the band"

(\*Leaving the antenna circuit untuned and inserting only enough inductance at the receiver to couple it to the secondary circuit as in the diagram above is an arrangement which is fast gaining favor. This is the method used in the Reinartz tuner with good results. One adjustment is thus done away with and the result is practically no loss in sensitivity. Usually the antenna coil consists of one to four turns wound directly over the secondary coil.

Strictly speaking, however, the antenna circuit is not aperiodic. An aperiodic circuit, meaning a circuit without a period, is one that contains such a preponderance of resistance that it is impossible to maintain oscillations in it. Any circuit made



$L_1$ —Single turn wound directly over secondary coil,  $L_2$ .

$L_3$ ,  $L_4$ , and  $L_5$ —For concerts, 80 turns No. 26 D.C.C. wire wound single layer on a tube  $1\frac{3}{4}$  inches in diameter.

$L_6$  and  $L_7$ —Same as  $L_3$ ,  $L_4$ , and  $L_5$  except wound on a tube that makes a tight fit over them.

$L_8$  and  $L_9$ —Each ten turns No. 26 D.C.C. wire wound on a long tube arranged to slide inside of  $L_2$  and  $L_3$  respectively.

$C_1$  and  $C_2$ —Variable condensers, .0005 microfarad maximum, with common shaft and single control for both.

For amateur work: make  $L_3$ ,  $L_4$ , and  $L_5$  40 to 50 turns each, all other values remaining the same.

providing the coils  $L_3$ ,  $L_4$ , and  $L_5$ ,  $L_6$ , and  $L_7$  are wound with 50 turns instead of 80. With 40 turns, reception on very low waves is possible. The tuning is accomplished by a single control which varies  $C_1$  and  $C_2$ —similar condensers of .0005 microfarad maximum capacity mounted on the same shaft.

It will be noted that the antenna circuit is aperiodic\*, and consists of a single turn only. A loop can be used with a three-tube set of this type with a great audibility of signals. The ten turn coils  $L_2$  and  $L_3$  which slide inside of  $L_2$  and  $L_3$  are set at the proper value for each stage and then "screwed down." It will be noted that a C battery is used to obtain a negative potential on the grids of the amplifier tubes. When receiving C.W. just displace coil  $L_1$  and then listen.

Sincerely,  
A. E. Banks, M.D. (6ZB).

up mostly of inductance and capacity such as the antenna circuit of a receiver is certainly capable of tuning and therefore not aperiodic. What is done in this case is to put the natural period of the antenna circuit outside of the working range of the receiver, in which instance the antenna circuit behaves as if it were aperiodic.—Ed.)

HAVE YOU DONE YOUR PART TO-

WARD MAKING QST BETTER?

SEE PAGE 126.

# Bureau of Standards Explores Short-Wave Region

By Francis W. Dunmore\*

This article fairly teems with good information for the transmitting amateur—and most of the information flies in the face of tradition.

The radio pioneer is always being shouted down by standpat authority. To-day the standpatter is very busy assuring his fellow amateurs that 200 meters may be fine but no good work can be done below. Firmly convinced that the lower end of the amateur wave band is far better than the upper we ask the standpatter to account for the results obtained in this investigation. Attention is also invited to the fact that in our short-wave tests 6G1 with a 5-watt tube set dropped to the supposedly impractical wave of 125 meters and on both nights of the test put a roaring signal into every state in the Union.

**T**HIS investigation was undertaken at the request of the office of the Chief of Air Service, United States Army. The Office of the Chief of Air Service and the Office of the Chief Signal Officer, United States Army have given their consent to making public the results of the investigation.

### Advantages of the Short Waves

The use of short waves reduce the difficulties in reception due to strays (static) or "atmospherics." It has been observed that more serious strays are encountered in reception with an antenna of large dimensions than with an antenna of comparatively small dimensions. For reception on

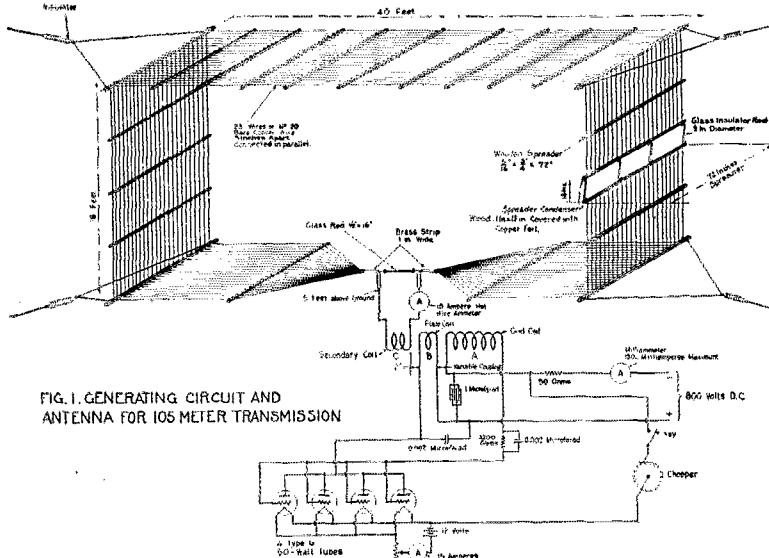


FIG. 1. GENERATING CIRCUIT AND ANTENNA FOR 105 METER TRANSMISSION

Fig. 1—Circuit of the Sending Set and Antenna

Most of these tests here described were made on a wavelength of 105 meters. A special type of receiving set was developed for this work. This paper gives sufficiently detailed information so that anyone having suitable radio experience can construct and operate similar apparatus and continue in this line of investigation.

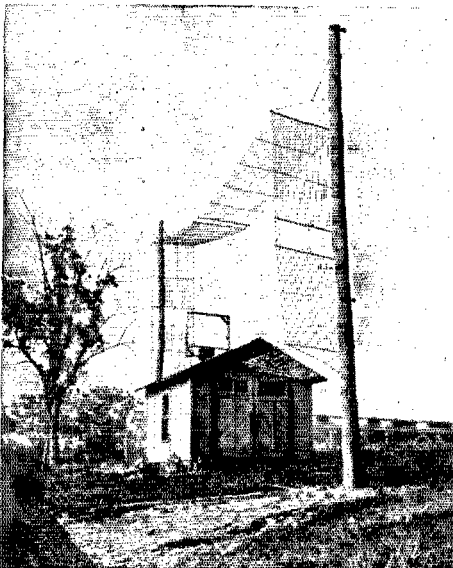
\*Physicist, Radio Section, Bureau of Standards. Original article will appear in the Proceedings of the Institute of Radio Engineers under the title "Continuous wave Radio Transmission on a Wave length of 100 Meters, Using a Special Form of Antenna." Abstract by permission of the Director, Bureau of Standards, and of the Secretary I.R.E.

100 meters a small antenna can be used. Furthermore, even if a large antenna be used, it has been observed that strays are usually not so severe when a receiving set is tuned to (say) 100 meters as when it is tuned to longer waves. An interesting application of the use of a wave length of approximately 100 meters has recently been reported to have been made by the Westinghouse Electric & Manufacturing Co. The report states that Cleveland, Ohio, is located in a so-called "dead-spot" with respect to the 360 meter broadcasts from KDKA in Pittsburgh, Pa. It was found that this dead spot did not exist when

wave lengths of 100 meters were used. Accordingly simultaneous broadcasts were made from KDKA on 360 and 100 meters. The 100 meter signals were received clearly in Cleveland (where KDKA's 360 meter signals did not "break in") amplified and sent out again on 360 meters from a station in Cleveland. Local listeners in Cleveland were therefore enabled to hear KDKA on their 360 meter receiving sets. (What a beautiful confirmation of the results secured in our 100 meter C.Q. party, where all manner of stations broke thru for the first time!—Tech. Ed.)

#### Sending Set

The circuit of the generating set (transmitter), as well as the antenna, is shown in Figure 1. There is a tuned-plate pri-



Station House and Special One-turn Loop

mary circuit with a coupled antenna circuit. Four Western Electric Type G tubes, rated at 50 watts, were used in parallel. The tubes were found to operate more satisfactorily by connecting in the grid circuit an inductive resistance of 3200 ohms shunted by a .002 microfarad condenser. A 50-ohm resistance in the high voltage supply circuit helped to stabilize the operation of the tubes.

For operation at 105 meters the plate coil B consisted of two turns of heavy copper strip two inches (5.08 cm.) wide, shunted by a .002 mfd. mica transmitting condenser to give the circuit a natural wave length of about 105 meters. This coil, and the plate, grid, and antenna coils as well, are clearly explained by Figs. 1 and 2. The coupling between the grid and

tuned-plate coils was rather critical. The same set can be used with the usual type of elevated antenna.

It is important to keep the frequency of the generating (transmitting) set constant. During the operation, the operator should not get near the helices or any other part of the circuit carrying radio-frequency current.

#### Sending Antenna

The antenna was especially constructed with a view to reducing ohmic resistance and to obtain the maximum radiation on the wavelength used. The antenna and the small operating building is shown in the photograph. The antenna consisted of twenty-three No. 20 B.&S. gage copper wires connected in parallel and spaced three inches, light wooden spreaders being placed at intervals of 4 feet to keep the wires separated. The antenna was supported on two poles and formed a rectangle 18 feet high and 40 feet long. The 23 wires did not form a complete circuit but had a gap of about 18 inches as shown in the photograph. Different locations of this gap were tried. The two spreaders at the gap at which the wires terminated were covered with copper foil connected to all of the wires, thus forming a condenser with long narrow plates, consisting of the copper-covered spreaders. The two spreaders at the gap were held together by (one half inch round "Pyrex") glass rods bent so as to have hooks in the ends. The capacity of this gap condenser was small but of the proper value to give a natural wave length of 105 meters to the antenna as constructed. The photograph shows three such condenser gaps but during any one test two of these were short circuited by jumper wires so that there was only one condenser in the antenna at a time.

One advantage of this type of antenna is that it can be made very rigid, so that its natural wave length will vary very little even when fairly strong winds are blowing.

#### Receiving Set

The receiving set was designed for use with a single turn coil antenna (i.e., a loop) measuring ten feet on a side. It consisted of one stage of radio-frequency amplification (employing a tuned plate circuit), a detector, and two stages of audio amplification. The plate circuit tuning element (G, Fig. 7) was made by winding 125 turns of No. 38 B.&S. gage double-silk-covered wire on an insulating tube 3 3/4 inches long with an inside diameter of 1/2 inch and an outside diameter of 3/8 inch. For tuning this coil a movable core is used. This core consists of iron laminations .001 inch thick built up into a core 1/8-inch square and 2 inches long.

#### Transmission Tests

In May and June, 1922, tests were conducted from Washington to station 8XK,

located at Pittsburgh, Pa., and operated by Frank Conrad, of the Westinghouse Electric and Mfg. Co. Two way communication was usually maintained during both daylight and darkness. The receiving set at Pittsburgh employed a detector and one stage of audio amplification. When the

set was flown over a sending set of this type, which had been installed at the McCook flying field in Dayton, Ohio, it was noticed that the signals were very strong in the plane of the antenna and weak at right angles to it. When flying over the antenna at right angles to it two dead zones were noticed, one just before being directly over the antenna and another immediately after passing over it.

The antenna was then connected with the condenser gap in the middle of one end and a second flight made. The transmission characteristic seemed to be similar to the print of a shoe, the transmitter being located just ahead of the heel. Maximum radiation took place from the end of the antenna at which the condenser gap was placed.

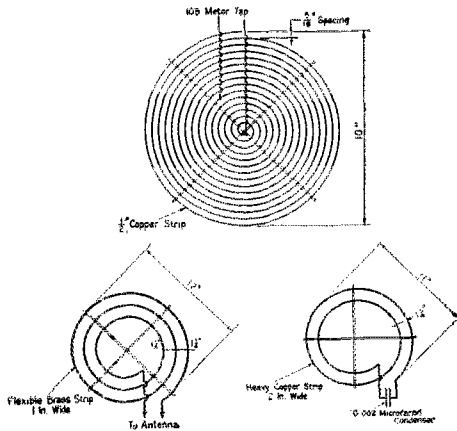


Fig. 2—The coupling coils of the sending set

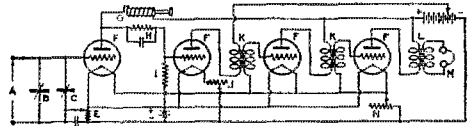


FIG. 7. RECEIVING SET FOR 75 TO 175 METERS  
 A. TERMINALS FOR CONNECTION TO COIL ANTENNA  
 B. 250V AC SOURCE  
 C. 250V AC SOURCE  
 D. 250V AC SOURCE  
 E. 250V AC SOURCE  
 F. 250V AC SOURCE  
 G. 250V AC SOURCE  
 H. 250V AC SOURCE  
 I. 250V AC SOURCE  
 J. 250V AC SOURCE  
 K. 250V AC SOURCE  
 L. 250V AC SOURCE  
 M. 250V AC SOURCE  
 N. 250V AC SOURCE  
 O. 250V AC SOURCE  
 P. 250V AC SOURCE  
 Q. 250V AC SOURCE  
 R. 250V AC SOURCE  
 S. 250V AC SOURCE  
 T. 250V AC SOURCE  
 U. 250V AC SOURCE  
 V. 250V AC SOURCE  
 W. 250V AC SOURCE  
 X. 250V AC SOURCE  
 Y. 250V AC SOURCE  
 Z. 250V AC SOURCE

transmitter at Washington was putting 4.8 amperes into the antenna, the signal received at Pittsburgh had an audibility which varied somewhat but on an average was about 100. (The distance is only about 200 miles but ordinary transmitters find it impossible to maintain communication on the more common waves. Even NSF at its best was always weak at Pittsburgh on all its waves, which ranged from 180 to 952.—Tech. Ed.) It was found that signals transmitted during daylight were nearly as strong as those transmitted at night. The fading often observed during radio communication on 200 meters, especially at night, was notably absent during these tests on 100 meters.

**Directional Characteristics of the Antenna**

The plane of the antenna at Washington was at an angle of 45° with respect to the line joining Washington and Pittsburgh so that the signals received at Pittsburgh do not represent the best that the set is capable of.

Experiments were made with the condenser gap in the middle of the top and also in the middle of each of the vertical ends. With the condenser in the middle of the top, the antenna had a directional characteristic similar to that of a coil antenna (loop), except that there was no zero point. The effect obtained was similar to that obtained when using an ordinary coil antenna (loop) together with a vertical antenna, that is to say, a figure-of-eight characteristic was obtained but without sharp minima. When a plane equipped with a receiving

**Acknowledgement**  
 Assistance in the course of the investigation has been rendered by Mr. Francis H. Engel. The author also wishes to acknowledge his indebtedness to Mr. Frank Conrad and his associates for their co-operation and assistance in conducting the transmission tests between Washington and Pittsburgh.

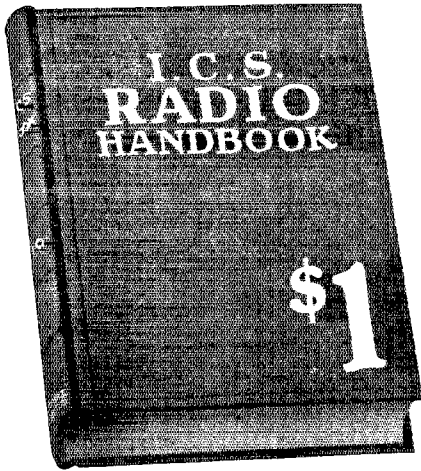
**CALLS HEARD**

(Continued from page 67)

- 3AIP, 3BMN, 3BPL, 3BRU, 3BHL, 3BFU, 3BDO, 3BVK, 3BWA, 3BPY, 3BTA, 3BOB, 3BJ, 3BQ, 3CBZ, 3CDN, 3CDP, 3CEO, 3CFU, 3CMP, 3CPD, 3FQ, 3GZ, 3HA, 3HD, 3HG, 3HS, 3IW, 3KG, 3KM, 3KR, 3LP, 3MX, 3NO, 3OE, 3OH, 3SU, 3T, 3VW, 3WF, 4BI, 4BX, 4BY, 4EP, 4FA, 4FR, 4FS, 4FT, 4GL, 4KC, 4KU, 4LJ, 4AN, 4AGJ, 4AGV, 4BW, 4BK, 4K, 4KL, 4L, 4MO, 4MR, 4NN, 4SL, 4UP, 4VM, 4XK, 4BCF, 4UF, 4TK, (8's too numerous), 9AAP, 9AAS, 9AAU, 9ACQ, 9AEK, 9AHV, 9AJA, 9AJP, 9AJS, 9AMH, 9AMT, 9AMU, 9APE, 9APS, 9APW, 9ARU, 9ASE, 9ASV, 9ATC, 9AWK, 9AZX, 9BAD, 9BCB, 9BCH, 9BDB, 9BGY, 9BID, 9BJB, 9BRY, 9BTT, 9BUJ, 9BUR, 9BVD, 9BVP, 9CFA, 9CGK, 9CHE, 9CIP, 9CKW, 9CNU, 9CPA, 9CRA, 9CTE, 9CUI, 9CVD, 9CVO, 9CVV, 9CWP, 9CWW, 9DCB, 9DDN, 9DDU, 9DFB, 9DGF, 9DHE, 9DHS, 9DIS, 9DLO, 9DLR, 9DRX, 9DSV, 9DXC, 9DXK, 9DYU, 9ECE, 9EDF, 9EDH, (spk.) 9EKM, 9EJT, 9EKF, 9EKL, 9EQ, 9EP, 9HK, 9HS, 9IL, 9KP, 9KY, 9NU, 9OF, 9SS, 9ST, 9TV, 9UR, 9US.
- Canadians: 2AF, 2BN, 3ADN, 3CO, 3GE, 3XN, 3ZS.

9ZT, D. C. Wallace,  
 54 Penn Ave. N., Minneapolis, Minn.  
 Calls Heard During May

- C.W.: 1VY, (1BWJ), (1CPN), (2FP), (2TS), (2AGB), (2CCD), 3BN, 3FQ, 3GB, 3HG, (3HH), 3JJ, 3QL, (3ZO), (3ABW), (3AVA), 3CCU, 4JL, 4MY, (5BW), (5EK), (5LL), (5MN), (5ZM), (5AEC), (5AGN), (5ZAB), 6EA, 6EB, (6EC),



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Canadian: (8DE), 8KO, 8NB, (8SI), 8UJ, 4AO, 4CL, 4CN, 4FN, (5GO).

One Tube—April and May 1923.  
C.W.: 1AJP, 1AQM, 1ARP, 1ARY, 1ASI, 1AYZ, 1BES, 1BWJ, 1CMP, 1SN, 1WC, 2BZV, 2CCD, 2CFB, 2CLJ, 2CVC, 3APR, 3BLU, 3BSS, 3BUC, 3BVA, 3GC, 3JJ, 3ME, 3MF, 3SU, 3TE, 3TR, 3UU, 4AI, 4BI, 4BK, 4DB, 4DN, 4EH, 4MB, 4MR, 4PD, 4YA, 6ACM, 6ALU, 6ALV, 6APW, 6ARE, 6BEC, 6BBH, 6BES, 6BGC, 6BHK, 6BJQ, 6BOU, 6BPL, 6BQB, 6BQC, 6BUN, 6BVE, 6BVG, 6BWR, 6BWL, 6CBI, 6CBU, 6CDC, 6CFQ, 6CGW, 6EO, 6IV, 6LU, 6RM, 6ZAO, 6ZH, 6ZI, 6ZQ, 7ABB, 7AEA, 7AHC, 7AK, 7BJ, 7JS, 7PF, 7QT, 7WM, (9AAM), (9ABU), (9ACK), (9ASF), (9AUU), (9BMR), (9BRI), (9BZF), (9CDS), (9CGA), (9CKD), (9CKQ), (9COJ), (9CF), (9CTN), (9DID), (9DLF), (9DTN), (9EIL), (9LW), (9PT), (9TI), (9YF). Canadian: 9BX.  
No aerial or ground: 5GA, 5GG, 5KC, 5VM, 5XA, 8ACN, 8CRT, 8WX cw and fone, 9AAU, 9AHZ, 9AOJ spk, 9BEL, 9BRK, 9CBA, 9CEH, 9DJF, 9DMJ, 9DVW, 9EKY, 9EQ, 9HK, 9LZ, 9NU, 9QR, 9XI, 9ZT, and Mexican JH?????.

Canadian: 2BN, 5GO.  
Mexican: AX, JH.  
Fone: 7ZU, (9AUU), 9BMR, 9BRI, (9BZF), (9CDS), (9CGA), (9CKD), 9CKQ, 9COJ, 9CF, 9CTN, (9DID), (9DLF), 9DTN, 9EIL, 9LW, (9PT) 9TI, 9YF. Canadian: 9BX.

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**The Sterling  
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Will Reduce Stray Fields  
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*Specified by radio engineers — designed and built by wireless specialists—and recommended by leading manufacturers of radio equipment.*

Burgess Radio Batteries, the result of years of careful experiments are built under exacting manufacturing standards which must meet the requirements of strict laboratory formulae and tests — a supervision that insures their perfect operation.

For professional or amateur radio use, where noiselessness, long life, high capacity and uninterrupted, dependable service are essential, Burgess has no superior.

Burgess Batteries are built for both "A" and "B" circuits. The Burgess No. 6 is used and found most satisfactory on the "A" or filament circuits equipped with the new type one and one half volt vacuum tubes. The Burgess "B" Battery is everywhere recognized as the Standard of Quality in the wireless field.

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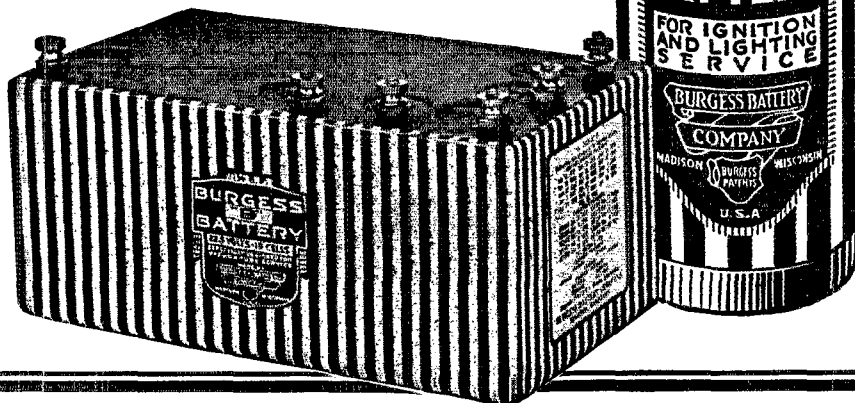
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## RADIO BATTERIES

"ASK ANY RADIO ENGINEER"



# The Receiver

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# Telmaco



## Type B-R Receiver

fully meets the requirements of the discriminating purchaser because of the following features:

**EFFICIENCY OF OPERATION:** Securing volume, distance (1500 miles with single tube is not unusual), selectivity; broadcasting stations one-half mile distant are tuned out by a slight turn of condenser dial.

**EASE OF OPERATION** enabling the novice to secure satisfactory results.

**HIGHEST QUALITY OF WORKMANSHIP AND MATERIALS.**

**\$25<sup>00</sup>** PRICE within the reach of everybody.

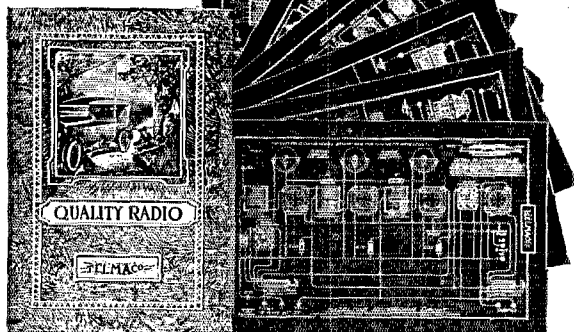
Tri-City Radio Electric Supply Co., licensed under Armstrong U. S. Patent No. 1113149, Oct. 6, 1914.

**Telmaco BA 2-Stage Amplifier for the Above \$20.00**

## Our New Radio Guide Book Sent at Your Request

Our new 64-page Catalog No. TCR contains twenty of the most popular radio circuits printed in blue. These include the Hazeltine Neutrodyne, Grimes Inverted, Colpitts, Flewelling, Reinartz, Diode Electrad, Heterodyne, Super-Regenerative and many others. Each article used in circuit is attractively pictured instead of appearing in straight schematic form. Besides containing blue prints, the best in radio is also illustrated and described. Catalog sent postpaid for 10¢. Each circuit worth double.

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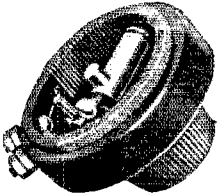
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 Radio Products  
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The new Crosley Duostat universal duo-wound rheostat for all makes of tubes is sold separately from Crosley radio sets if desired, complete as shown in the illustration above. Price 85¢.

By perfecting the new Crosley Duostat universal filament control rheostat, the Crosley Manufacturing Company has made giant strides in bringing within reach of all, the true reproduction of signals from the air. This rheostat, (patent pending) properly controls all makes of tubes, including the new "A" and 199 and makes Crosley instruments even more efficient than ever before because of the:

1. Efficient, smooth, uniform control of all tubes duo-wound to low and high resistance 10 to 20 ohms.
2. Plunger type contact actuated by a special spring, insuring uniform pressure at all times.
3. Spring washers producing uniform tension.
4. Positive rugged stop at zero resistance or "on" position.
5. Circuit interrupted at "off" position.
6. Resistance material having zero temperature co-efficient.
7. Windings protected by a black moulded shell of high heat insulating material.
8. Electrical connections substantial in construction.
9. Design of parts to prevent warping.
10. Extremely low operating temperature with all tubes.

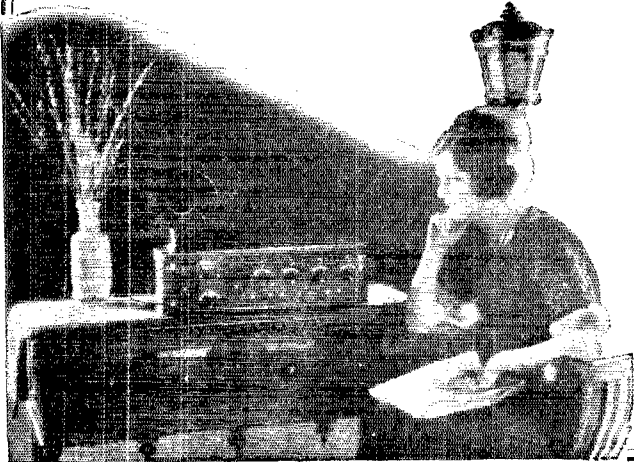
The outstanding performance of all Crosley instruments is due to the effective co-operation of the new filament control rheostat with the other parts.

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 dicate Trust Bldg.



Crosley Radio Receivers have a universal appeal. The Model X pictured here is the last word in efficiency. It sells at \$55 in spite of its new features and advanced manufacturing cost.

# Crosley Radio Parts

## Popularity Proves Their Worth

The fact that innumerable favorable comments are received daily from people everywhere who have used Crosley parts with entire satisfaction leads us to believe that you too will find that they will fill your every requirement.

The Crosley V-T Socket has been pronounced by many radio engineers as the best socket on the market. Its popularity is based chiefly on its high quality, efficiency, service and practical unbreakability combined with its very low cost.

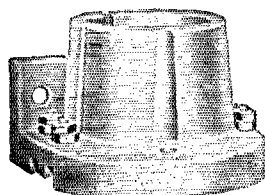
The Crosley Radio Frequency Amplifying Tuner consists of an inductance coil and a Crosley book type variable condenser. It can be tuned to any wave length between 200 and 600 meters. When used with non-regenerative sets it will increase the range many times.

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.

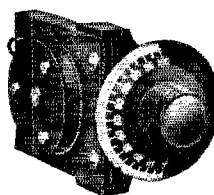
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**CROSLEY**  
BETTER • COST LESS  
**RADIO**

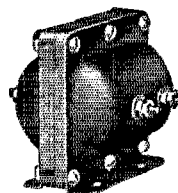
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**CROSLEY V-T SOCKET**  
Made of porcelain for base  
or panel mounting.  
Price .....40¢



**CROSLEY AMPLIFYING  
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Price .....\$4.00



**CROSLEY SHELTRAN  
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# Pleasant Evenings in Camp

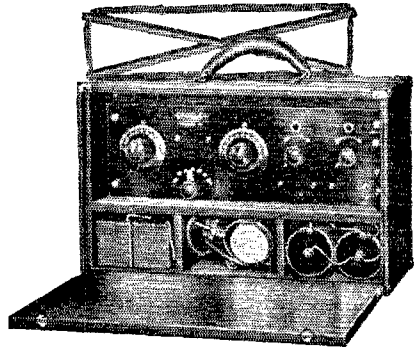
## With a Crosley Portable

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.

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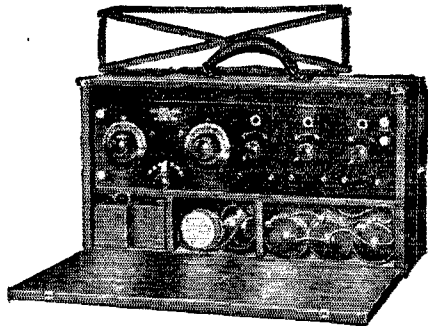
**CROSLEY**  
*Better---Cost Less*  
**RADIO**



**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

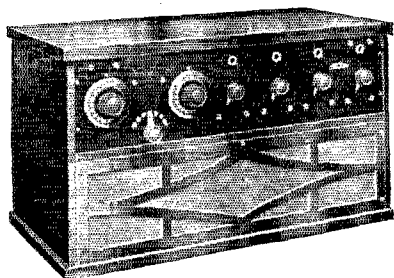
*Free Catalog on Request*

**CROSLEY MANUFACTURING CO.**

**718 ALFRED ST.,**

**CINCINNATI, O.**

## Three Beautiful Cabinet Models The Last Word in Crosley Efficiency



**CROSLY MODEL XV**  
(Above)

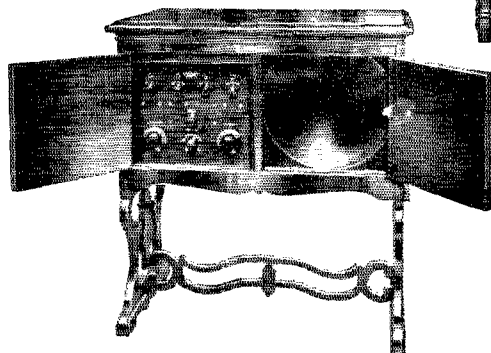
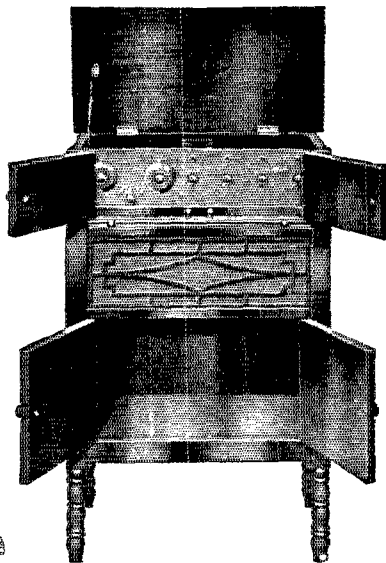
The receiving apparatus in this model is the same as that in our cabinet Model XX. The cabinet contains no place for the batteries, however, placed on a mahogany table or stand, it forms an attractive piece of furniture. Price without tubes, batteries or phones..... \$70.00

**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 every one 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



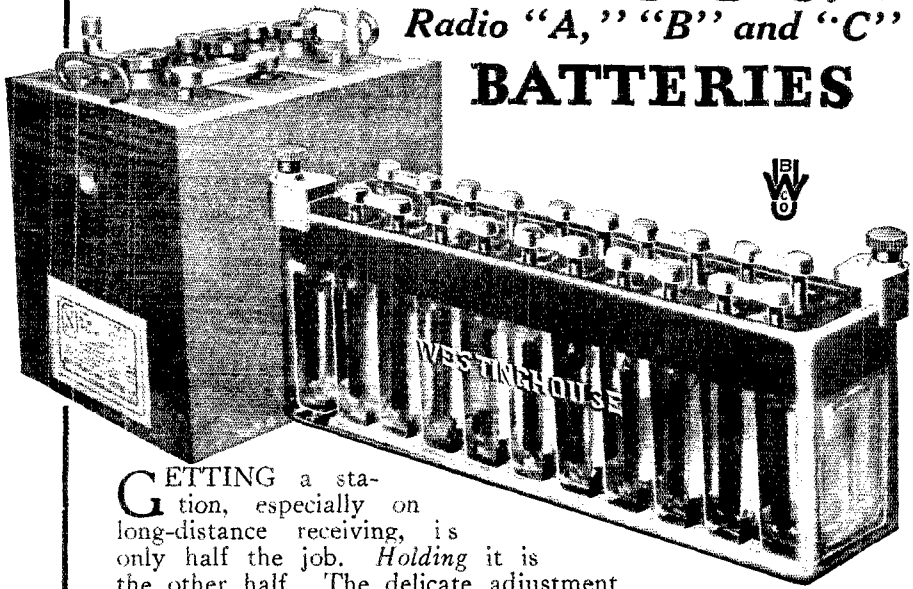
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**RADIO**

**CROSLY MANUFACTURING CO.**  
718 ALFRED ST., CINCINNATI, O.

# WESTINGHOUSE

Radio "A," "B" and "C"

## BATTERIES



**G**ETTING a station, especially on long-distance receiving, is only half the job. Holding it is the other half. The delicate adjustment requires constancy as well as accuracy. Batteries must be even-powered as well as full-powered; steady as well as lively; noiseless. Westinghouse Batteries are built for getting the very utmost out of your receiving set. The extra satisfaction you get will repay you many times for your determination to have nothing less than these carefully engineered storage batteries. What's more, their first cost is practically the last—for they'll last indefinitely and can be recharged repeatedly.

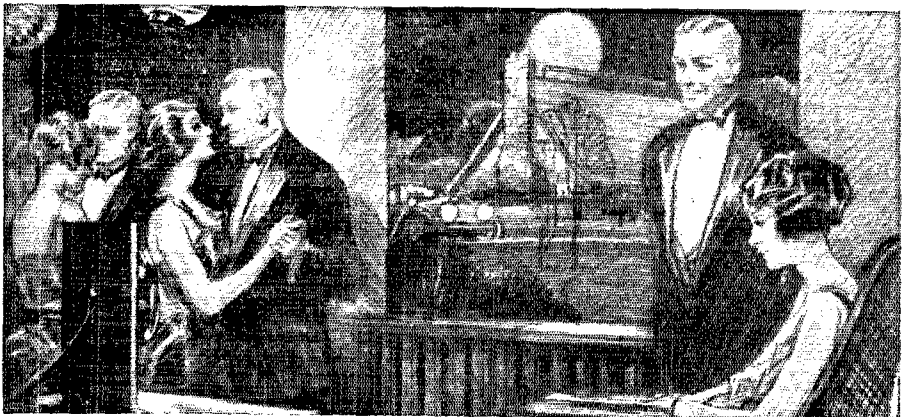
**Westinghouse "A" Batteries** are full-capacity, slow-discharge, long-life batteries. Made in 4, 6 and 8-volt sizes, with 5, 9 and 13 plates per cell, to meet various filament-battery requirements.

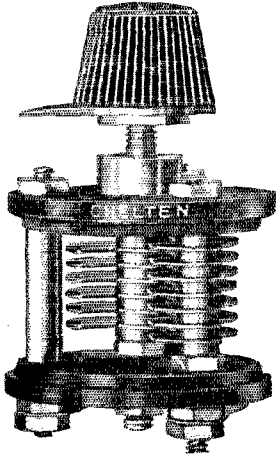
**Westinghouse "B" Batteries** The 22-MG-2 (22 volts) is a marvel for long, steady, noiseless service. (Glass case; visible interior; sealed-in tops. Larger types, too; also 2-volt single "C" cells.

*At radio dealers and Westinghouse Battery Service Stations everywhere. Write for illustrated folder.*

**WESTINGHOUSE UNION BATTERY CO., Swissvale, Pa.**

*For summer receiving especially, you need the quiet, even performance of Westinghouse Batteries.*





Sells for

\$1.50

## CHELTEN MIDGET VERNIER

The Chelten Midget is a Vernier easily connected to any condenser. Its seven stationary and six rotor plates permit closer graduation of capacity than is usually possible with ordinary single plate Verniers. Installed in your receiving set you will at once realize the possibility of sharper tuning.

Like all Chelten Products it is a precision instrument of highest quality. All parts are made to micrometer measurement. Genuine moulded Bakelite top and base. Method of stacking plates insures absolute alignment always. Clear up your signals tonight with a Chelten Midget Vernier.

Chelten Radio Products include — Rheostats — Variable Condensers — Tube Sockets — Switches — Dials and Knobs — Plugs — Jacks — Crystal Detectors, etc. Each one a quality product.

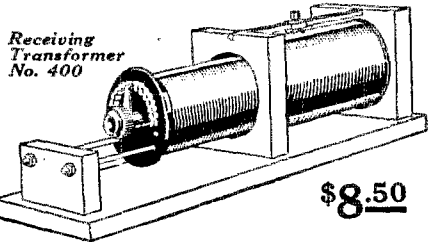
Descriptive folder with wiring diagrams on request.

*Since 1910 Manufacturers of  
High Grade Electrical Specialties.*

**Chelten Electric Company**  
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# FROST RADIO



Receiving  
Transformer  
No. 400

\$8.50

## A wonderfully fine Receiving Transformer at a Popular Price

TO examine this big Frost-Radio Receiving Transformer is to be convinced that it is as finely made a piece of apparatus as you ever saw. Yet the price is remarkably low. Frost-Radio quantity production of precision made products gives you lowest price and highest quality.



## Buy Yours Today

Go to your dealer and buy your Frost-Radio Coupler today. Ideal for all wave lengths between 200 and 4000. Selective to a single turn. Mahogany finished hardwood base. Formica secondary coil head; silk covered wire wound; hand buff-

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**HERBERT H. FROST, Inc.**  
154 West Lake Street, Chicago  
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**General Radio Type 247-G Variable Air Condenser:**

*A quality condenser at a reasonable price. Low dielectric loss. Rigid mechanical assembly. Fitted as shown, with reduction gearing for fine capacity adjustment. You will notice an immediate improvement in signal strength when a 247 Condenser is connected to tune a low resistance circuit such as a receiving loop or the secondary circuit of your tuner. It is valuable in a wave meter or radio filter and as an experimenter's standard of capacity.*

**Price—**

Type 247-G Mounted as shown. With gear. (calibrated in MMF). **\$7.25**

Other capacities, with or without gear, from **\$3.25 to \$6.00**

**Type 231-A Transformer**

*Gives the maximum amplification possible without distortion. Like all apparatus manufactured by The General Radio Company, the Type 231-A is guaranteed.*

**Price . . . \$5.00**

**Type 214 Rheostat**

*A quality rheostat for the new UV 201-A and 199 Tubes. A convenient, practical instrument, equally well adapted for experimental service or permanent installations. You'll never cause unpleasant noises in the phones when you rotate the contact arm of a Type 214 Rheostat.*

**Prices—**

For UV201-A and UV199 Tubes, 20 Ohms. For Tubes such as UV201, 7 Ohms—**\$2.25**



If you value your Radio Equipment by the satisfaction it gives rather than by its initial cost, you're a potential customer of General Radio Company.

For more than eight years, in the design and manufacture of Radio and Laboratory Apparatus, we've set a standard of quality rather than of price. The results have justified the policy.

Today, men who know and use Radio Equipment of the better sort—whether Amateurs, Engineers or Scientists—accept the General Radio Company's name on an instrument as a guarantee of satisfaction.

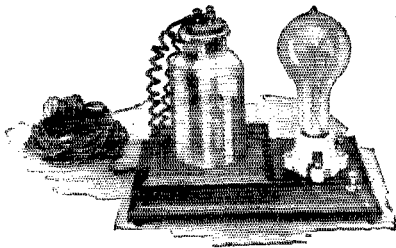
If you're looking for Radio Apparatus—Variable Condensers, Amplifiers, Rheostats, Potentiometers, Sockets, Hot Wire Ammeters, Audibility Meters, Decade and Capacity Bridges, Etc., buy General Radio Company's instruments—apparatus that offers a little greater value per dollar, gives a little more satisfaction, and is designed and made a little better.

Our Bulletin 9140 not only describes our Amateur line, but is an educational pamphlet of value. Sent free on request.

**GENERAL RADIO CO.**

*Manufacturers of*  
Radio and Electrical Laboratory Apparatus  
Massachusetts Avenue and Windsor Street  
Cambridge, Mass.

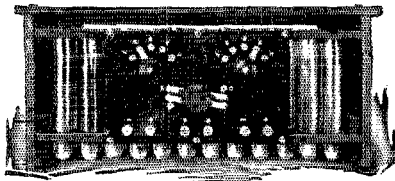
5303



## Storage Batteries

designed for

# RADIO



"B" Battery with Panel Control

KICO Storage "B" batteries are used by thousands of amateurs who understand radio and consequently buy nothing but the most efficient equipment.

### A FEW REASONS

1. Alkaline type.
2. They eliminate noises caused from "B's" that are rapidly deteriorating.
3. The switch control allows single cell variations from 12 volts up. (A critical plate adjustment is essential on your detector bulb for C.W. and Radiophone reception.)
4. Rechargeable from your 110 Volt A.C. line in connection with the rectifier supplied with each battery.
5. Will last from three to six months on a single charge while in the detector plate circuit.
6. NOT an experiment. All batteries sold with the privilege of receiving your money back if unsatisfied within a 30 day trial.
7. Neat, Efficient and Compact.
8. Unlimited life.

*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	

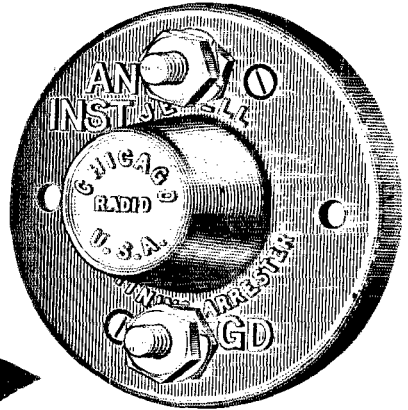
F.O.B. Buffalo, N. Y.

Literature gladly furnished

**KIMLEY ELECTRIC CO., Inc.**

2665 Main St.,

Buffalo, N. Y.



## 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 Underwriters' 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

# \$1000.00 in prizes

*for the best results with Radio frequency.*

*Read how you can enter this summer's contest*

FOR the fifty best articles setting forth how radio frequency has helped conquer summer static and other forms of interference (such as from spark transmitting stations and your neighbor's radiating receiving set) the Acme Apparatus Company will pay a total of one thousand dollars in cash and radio apparatus.

Each article submitted must narrate the personal experiences and experiments of the writer in securing distant stations, in avoiding interference and distortion, and in securing volume and clearness of reception. Wiring diagrams showing the hook-ups used to secure these results will add greatly to the value of the article. No article shall exceed five hundred words.

Radio and audio frequency transformers of any make or brand will be eligible. The contest starts June first and ends September thirtieth. In case of a tie, each tying contestant will receive the full amount of the prize. All articles must bear a postmark of not later than October first. Do not stay out of the contest for fear that you are not an "expert". A novice with natural mechanical or electrical ability may hit on a combination which will win the first prize—\$250.00 in cash. Send the coupon or apply to any radio dealer to secure the four page folder explaining complete details of contest, the judges, the prizes to be given, etc.

# ACME

*for*  
*amplification*

ACME APPARATUS COMPANY  
Cambridge, Mass.

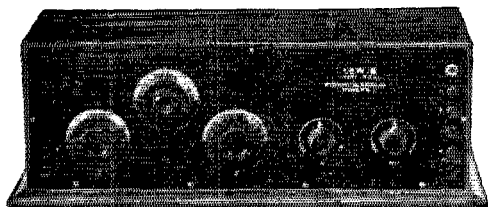
Gentlemen:—Please send me full details  
of radio frequency contest.

Name \_\_\_\_\_

Street \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

# The Radio Outfit That Stays Sold



## The W. C. 5

W. C. 5 receiving sets are giving complete satisfaction because they are so reliable and easy to operate. One distributor recently sent out an order of over 100 W. C. 5 sets to garagemen who had had no previous experience with radio outfits. The fact that only 2 out of the 100 sets required service from the distributor shows how successfully W. C. 5 sets can be operated by people who have had no radio experience. Among operators who have seen it the W. C. 5 is fast becoming recognized as the most efficient tuned radio frequency set.

**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.

*This set is so efficient on short waves that it has picked up many stations on their lower harmonics.*

## 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 an 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.

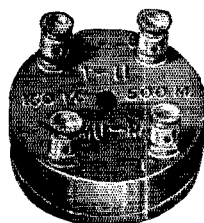
*Just drop us a line and we will see that your enquiry gets prompt attention*

WESTERN COIL AND ELECTRICAL CO.  
303-Fifth St., Racine, Wisconsin.



## Mu-Rad R-F

Amplifying  
Transformers



200-600  
Meters  
Air Core

### Delight the Experts

Professors of physics, instructors of trade schools and radio operators—men who know the fine points of amplification—write us letters of enthusiastic praise for Mu-Rad Transformers. Build your set around a Mu-Rad Transformer, the secret of the long distance achievements of Mu-Rad Sets. No eddy current and iron losses or capacity effects.

DEALERS:

Quality Pays

YOU

As Well As Your

Customers

#### Three Types

Type T-11 for  
the first stage  
\$6.00

Type T-11A for  
the second  
stage \$6.50

Type T-11B for  
the third stage  
\$7.00

Write for our proposition

**MU-RAD LABORATORIES, INC.**

804 FIFTH AVE. ASBURY PARK, NEW JERSEY



# A New Thrill!

Listen-In Tonight with a Kellogg  
Head Set

Clear reception with plenty of volume is necessary to satisfactorily hear distant stations.

Kellogg head sets should not be classed as ordinary radio receivers. Today Kellogg stands foremost in the manufacture of a high-grade head set that actually surprises listeners in comparative tests.

Maximum volume, unusual clearness, extreme lightness in weight, are a few of the many outstanding advantages. The head band is unusually light, though durably built.

The magnets are of special tested steel and hardened by our own special method which controls the heat and time electrically and mechanically, eliminating any possible variation.

The magnet windings are of great accuracy, the mountings, end plates, wire, insulation, etc. are of the highest grade.

Our twenty-five years experience in building receivers for telephone work has proven invaluable in turning out a real radio receiver of merit.

Listen-in tonight with a pair of Kellogg receivers and get a new thrill from your radio set. With Kellogg radio equipment, USE IS THE TEST.

**Kellogg Switchboard & Supply Company**  
CHICAGO

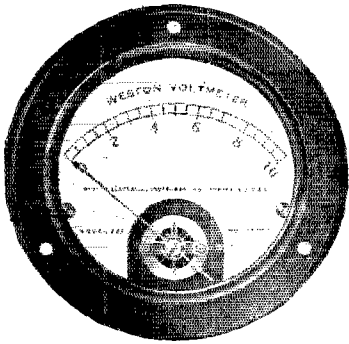
COLUMBUS

KANSAS CITY

SAN FRANCISCO

PORTLAND

*Kellogg apparatus exclusively is used in building The Symphony Receiver*



Send To-Day  
for Booklet J

# IS NOISE STATIC?

Noise does not mean static—it is often caused by weak "B" batteries.

You should have a Weston Voltmeter with which to positively determine battery conditions.

The manufacturers of "B" batteries recommend the discarding of 22½ volt batteries when they drop below 17 volts, for they then cause noise; 45 volt batteries should be discarded at 34 volts.

The Weston is the Voltmeter with high resistance and absolute dependability especially adapted for making such tests.

## WESTON ELECTRICAL INSTRUMENT CO.

158 Weston Avenue,

Branches in all principal cities

Newark, N. J.

Electrical  
Indicating  
Instrument  
Authorities  
Since 1888

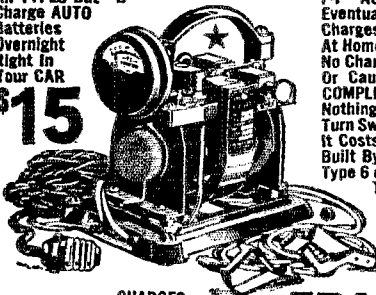
# WESTON

STANDARD - The World Over

## F-F BATTERY CHARGER

All TYPES But "B"  
Charge AUTO  
Batteries  
Overnight  
Right In  
Your CAR

\$15



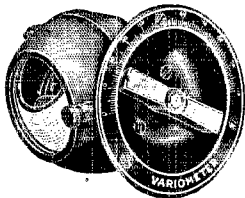
CHARGES  
RADIO & AUTO BATTERIES.

CHARGES RADIO "A" & "B" & AUTO STORAGE BATTERIES at HOME Overnight, for a Few Cents From Any 100 to 130 Volt 60 Cycle A. C. Lamp Socket. Eventually You Will Buy An F-F CHARGER & The Sooner You Buy One: The More You Save. A-B Charges All 6 Volt & up to 120 Volts Of "B" & Loud Speaker Storage Batteries In Series Inductively At Home Overnight. Disconnecting & Multiple Connections Unnecessary. Charging Circuits Separate. No Chance For Grounds, or Short Circuits. Nothing To Stop Over, Be Filled, Burn Out, Need Attention Or Cause Trouble. Infusible Rectifying Brushes Maintain Constant Efficiency Uninterruptedly. COMPLETE PORTABLE AUTOMATIC. No Skill Required. AMMETER eliminates Guess Work. Nothing Like It Made. Lasts A Lifetime. Screw Plug In Lamp Socket; Snap CLIPS on Battery Terminals; Turn Switch & Battery Is Charged In Morning. Charged Batteries Mean Fewer Expensive Replacements. It Costs Less To Buy An F-F CHARGER Than To Be Without One. INSIST on The F-F CHARGER. Built By A Master Of The Art in 7 TYPES. Thousands Sold Make Possible These POPULAR PRICES: Type 6 charges 6 Volt Battery At 6 amperes \$15 Type 12 charges 12 Volt Battery At 5 amperes \$15 Type 6 charges Radio "B" Batteries Up to 120 Volts \$15 Type A-B Is Combination Of 6 & B \$20 Type 166 charges 6 Volt Battery At 12 amperes \$20 Type 1612 charges 12 Volt At 7amps \$20 Type 1626 Is a Combination Of Types 166 & 1612 and Charges Both 6 & 12 Volt Batteries \$28 Types B & A-B are RADIO Specials. Types 166, 1612 & 1626 are For Heavy & Rapid Charging. SHIPPING WEIGHTS Complete with AMMETER & BATTERY CLIPS 11 to 15 lbs. PURCHASE from DEALER; Mail Check, or WRITE us to Ship TYPE desired C. O. D. ORDER Now, or WRITE immediately for FREE Descriptive CHARGER Bulletins 31&31-A.

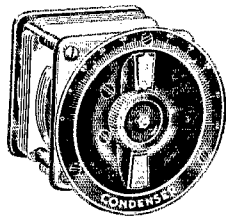
FRANCE MFG. CO., Cleveland, Ohio.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

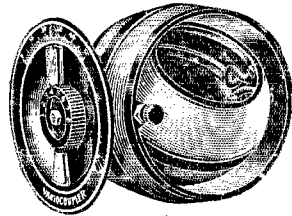
# EISEMANN



VARIOMETER



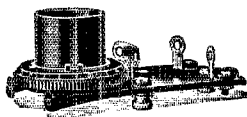
CONDENSER



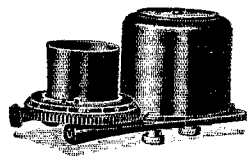
VARIOCOUPLER

**T**HROUGH the use of Eisemann units and panels the assembly of a receiving set entails less than half the labor customarily involved.

The panels illustrated below are completely drilled and ready for use. The units are simply bolted to the panels—the only tool required being a small screw driver. The panels are of aluminum, which acts as a body capacity shield, and have a crystal black finish.



DETECTOR UNIT



AUDIO AMPLIFIER UNIT

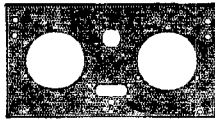
Variometers, variocouplers and condensers, with their matched recessed dials, fit interchangeably into the large circular openings. The rheostat wheels surrounding the sockets on detector and amplifier units extend through the rectangular holes in lower half of panels.



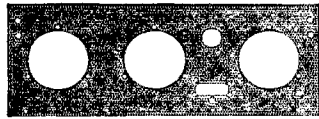
T-1



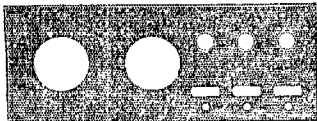
A-2



TD-2

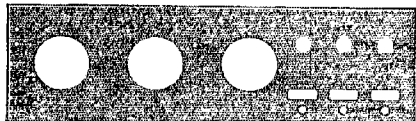


TD-3



TD-2A

METAL  
PANELS



TD-3A

*Descriptive literature on request.*

**EISEMANN MAGNETO CORPORATION**

William N. Shaw, President  
BROOKLYN, N. Y.

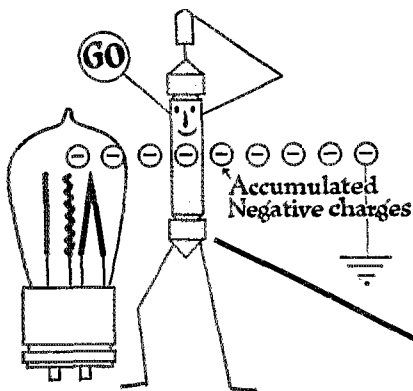
DETROIT

CHICAGO

SAN FRANCISCO

# A.R.R.L. shows great interest in new Grid Control

Little Omega Durham and his friend Dubilier have created quite a stir in the A.R.R.L. circles. For Uncle Sam and the land wires have been kept busy with inquiries and orders from "hams" anxious to do better DX work. And it all depends upon close grid control—the hair's breadth accuracy of DURHAM plunger adjustment and reliable Dubilier Condenser values.



Use DURHAM-DUBILIER combination for tubes, and DURHAM Variables on Durham bases for resistance coupling and across transformers.

When you rebuild

See your dealer at once

**DURHAM Variables** + **DUBILIER Micadons**

No. 101—to 5 megs.  
No. 201A—to 10 megs.

.00025 mfd.  
.00050 mfd.

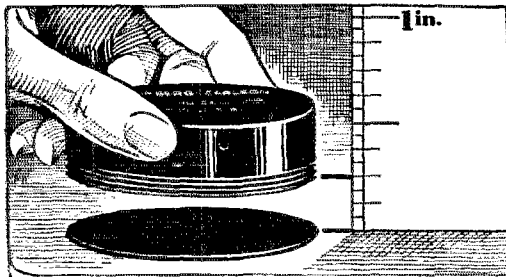
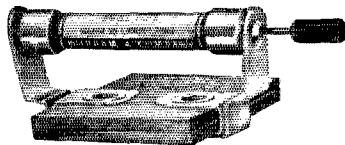
There's a combination for your tubes

Manufactured by

**DURHAM & CO., Philadelphia**

Dealers and Jobbers:—There are over 40,000 readers of "QST." They keep at it all thru the summer. It will pay you to get their trade.

Price Complete  
**\$1.10**



## POWERFUL MAGNETS

**Compare—Then Buy**  
Test the magneto in each head set. See how far they will pick up their diaphragms. Then you will find that Stromberg-Carlson Head Sets have powerful magnets. Those powerful magnets with the equally powerful windings are two reasons why they are unexcelled for long distance reception.

**STROMBERG-CARLSON RADIO HEAD SETS**

have other distinctive features:—  
The receivers are layer wound and layer insulated.

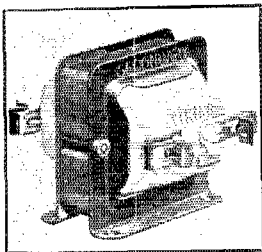
The receivers are balanced as to volume. The adjustment rods telescope. Order Stromberg-Carlson apparatus through your dealer or write for descriptive circular.

Stromberg-Carlson  
Telephone Mfg. Co.  
Rochester,  
N. Y.



**“— the ‘Viking Audio’ has been found best for the Grimes Inverse Duplex. ”—**

*Says March Q.S.T.*  
WHATEVER THE CIRCUIT, YOU ALSO WILL FIND “VIKING AUDIOS” A REAL SOURCE OF CLARITY AND VOLUME.



*Shell type core; layer insulated windings; practically distortionless; quadruple tested at the factory.*

Send for your “Viking Audios” today  
**PRICE \$4.75**

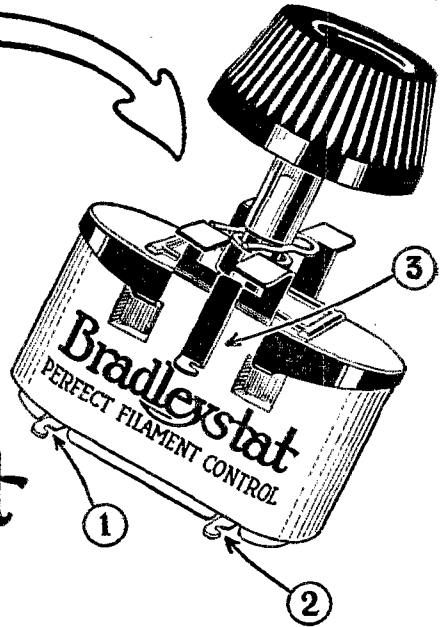
*(Dealers, write for special discount!)*

**VIKING RADIO CO.**  
91 Seventh Ave., New York City



**PERFECT  
FILAMENT  
CONTROL  
FOR  
ALL  
TUBES**

**Ask**  
for the  
**Universal  
Bradleystat  
With 3 Terminals**



**A Perplexing Problem Solved!**

**TRY** any tube in your radio set! It makes no difference what tube is used, the new universal Bradleystat with three terminals will give perfect filament control. A very simple change of connections and a remarkable range of control make this possible for the first time in radio history. Like former Bradleystat models, the new universal Bradleystat with three terminals is covered by the same iron-clad guarantee of perfect performance, noiseless control and quicker tuning that sold hundreds of thousands of Bradleystats during the past year.

Be prepared to try any new tube by replacing your present rheostats with the new universal Bradleystat. It is the last word in flexible and perfect control. It is backed by twenty years' experience with graphite disc rheostats. *Beware of imitations.* Avoid the use of inferior carbon powder rheostats. The name "Bradleystat" is embossed on container for your protection.

*Mail the coupon below for full information about the latest and most remarkable development in filament control. CLIP THE COUPON, NOW!*

ALLEN-BRADLEY CO. 277 Greenfield Ave. MILWAUKEE, WIS.

I am pleased to hear that the universal Bradleystat with three terminals has solved the perplexing problem of finding one rheostat for all tubes. This is good news. Please send me full information and explain how it is done

---



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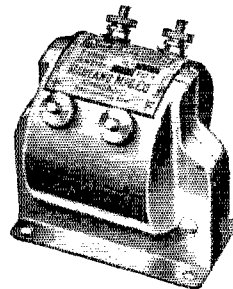
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- C-300
- UV-200
- C-301
- C-301A
- WD-11
- WD-12
- UV-200
- UV-201
- UV-201-A
- UV-199

# "ALL-AMERICAN" Amplifying Transformers

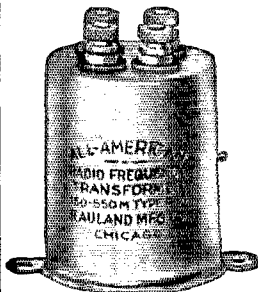
(Radio and Audio Frequency)

## Again Prove Their Superiority in "Neutrodyne" and "Reflex" Circuits



The use of "All-American" radio (Type R-10) and audio frequency (Type R-13, Ratio 10 to 1) amplifying transformers make possible the wonderful success of the single tube Reflex circuit.

"All-American" radio frequency transformers (Type R-10) having a non-magnetic core can be tuned, making them the most efficient radio frequency transformers for the Neutrodyne Circuit.



<b>R-10 Radio Frequency (150-500 meters)</b>	<b>\$4.50</b>
<b>R-12 Audio Frequency (Ratio 3 to 1)</b>	<b>4.50</b>
<b>R-21 Audio Frequency (Ratio 5 to 1)</b>	<b>4.75</b>
<b>R-13 Audio Frequency (Ratio 10 to 1)</b>	<b>4.75</b>

Ask your dealer for FREE "All-American" Hand Book of Radio Hookups. If he cannot supply you, send two cent stamp for postage and name of your dealer.



## RAULAND MFG. Co.

200 No. Jefferson St., Chicago, Ill.



## PANEL SERVICE

We offer to the amateur and dealer

### REAL PANEL SERVICE

Our panels are cut to your order. Only genuine Condensite and Formica used.

1/8" per square inch \$0.02

3/16" per square inch .02 1/2

1/4" per square inch .03

We also carry a complete line of radio essentials. Dealers will find it profitable to have our latest price list and discount sheet.

**PITTSBURGH RADIO**

AND

**APPLIANCE CO., Inc.**

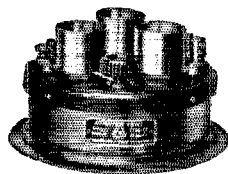
"Pittsburgh's Radio Shop"

Desk B

112 Diamond St., Pittsburgh, Pa.

# ATWATER KENT

RECEIVING SETS AND PARTS

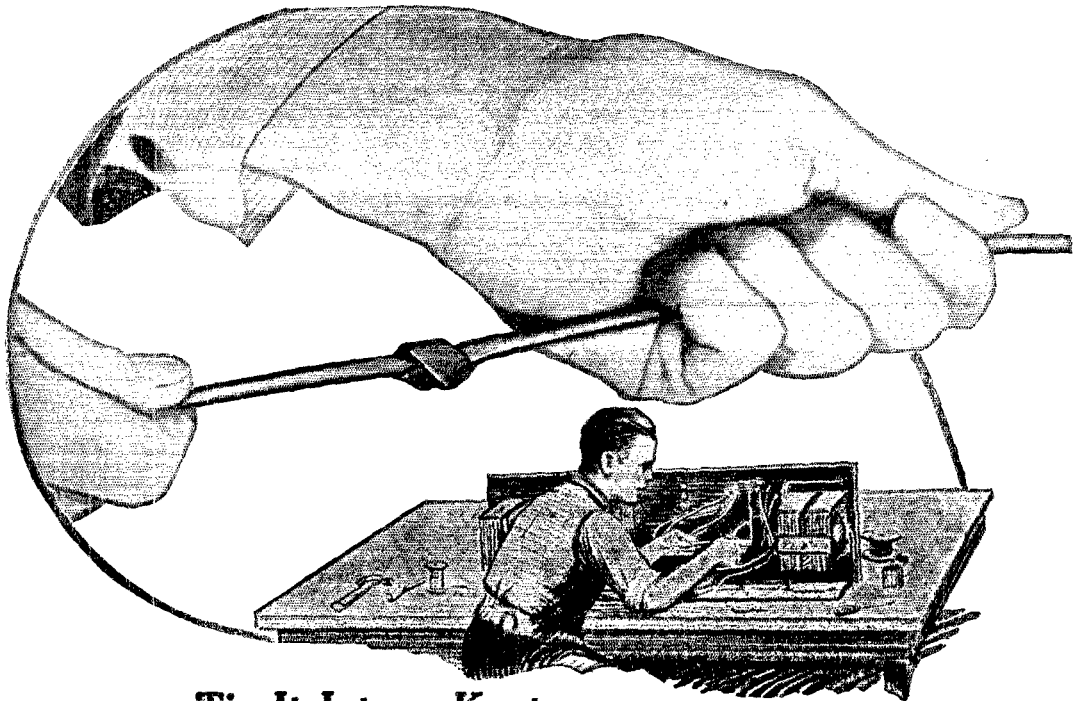


Detector 2-stage Amplifier

ATWATER KENT Sets and Parts are ideal for summer use due to their compact and rugged construction and the fact that they are moisture-proof. They are made mostly of condensite and are thoroughly water-proofed.

Send for an illustrated folder showing all parts and complete sets.

ATWATER KENT MFG. COMPANY  
1945 Stenton Ave., Philadelphia



## Tie It Into a Knot It Will Not Crack

Don't ask for "spaghetti" when you are buying supplies to assemble that radio set—ask for

### G-E Flexible Varnished Tubing

Then you will be sure of getting not only the highest possible degree of insulation but also a tubing that can be used to cover the shortest turns without cracking or peeling. Furthermore, this tubing remains soft and flexible indefinitely.

The best is always cheapest in the long run—and G-E tubing costs no more than the ordinary kind.



General Electric Company  
Merchandise Dept., Bridgeport, Conn.

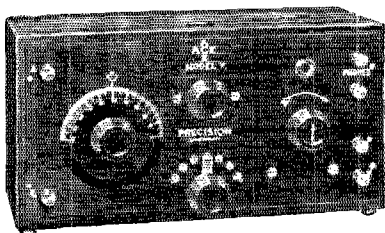
# Insulations

Use them when you build—demand them for repairs

48G-16

# ACE

## MODEL V Formerly called Crosley Model VC REGENERATIVE RECEIVER \$20



Licensed under Armstrong U. S. Patent  
No. 1,118,149

Efficiency and moderate price have caused an enormous demand for the Ace Model V Regenerative Receiver. It is a wonderful set and its popularity is increasing daily. Thousands have been sold and all are producing remarkable results. Everyone knows the set will bring in far-away stations clearly and loudly. Hundreds of satisfied customers have written to us lauding the Ace Model V. Read what a few say:

*"We have tested the Ace Model V with outside aerial, house wiring and bed spring and get excellent results on long distance reception. St. Louis, Kansas City, Fort Worth, Cincinnati, Omaha and many others come in fine. We consider the Ace Model V supreme.*

CLOVERDALE MOTORS CO.,  
Montgomery, Ala."

*"I consider the Ace Model V a little wonder. Last night I tuned in Portland, Oregon and Los Angeles, Calif. The set performs like a well-bred horse. I have operated many expensive sets, but they are not in it with the Ace Model V.*

R. H. RINES,  
St. Paul, Minn."

*"I am writing to tell you of a long distance record for the Ace Model V. The other night Mr. Blake D. Foster, who purchased the set from us, tuned Kamach, Hawaii, and held a concert from 10:45 to 11:45 P.M. He was using a lamp socket plug instead of an aerial. He told us the music was clear and the speaking distinct.*

HAROLD FINK,  
Evansville, Ind."

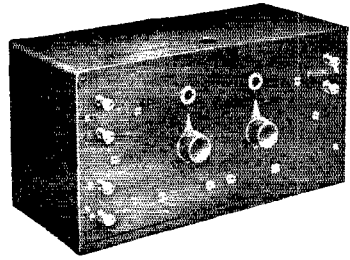
We do not claim everyone will be able to hear Hawaii, but the mere fact that certain owners have done so is evidence of the efficiency of the set.

For Sale by Good Dealers Everywhere

**THE PRECISION EQUIPMENT CO.**  
*Powel Crosley Jr. President*  
718 GILBERT AVE., CINCINNATI, O.

# ACE

## TWO STAGE AMPLIFIER Only \$18



The Ace two stage audio frequency amplifier was designed to be added to Ace Model V Radio Receiver, illustrated and described on the foregoing page. However, it operates efficiently with any type of tuner and detector. Like in the Ace Model V, the simplicity appeals to everyone, especially to the man who knows but little about radio. Every part used in it has been tested carefully and thoroughly; it has been compared with parts made by other manufacturers, and has been found to produce far better results.

The transformers, with their ratio of nine to one, are naturally the most important units in the set. They are made with the greatest care and the very best material available. Special insulating paper is used in insulating the core laminations, something not found in any other transformers in the market. It is completely shielded, and incorporated in it are all the characteristics so essential and necessary in obtaining the maximum amplification from the modern vacuum tubes. These tubes, with their high amplification constant, operate most effectively at large fluctuations of the grid potential. The transformers used are designed to accomplish these results and tests have shown that the design is correct to insure maximum efficiency. And so it is with the rheostats and sockets. Each is carefully made with the one aim—to produce perfect results. It also must be remembered that either six volt or one and one-half volt tubes may be used.

Naturally use of an amplifier is necessary when the owner of a receiving set desires to add a loud speaker, and it will be found that there are few, if any, that will compare with the Ace. Eliminates howls and other extraneous noises. It amplifies desired signals and cuts out undesirable ones. It does not produce volume, it amplifies it. In fact, the Ace Amplifier increases the volume of the Ace Model V approximately one hundred times.

For Sale By Good Dealers Everywhere

**THE PRECISION EQUIPMENT CO.**  
*Powel Crosley Jr. President*

718 GILBERT AVE.,

CINCINNATI, O.

## !! LOOK FELLOWS !!

Here I am again with another bargain. This is better than my  
January List

### HERE IT IS

TUNER, DETECTOR, and **THREE STAGE AMPLIFIER** in a well-built cabinet, hinged cover, black metal panel, Bradleystat filament control on each stage, highest quality transformers.

**\$27.50 TWENTY-SEVEN, FIFTY \$27.50**

You can not buy the parts to build a three-stage amplifier for the above amount!!!! The manufacturer's bankruptcy is your good fortune. A "Whang-doodler" on a loud-speaker.

Send me \$5.00 by money-order, draft, or registered mail, and I'll ship you a set, balance C.O.D. Transportation not prepaid at this price.

**ROY K. MORRIS, TRUSTEE**  
**BOX 760, CHARLESTON, W. VA.**

## Delicate Soldering

Both the manufacturers' and amateurs' problems on all fine work are readily solved by the instrument constructed for this particular purpose.

### THE POST SOLDERING IRON

Platinum Heating Unit—Interchangeable Tips—Universal Current  
(Large & Small)



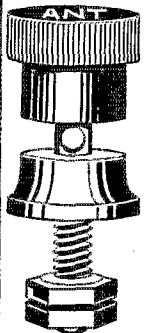
Awarded Certificate of Excellency, N. Y. Evening Mail Radio Institute.

From your Dealer, or write

POST ELECTRIC COMPANY

(Section Five)

30 E. 42nd St., New York



## "Read'em" Binding Posts

With knobs that won't come off Anyone can "read 'em." All popular styles—Antenna, Ground, Fones, A and B Battery plus and minus—abbreviations of different names engraved on knobs. Ask your dealer for "Read 'em"—the kind for real Radio fans. If your dealer does not have them—write direct.

The Marshall-Gerken Co.  
Manufacturers  
Dept. F. Toledo, Ohio

## Cockaday Circuit TUNER COILS

Complete B, C and D coils as per specifications.

**No. 18 Wire Used—D Coil  
Bankwound. Price, \$2.75**

Hook-up, directions, and material list furnished free with each set of coils.

MAIL ORDERS FILLED

Dealers, Communicate

**Eastern Radio Mfg. Co.**  
22 Warren Street, New York, N. Y.



*Magnavox keeps the "stay-at-homes" happy*

THE "boys" just naturally make their headquarters in proximity to the receiving set whose owner has been wise enough to add a Magnavox Reproducer and Power Amplifier. When "Magnavox invites you," the Radio party is sure to be a success.

Magnavox R2 Reproducer and 2 stage Power Amplifier (as illustrated) \$115.00

R2 Magnavox Reproducer with 18-inch horn: the utmost in amplifying power; requires only .6 of an ampere for the field . . . . . \$60.00

R3 Magnavox Reproducer with 14-inch curvex horn: ideal for homes, offices, etc. . . . . \$35.00

Model C Magnavox Power Amplifier insures getting the largest possible power input for your Magnavox Reproducer  
2 stage \$55.00  
3 stage 75.00

*Magnavox Products can be had from good dealers everywhere. Write for new booklet.*

**THE MAGNAVOX COMPANY**  
Oakland, California  
New York Office: 370 Seventh Avenue

**MAGNAVOX PRODUCTS**  
*No Radio Receiving Set is complete without them*

7-R

Pacific Coast Branch:  
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Los Angeles.



### The Superlative Inductance

Four years of careful attention to the details of manufacture of this type of inductance unit has yielded a product of unquestioned superiority. And with increased efficiency in manufacturing methods, moderate prices prevail for all sizes

Ask Your Dealer

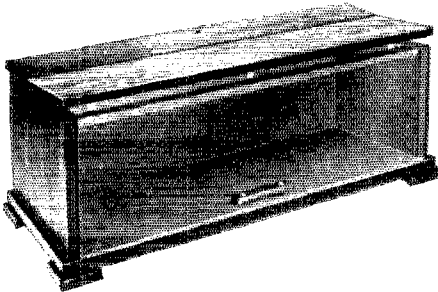
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"Built First to Last"

**COTO-COIL CO. PROVIDENCE**

## RADIO CABINET De LUXE

Including Celoron Panel



### SOLID MAHOGANY

Beautifully finished—can be completely taken apart and put together with screw driver—easy to get at any part of working radio elements inside.

A work of art—yet strong and serviceable.

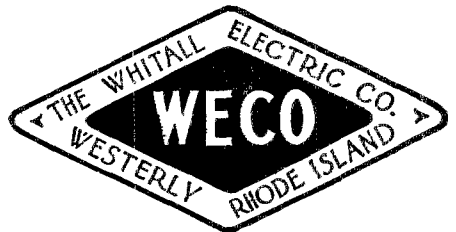
#### The Popular Size

7" X 21"  
PANEL TYPE  
IS SHOWN ABOVE

The price is \$12.50 delivered via Parcel Post anywhere in U. S. A.

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**WETHREE MFG. CO.**  
518 Columbia Road  
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## BARGAINS

In All Makes of Radio Material—  
Send for Our Special Summer  
Bulletin No. 30.

We carry Radio Corporation, Federal, Magnavox, Acme, Frost, Chelsea, Electro, Atwater-Kent, Cutler-Hammer and many other.

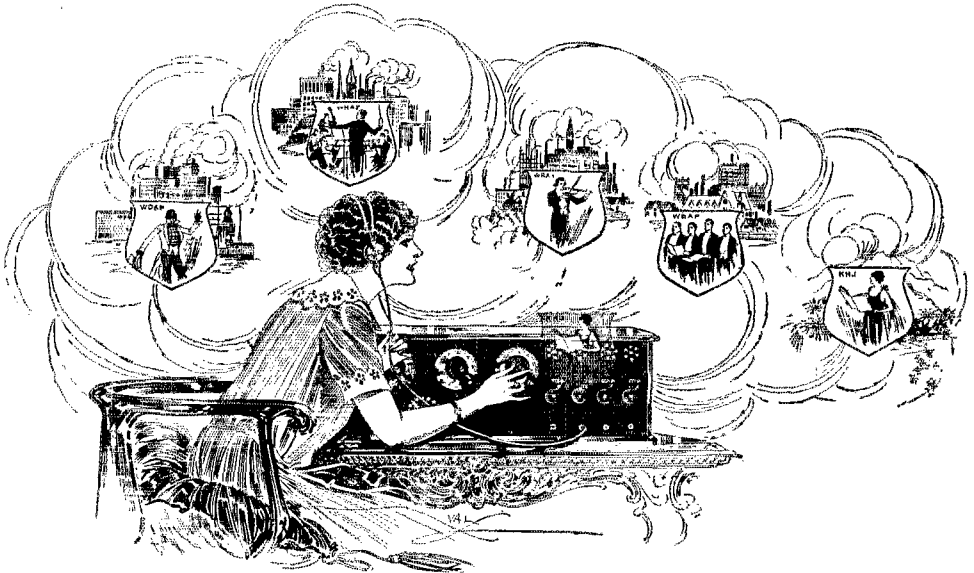
We are distributors for practically all the leading makers.

**PROMPT AND EFFICIENT SERVICE**  
TRY US AND SEE

**Whitall Electric Company**  
Westerly, Rhode Island



# The Symphony



The ability to select your entertainment from the various programs that are being broadcast, and the clarity with which long distance stations can be heard depend entirely on the quality of the receiving set.

The Symphony is an unusually good receiver. By turning a single knob under proper conditions, it is possible to tune in stations, one by one, to the total exclusion of all others.

This improved circuit, in the vernacular of the technical expert, is an improvement over the single circuit by means of a variometer, and affords unusually selective reception.

So efficient is the Symphony that its volume, at any stage, surpasses many

sets, and is equal to many other receivers using additional stages of amplification.

Every piece of apparatus that goes into the Symphony is the best that can be produced, and each unit is correctly mounted in proper relation to each other part, factors that play an important part in your satisfaction of radio.

The placing of a Symphony in your home is a permanent investment that will win your instant approval, and occupy a prominent place among your cherished possessions.

The Symphony Receivers are made in two types—detector, and two or three stages of audio frequency amplification.

If your dealer cannot furnish information on the Symphony, wire or write for illustrated catalog, giving us his name.

**JONES RADIO COMPANY**

Lytton Building, Chicago

The Symphony is manufactured under the U. S. Patent No. 1113149, Armstrong Regenerative Circuit

*All parts used in the Symphony are built and guaranteed by the Kellogg Switchboard & Supply Company manufacturers for twenty-five years of complete telephone equipment*

Get a  
**Federal Standard**  
**HEAD SET**

*for every member of the family*



Federal Standard Head Sets are made with 2200 Ohms and 3200 Ohms resistance.

Federal makes a complete line of Standard Radio apparatus—all reasonably priced. Write for latest catalog.

ADD to the pleasure you get out of Radio by permitting all the members of your family to enjoy it at once.

Federal Standard Head Sets are fully Guaranteed. Permanent magnets and a uniform air-gap give just the correct diaphragm action, perfect clarity of tone, and durable efficiency.

Scientific winding and the expert hand-workmanship of master craftsmen give exceptional range and power.

*Get these guaranteed head sets from your dealer today and refuse to accept a substitute.*

**Federal Telephone and Telegraph Company**

**BUFFALO, N. Y.**

Coils and Mountings licensed under DeForest patents



**Insist  
On  
The  
Genuine**

Ask your "Old Timer" Radio friend why they use Honeycomb Coils are best. Then ask your dealer for Branston Lateral Wound Honeycomb Inductance Coils and Mountings.

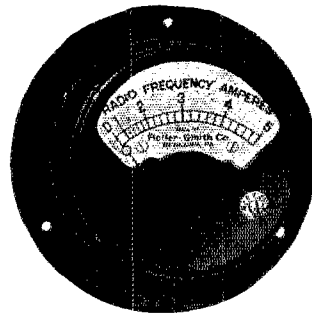
Branston Coils are protected from injury and can not come loose from mountings. Positive contact assured. Guaranteed uniform maximum inductance with minimum distributed capacity.

Send 2c in stamps for Series 1 "Hook-Up" Circular showing five good Honeycomb Coil hook-ups and Catalog of famous Branston Radio materials. Write today. Give us name of your Radio Dealer. If he can't supply you, let us know.

CHAS. A. BRANSTON, INC.,  
823 Main St., Buffalo, N. Y.  
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Toronto, Ont.



**BRANSTON**  
RADIO



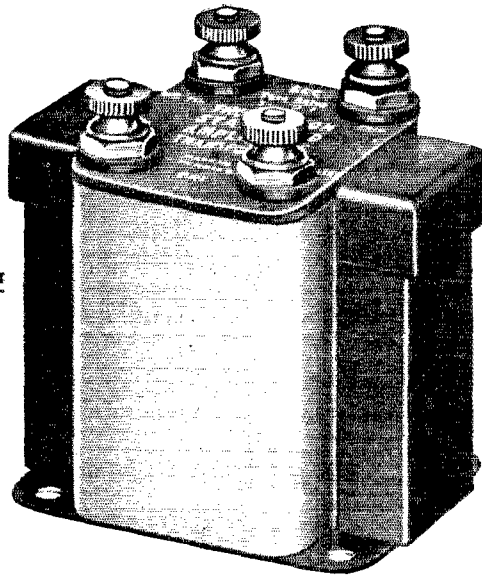
**How Many  
Amperes  
Are You  
Radiating?**

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

**ROLLER-SMITH COMPANY**  
16 PARK PLACE, NEW YORK

Offices in principal cities in U. S. and Canada

Price, mounted only  
 6 to 1 ratio transformer .....\$4.50  
 (with Red Label)  
 3½ to 1 ratio transformer .....\$4.00  
 (with Blue Label)



## The New Thordarson Audio Frequency Amplifying Transformer

For the past twenty-eight years THORDARSON transformers have been installed in the country's greatest engineering concerns, manufacturing plants and immense central stations. The first 1,000,000 volt transformer in the world was devised and constructed by THORDARSON engineers. The history of the improvement of transformers could be read in the history of THORDARSON development.

The new shell type audio frequency transformer is scientifically and mechanically perfect. A thorough understanding of its construction will convince you that it would be physically impossible for the transformer you are now using to obtain results equal to the THORDARSON in either amplification or tonal perfection.

### SPECIFICATIONS:

THORDARSON transformers are constructed and assembled entirely in the THORDARSON plant—not merely assembled as is the case of most transformers now on the market. Core is made of .007 mil highest grade silicon steel, 236 gauge—the cross section of which measures ¾ inch—twice that of an ordinary amplifying transformer. The coils of #40 wire are SQUARE LAYER WOUND to fit the square core—wound by machines designed and developed entirely by THORDARSON. Our new coil is a recent achievement of THORDARSON engineers. Between each layer of wire is the finest grade 1,000 volt condenser paper—the transformer is guaranteed and tested to withstand 600 volts D.C. without breakdown.

These transformers are designed to serve with tubes now on the market. For a one stage set, use the 6 to 1; for two stages, hook up the 6 to 1 type on the first stage and the 3½ to 1 on the second stage. These transformers balance the resistance of the plate circuit of one tube with the grid circuit of the following tube, and have proven to produce the maximum of amplifying efficiency by exhaustive tests and experiments at all audible frequencies.

Your receiving set and the pleasure you derive from it depends upon the transformer you use and it is our firm belief that this new THORDARSON Amplifier is the finest the market affords. For sale at good dealers at our new prices.

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ELECTRIC MANUFACTURING COMPANY  
 500 West Huron St., Chicago, Ill.

# "ESCO" BATTERY CHARGERS

To meet an insistent demand for  
**RUGGED—RELIABLE**  
**NEVER-FAILING**  
**MOTOR-GENERATORS**

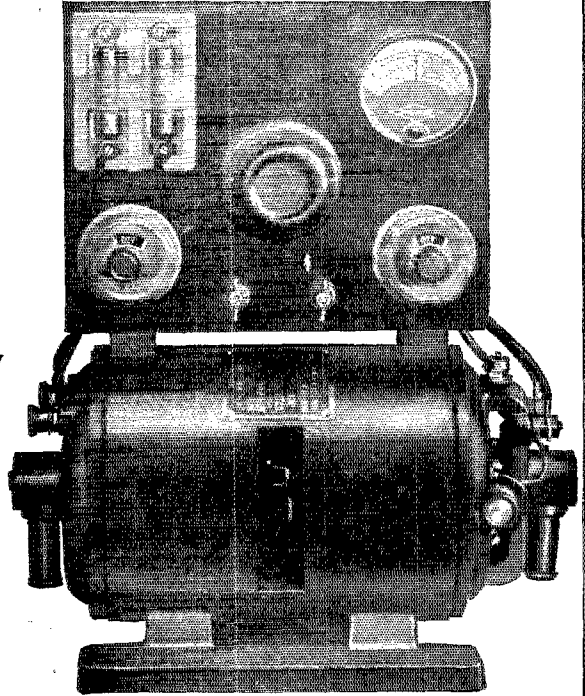
For charging Batteries  
Used in Wireless Operation  
We have developed a complete line of  
**MANY SIZES.**

With or Without panel Boards.  
"ESCO" QUALITY thruout. You KNOW  
what THAT means.  
Ask for Bulletin 242.

## ELECTRIC SPECIALTY COMPANY

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CONN., U.S.A.

Pioneers in developing  
Quality Wireless Apparatus



# "ILLINOIS" THE RELIABLE CONDENSER THAT IS MADE RIGHT AND STAYS RIGHT

Size	Panel	Cased
67 Plates...	\$7.00	\$8.50
43 Plates...	3.50	4.75
23 Plates...	2.75	4.00
13 Plates...	2.25	3.50

Vernier with single movable plate applied to 13, 23 or 43 sizes, \$2.00 extra. Send for Bulletin.

This list is inclusive of Fine Black, Moulded Dial. We also furnish the Condenser with smooth  $\frac{1}{4}$ -in staff suitable for Dial at 15¢ off list.

Fully Assembled and Tested. IMMEDIATE SHIPMENT.

Money back if not satisfied. Just return within 10 days by insured Parcel Post.

Send Prepaid on receipt of Price, Except; Pacific States, Alaska, Hawaii, Philippines and Canal Zone, add 10¢. Canada, add 25¢. 20% discount on orders of 6 or more: AMATEURS! Pool your orders and get benefit of discount.

**G. F. JOHNSON, 625 Black Avenue, SPRINGFIELD, ILL.**



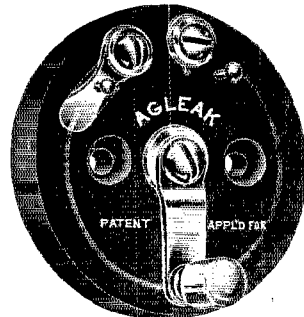
## WOC—TRESKO

Licensed Armstrong U. S. Patent  
No. 1113149

Two things that made Davenport famous. A complete 2000 mile Armstrong regenerative tuner for \$25.00. Use it with any make bulb W.D. 11 or 12, or dry battery operation as well as storage battery. Portable set to use at camp or in your machine. Complete with bulb, batteries and phones, etc., \$37.50. Circulars free. This set received the Chicago American Regional Prize of \$350.00.

## TRESKO

Tri City Radio Elec. Supply Co.  
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## Flewelling Circuit

A continuously variable grid leak over a wide range of resistance is the most essential and critical instrument required in this circuit.

The BUNNELL VARIABLE GRID LEAK with a range of  $\frac{1}{4}$  to 6 megohms fills the bill.

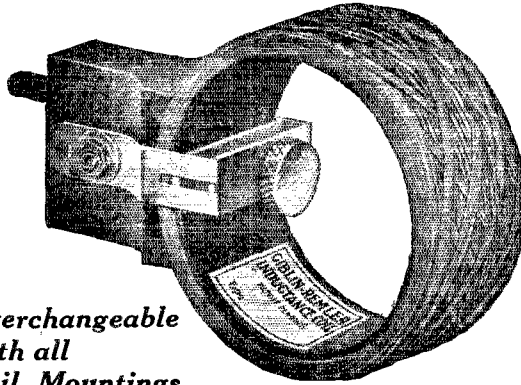
Furnished with or without japanned metal cover and screws for mounting.

Sample by mail. With cover \$1.00; Without cover 70¢  
32 Park Place J. H. BUNNELL & CO. New York City

Liberal discounts in quantities.

Send stamp for catalog No. 45-Q  
32 Park Place J. H. BUNNELL & CO. New York City

# The Most Efficient Compact Inductance Ever Used in Radio



Interchangeable  
with all  
Coil Mountings

## USE GIBLIN-REMLER COILS for receiving over the entire range of broadcast wave lengths— 228-546 METERS

THERE are two reasons why Giblin-Remler Coils constitute the very best system of broadcast reception under the new assignment of wave lengths for broadcasting stations ranging from 248 to 546 meters.

First: The coil is so designed as to have maximum inductance, minimum distributed capacity, and minimum high-frequency resistance for a given number of turns. These are the three features most essential to obtain maximum signal strength and maximum selectivity.

Second: It is possible, by the use of the accompanying table, to select a single set of coils for use with condensers of .001 mfd. capacity, that will efficiently cover this entire range of broadcast wave lengths.

Furthermore, the use of Giblin-Remler Coils insures greatest possible flexibility. By merely changing one or more of the coils your set may be made to cover any desired range of wave lengths.

Type and Number of Turns, Mounted	Price, Mounted	Type and Number of Turns, Unmounted	Price, Unmounted	Inductance in Milli-henrys at 1000 cycles Accuracy 1/2 %.	Natural Wave Length in Meters, Accuracy 1/2 %.	Distributed Capacity, in micro-micro-farads, Accuracy 1 %.	Wave Length Range in Meters using Condenser of .001 max. and .00004 mfd. min.		High Frequency Resistance in Ohms at Wave Length shown.				
							Min.	Max.	200	500	1000	2000	
RG 20M 1.50		RG 20U	.70	.030	39	14.3	63	334		1.1			
RG 25M 1.50		RG 25U	.70	.041	47	15.2	75	389		1.5			
RG 35M 1.50		RG 35U	.70	.083	87	25.4	123	550		3.5			
RG 50M 1.60		RG 50U	.30	.169	114	21.6	185	785		8.8	4.4		
RG 75M 1.65		RG 75U	.35	.377	163	19.8	266	1170		28.3	12.1		6.2
RG 100M 1.70		RG 100U	.90	.666	217	19.9	358	1550		80.3	26.8		12.6
RG 150M 1.75		RG 150U	.95	1.503	281	14.8	512	2320	1000	2000	5000	10000	
RG 200M 1.80		RG 200U	1.00	2.68	374	14.7	690	3110	69.8	23.8	7.1		
RG 250M 1.90		RG 250U	1.10	4.20	424	12.1	860	3880		50.6	12.5		
RG 300M 2.00		RG 300U	1.20	6.11	494	11.2	1030	4680		87.5	19.9		
RG 400M 2.10		RG 400U	1.30	11.04	618	9.7	1380	6300	141	29.3	13.8		
RG 500M 2.30		RG 500U	1.50	17.50	747	9.0	1730	7900		54.6	22.3		
										93.1	34.9		
RG 600M 2.40		RG 600U	1.60	29.2	1024	10.1	2260	10250	2000	5000	10000	20000	
RG 750M 2.65		RG 750U	1.85	39.0	1249	11.3	2660	11850		111	43.8		
RG1000M 3.40		RG1000U	2.50	71.6	1620	10.3	3570	16000			64		
RG1250M 3.80		RG1250U	2.90	108.0	1930	9.7	4380	19700			123		
RG1500M 4.40		RG1500U	3.50	159.8	2300	9.3	5300	23800					

These tests have been made by Robert F. Field of Cruft High Tension Electrical Laboratory, Harvard University, Cambridge, Mass.

### REMLER RADIO MANUFACTURING COMPANY

Factory and Home Office  
248 First Street, San Francisco, Cal.

Eastern Sales Office  
Chicago, Ill.

## TELOS VARIO-TRANSFORMERS

When used in the

# ACMEDYNE

circuit give selectivity and amplification as shown by this curve taken from the MELCO SUPREME RECEIVER.

The base of the curve is magnified to permit comparison with two steps untuned R.F. No need for vario-couplers, tuning condensers or untuned R. F. transformers.

Write for **FREE** booklet  
By Lester L. Jones  
*Formerly Expert Radio Aid U.S.N.*  
on **TUNED RADIO AMPLIFICATION.**  
**DANZIGER-JONES Inc.**  
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## R H A M S T I N E \*

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*and your phonograph make a Perfect Loud-Speaker*



**Price**  
**7.50**

Complete with  
Cord

This reasonably priced unit makes it possible for you to secure great volume when attached to a horn or the tone-arm of your phonograph. Critical adjustment of the poles is easily made, giving you the desired fullness and sweetness of the low or high notes.

Compare it with others—even those selling at double the price—and the Victophone will be your choice.

Order yours now.

Manufactured by  
**J. THOS. RHAMSTINE\***  
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## Loud Speaker in Auto

### No Cumbersome Aerial Required

The Ideal Portable set weighs only ten pounds, including detector and two stage amplifier, with all batteries. Carry it like a camera. Just the set for the auto, camp, or home. Absolutely guaranteed as efficient as any detector and two stage set made, and at a cost of slightly more than some detector sets.

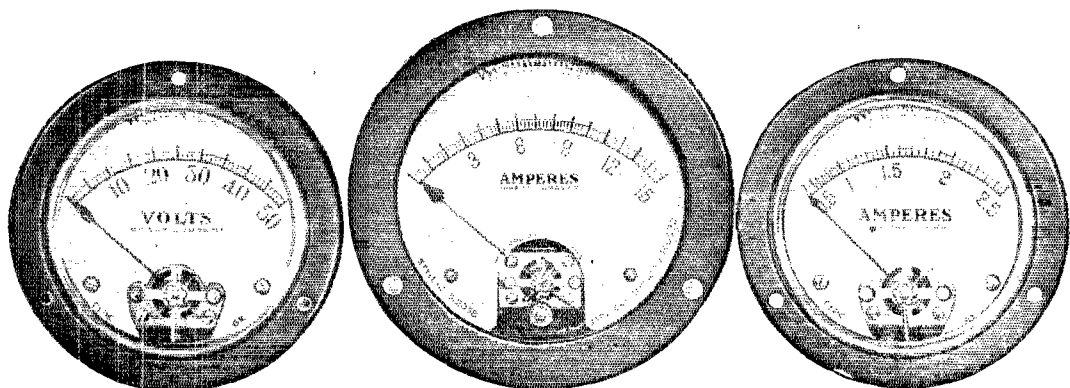
Get our complete instructive catalogue. Get information on loud speaker for crystal set.

### STEINMETZ WIRELESS MFG. CO.

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# Send For Folder 4471-A

It tells an important story  
about Radio Instruments



Type BX Voltmeter

Type CX Ammeter

Type BX Radiation Ammeter



**Every Radio Receiving Set**  
should have its proper  
equipment of measuring  
instruments; an Ammeter  
for determining the fila-  
ment current; a Voltmeter  
to tell the condition of the  
battery.

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# Westinghouse

# POSACO RADIO

## QUALITY AND EFFICIENCY

The "POSACO" condenser has made for itself an enviable reputation. It is a real instrument. The single knob controlled vernier is an absolute necessity for efficient tuning in radio frequency, super-regenerative and regenerative circuits. The regular variable is unexcelled for use in circuits which do not require a vernier adjustment.

MATERIALS used in the manufacture of these instruments are the finest obtainable.

WORKMANSHIP, the best. CONSTRUCTION and DESIGN, electrically and mechanically correct. Absolutely rigid. Minimum of dielectric loss.

Each instrument is tested before leaving our factory.

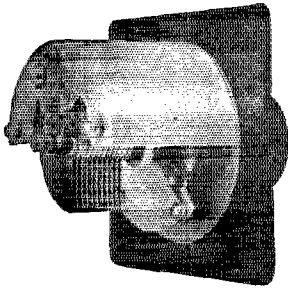
GUARANTEED to give satisfaction and to be free from any defect in materials or workmanship.

If your dealer or jobber cannot supply you, send us your order direct, together with his name and address.

*Circular sent free upon request.*

Manufactured by

THE C. D. POTTER CO.  
STAMFORD, CONN., U. S. A.



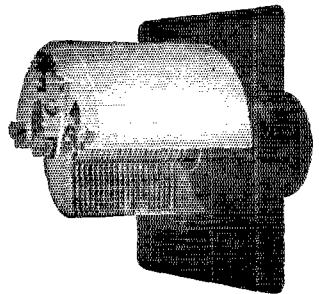
Patent applied for

ALDEN L. MCMURTRY, License

VERNIER

(Single Knob Control)

B-1 Capacity .001045 Mfd. \$7.50  
 B-2 " .000545 " 7.00  
 B-3 " .000295 " 6.50  
 D-2 Highest Grade 4" Dial. 1.00



Patent applied for

REGULAR

A-1	Capacity .001	Mfd. \$4.50
A-2	" .0005	" 4.00
A-3	" .00025	" 3.50
A-4	" .000045	" 3.00

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Here is where you can get

"Everything worth  
while in Radio"



The Radio Store of

**PAUL FRANKLIN JOHNSON**

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Pasadena,

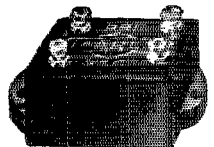
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Audio Frequency  
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Superior Quality  
Reasonably Priced

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**MARLE ENGINEERING CO.**  
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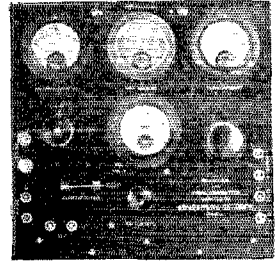
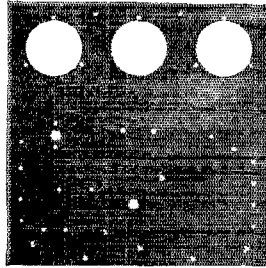
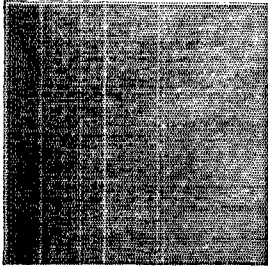
SOUTHERN RADIO CORPORATION

Radio Engineers and Jobbers

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The United States Navy Department, the Signal Corps, and the leading Radio Manufacturers, without exception, have adopted our material in one form or another.

They use it because it's a standardized product of uniform quality, and

because it is ideally adapted to the manufacture of radio apparatus.

In Laminated form its surface and volume resistivity are extremely high and the dielectric losses quite low as shown by the following Bureau of Standards Tests:

Properties	Hard Rubber	Laminated Phenolic Insulating Materials
Dielectric strength, volts / mm	10,000 to 38,000	27,000 to 45,000
Tensile strength, lbs. per square inch.....	3,500 to 6,500	10,000 to 25,000
Water absorbed in twenty-four hours immersion, percentage of weight.....	0.2	0.2 to 0.1
Thermal expansivity at 20 to 60 degrees Centigrade.....	60 to 80 x 10 <sup>6</sup>	20 to 30 x 10 <sup>6</sup>
Heat .....	At 65.5C.(150F.) hard rubber softens perceptibly; at 100C.(212F.) it is so soft it may be bent easily; at 115.5C.(240F.) it becomes leathery and may easily be cut with a knife; melts at 200C. (392F.)	Not readily inflammable; will withstand continuously temperature of 149C (300F.) Heat tends to complete reaction and volatile substances are driven off.
Sunlight .....	Discolors and disintegrates after a few months; the sulphur of the hard rubber is oxidized, forming the equivalent of sulphuric acid; this may take up ammonia from the air or may attack the filling materials forming the various sulphates on the surface; the surface resistivity is greatly reduced.	No visible effect.

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Quality Apparatus

We stock all makes and types of complete Radio sets and parts

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Delivery same day order received

Pioneers in the Radio Field

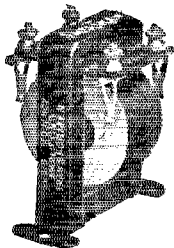
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129 Camp Street, New Orleans, La.

### In Any or All Stages of audio frequency amplification

## The AMERTRAN



Price \$7

Ask your electrical dealer, or sent carriage charges collect. (Wt. 1 lb.)

can and should be used. It is made in only one type and one ratio. Its flat-top amplification curve precludes the possibility of distortion on the part of the transformer when used in any or all stages. It will give the same clear-toned distortionless amplification with all tubes which are approximately alike in A.C. Impedance and Amplification Factor, such as

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 UV-201-A, UV-199,  
 C-299, C-301, C-301-A,  
 UV-201

Its amplification in one stage is 33.6; two stages 1490.

### American Transformer Company

Designers and builders of radio transformers for over 20 years.  
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(Guaranteed)

Compact — Interchangeable  
 Most Efficient — Accurate:

60  
Cents  
per  
Unit



60  
Cents  
per  
Unit

Mica Condensers — Grid Leaks  
 Mountings:

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MAXIMUM EFFICIENCY

### Variable Condensers

Assure yourself of the best results by placing one of these high grade and reliable condensers in your Radio set. At new low prices

201	3 plate Vernier	\$1.25
202	11 plate Vernier	2.00
203	23 plate Vernier	2.50
204	43 plate Vernier	3.00

*At your dealers or write direct to manufacturers*

### THE HIGGY-AVERY CO.

1199 Franklin Ave., COLUMBUS, OHIO



## Improve Radio Reception

You don't know what *real* radio is 'till you've tried WD-11 or WD-12 Dry Battery Tubes with a Ray-O-Vac "A" Dry Cell. The cost of a single cell is small and it lasts a long time. And say! when you get them set up, you won't know the old set.

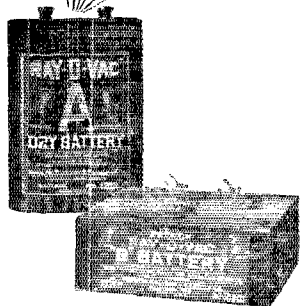
Everybody knows that this combination of Ray-O-Vac "A" with dry battery tubes gives clearer signals. The limit of your set is picked up easily and sounds as though you were right in the same room. Units 1, 2, 4, or 6-cell. Send for the free booklet "How to Get the Most out of Radio," full of interesting things about the use and care of your set. Also gives a complete list of official broadcasting stations with their signals.

*Ask your dealer for this new battery—*

**FRENCH BATTERY & CARBON COMPANY**

Madison Wisconsin

Atlanta Dallas Denver Chicago  
Minneapolis Kansas City New York



*Use Ray-O Vac "B" Batteries for sustained voltage, longer service and elimination of noise.*

# RAY-O-VAC

*The Battery that Completes Radio*

Est. 26 years—Pioneer Radio Distributors—Radio 9 Years

AT SPECIAL LOW PRICE

**KNOCKDOWN RECEIVING SET--DHE-NO. 20 . \$15.50**

(Reduced from \$25.00)

**Long Distance Reception - Selectivity**

**Also—Efficient Code Reception**

Will easily assemble to Set of High Efficiency—Tested Equipment—Standard Design—Equal to High-Priced Outfit  
**at ABOVE LOW PRICE**

Order from Your Nearest Dealer

**DOUBLEDAY-HILL ELECTRIC CO.**

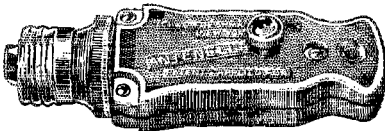
Broadcasting Station -KQV-

719-21 Liberty Ave.—Pittsburgh—E. E., 5913 Baum Blvd.

Southern Warehouse—Washington, D. C., Station—WMU—

**Summer  
Static  
Overcome**

"Good-bye Aerial"



**ANTENELLA**

*No aerial or antenna needed*

All outside wiring, aerial, lightning arresters, switches and other inconveniences so inductive to static are eliminated.

Merely plug Antenella in any light socket and you can enjoy all Radio pleasures in any room in your home, apartment or hotel. No current consumed.

New Improved

**ANTENELLA**

**NOW ONLY \$1.25**  
formerly \$2.00

At your dealers—otherwise send purchase price and you will be supplied postpaid.

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*Radio Condenser Products*

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**EVERYTHING  
Radio!**

For Your Vacation. Complete portable units, just the thing for Camp, Motor Boat, Canoe, Seashore, or your Mountain Home.

Send for illustrated booklet "TS"

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Sales Corporation**

1533 Pine Street  
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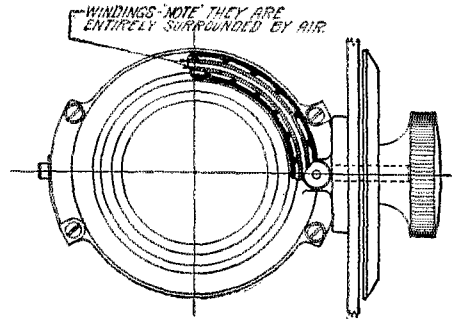
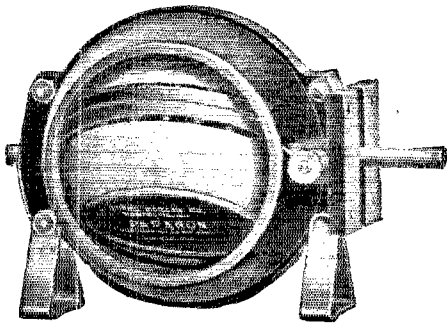


A Tuska Radio Set at Station 1RU received the first British amateur code in trans-Atlantic tests.

Finely built. Several models. Catalog #18-C on request.

**THE C. D. TUSKA COMPANY**  
Hartford, Conn.

**TUSKA RADIO**



## 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

TRADE MARK  
**Wave Trap**  
PATENT APPLIED FOR



Get that elusive DX station thru heavy QRM. With the "WAVE TRAP" you can do it and greatly increase your range. It is installed in a minute by changing only one connection and is indispensable on any receiving set, with any type of antenna. It is mounted on a Formica panel in a handsome mahogany finished cabinet 6x5x6, and is a high-grade instrument throughout.

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

**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 \$21.50. 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!"  
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Licensed by I. R. M. Inc. Under Hazeltine Patents

**J. F. A R N O L D**  
Radio specialist since 1910  
Sets built to order, rewired or repaired  
Your own material made into a set  
Baldwin Phones repaired, or made into Loud Speakers  
Dependable work—Reasonable charges  
Address 109 East 125th St., N. Y. C.  
UP ONE FLIGHT

**RADIO TRANSFORMERS**

REAL MERIT is what you expect and what you receive when you use STANDARD Radio Transformers.

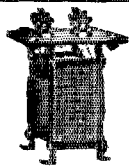
PERFECTLY SHIELDED by virtue of the design MAXIMUM AMPLIFICATION by proper impedance.

Silicon steel cores, insulation test on coils 1500 volts. Bakelite Terminal Board.

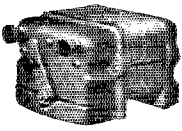
Type M—Ratio 9 to 1.....\$5.00  
Type MR—Ratio 4 to 1..... 4.50  
Type FL—Filament Heating..... 8.00  
Discount 10% for cash with order

Designed by *Richard* engineers, a quality name in Radio.

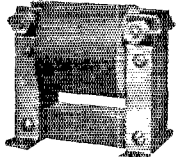
THE STANDARD TRANSFORMER COMPANY  
WARREN, OHIO.



Type M



Type FL

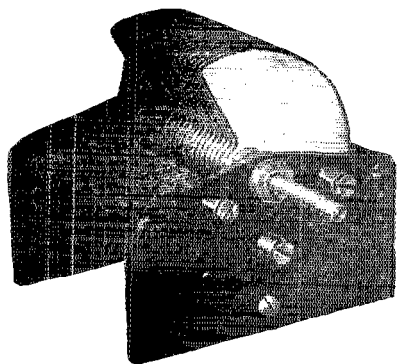


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If you need small radio parts in a rush, "RASCO" will supply them cheaper, better and quicker than any one. Be sure to get our great 68-page catalog. Over 500 different parts, 300 illustrations. This catalog contains 75 Vacuum Tube Hook-Ups, all values being shown. Due to great cost, catalog sent only upon receipt of 15c, stamps or coin.  
Radio Specialty Co., Inc.  
960 Park Place, New York

**CHELSEA**  
**REGENERATIVE EQUIPMENT**  
Licensed Under Armstrong U. S. Patent No. 1113149, October 6, 1914.  
Write for bulletin #7  
**CHELSEA RADIO COMPANY**  
CHELSEA, MASS.

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## THE WIMCO CONDENSER

Made to meet a demand for quality — highest efficiency, 3 plate, 23 plate and 43 plate sizes.

Very low resistance and very low zero capacity. The phase angle does not depart from 90° sufficiently far to be detectable. Highly recommended for the fine tuning necessary in amateur apparatus.



## THE CARCO COUPLER

Just the thing for the popular receiving set. Bakelite tube and rotor, silk covered wire, perfect contacts. Designed and developed by an amateur for the amateur.

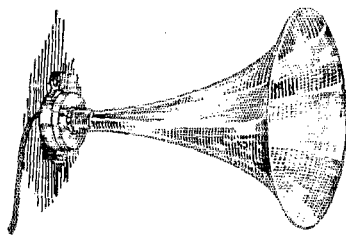
Guaranteed to produce superior results. Range 150 to 700 meters. Not just "a coupler" but the real coupler—peer of all, the Carco.

We invite Dealer and Jobber inquiries.  
Send for literature and prices on the  
WIMCO SOCKET FOR WD-11 TUBES

**THE WIRELESS MANUFACTURING CO.**  
CANTON, OHIO

Manufacturers—Distributors

## The AMSCO LOUD SPEAKER



is without a doubt the most scientifically accurate reproducing unit in existence—not the slightest trace of tone distortion being evident in the reception it affords. Tuning can be adjusted for either an unusually large volume of sound or meditative softness when desired.

The fact that the Amsco Loud Speaker can be suspended from wall or ceiling, is a new and favorable innovation.

Price, \$22.50

A postcard will bring literature—illustrating and describing our entire line.

AMSCO PRODUCTS, Inc.,

Successors to MORTIMER RADIO CORP.  
ADVANCE METAL STAMPING CO.

Fairbanks Building  
Broome & Lafayette Sts. New York City

### It's the contact that counts

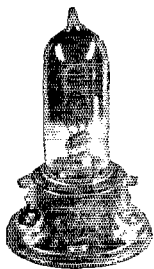
The Na-aid Special Socket No. 499 is a sturdy little socket with a dependable contact for the G. E. No. 199 dry-cell tube. It has special slot construction, and is moulded of genuine Bakelite. The heat from soldering connections will not affect Na-aid sockets.

Price 50 cents  
The dual-wipe contact strips of the Na-aid De Luxe socket avoid the trouble experienced with the socket of conventional design. Because of thorough cure and high dielectric properties Na-aid sockets keep plate to grid losses at a minimum (of particular importance in Flewelling Circuit or in Radio Frequency).

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Na-aid Adapter for  
No. 199 tube, \$1.00

Booklet with diagram of Hazeltine's Neutrodyne Circuit and other selected circuits, packed with each Na-aid product or sent in exchange for cover taken from any Na-aid carton.

**Alden Manufacturing Co.**  
Manufacturers of Sockets for  
Every Tube and Requirement  
Dept. M., 52 Willow St.  
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**NA-AID**

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\$1.50      \$1.50      \$1.50

Send your old tube with \$1.50. Receive by return mail a Guaranteed tube.

Be sure and state in your letter type wanted. Detectors or Amplifiers.

### NEW TUBES CUT PRICES

Price list of New and Repaired Tubes free

UV200 \$3.50      WD12 \$3.50

## Radio Tube Exchange

W. H. Bryant

453 Washington St., Boston, Mass.

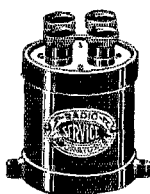
### JOBBERS

EXCLUSIVE territory now open on good standard radio products. Inquire now, before it is too LATE.

**R. R. GARRICK**  
91 Homestead Ave.,  
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## RT-A 2

The Audio Frequency Transformer that gives you perfect Tone Quality and High Amplification without distortion. Moisture-proof —it is ideal for the seashore.



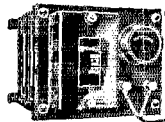
Letters received every day state that RT-A 2 passes every test and fulfills the most critical requirements of experts and amateurs.

Use RT-A 2 transformers at once and enjoy better radio reception.

Price \$6.50 at all good dealers.  
**RASLA SALES CORPORATION**

National Distributors  
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## CHARGE YOUR BATTERY.



(RADIO OR AUTO)  
at HOME for a NICKEL  
The **HOMCHARGER**  
POPULARLY PRICED — PAYS FOR ITSELF  
SEND FOR THE AUTOMATIC ELECTRICAL  
DEVICES CO. FREE BOOK #2 — 7300 E. CINCINNATI, OHIO.



# Proven by every test to surpass all other rheostats and filament controls---

**2000 Miles on One Tube With a Fil-Ko-Stat**

*From Paul H. Woodruff Editor Industrial Power, Chicago.*

"I am of the opinion that the Fil-Ko-Stat is the best filament control and have recommended it highly. It is a fact that I picked up two Los Angeles stations, KHJ and EWH with a single tube regenerative detector shortly after installing it."

Made and Guaranteed by

**DX INSTRUMENT CO.**  
HARRISBURG, PA.

Laboratory research proves Fil-Ko-Stat to have a fine adjustment area (which means ability to control filament heat and electronic flow) eighteen times greater than that of the wire rheostat and several times that of the next best filament control.

Actual use proves Fil-Ko-Stat the most accurate control for any tube from "peanut" to "power." Full resistance 30 ohms.

—it has no screws or adjustments to tamper with. It is triple tested and regulated at the factory to the ideal "off" position for

**UV 200, 201, 201A, WD11, WD12, UV199, DV6A, W. E. Peanut, etc., etc.**

—it is non-microphonic, operates noiselessly, eliminating all "frying."

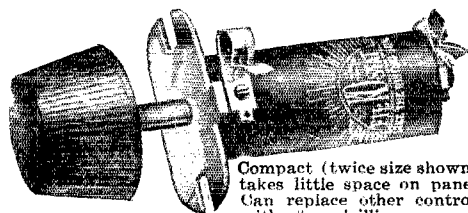
—it has no disks to break or chip and its reliability and durability are guaranteed by the manufacturer.

If you have never tried tuning with your filament control, start with a Fil-Ko-Stat. It brings in strong and clear D. X. stations you never heard before.

Recommended and sold by dealers in high quality radio supplies.

PRICE

**\$2**



Compact (twice size shown) takes little space on panel. Can replace other controls without redrilling.

If your dealer has no Fil-Ko-Stats in stock, send his name and your remittance direct to

**RADIO STORES CORPORATION**

SOLE INTERNATIONAL DISTRIBUTORS

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**FILAMENT KONTROL**

**OF INFINITE ADJUSTMENT**

# FIL-KO-STAT

DESIGNED TO UTILIZE THE GREAT TUNING POSSIBILITIES OF THE VACUUM TUBE  
ALWAYS MENTION Q S T WHEN WRITING TO ADVERTISERS

**a Chi-Rad Special!**



**for WD 11 tubes—**

Standard, threaded rubber, Willard's, specially adapted for use with W. D. 11 tubes. Supply current at 2 volts to one W. D. 11 tube for 210 hours on a single charge. Rechargeable. Brand new, size 4x5½x7 inches—Chi-Rad guaranteed.

**2-Volt Willard Charged. . \$7.50**  
**2-Volt Willard Dry. . . . . 6.50**

These same Willards can be adapted to deliver 8 volts for pure D. C. for C. W. Transmitters. Better than a generator because no filter is necessary. Much less expensive.

**In lots of 40 (320 volts) \$160**

(Better prices on larger quantities)  
*Specify dry or charged when ordering.*

**Chicago Radio Apparatus Co.**  
**415 S. Dearborn St., Chicago, Ill.**

**HYGRADE SPECIALS**

- 200 ft. 7 strand No. 22 Copper aerial wire \$1.40
- Morse Eureka Test Clips, per dozen. . . . .50
- Nathaniel Baldwin Head Sets, (Type C) . . . 8.50
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- 2000 Ohm Murdock No. 56 Head Sets. . . . 3.98
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- Acme Amplifying Transformers (new type) 3.98
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- 6 Volt Marko Storage Batteries. . . . . 8.95

*All orders must include Parcel Post charges.*

**HYGRADE ELECTRICAL NOVELTY COMPANY**

41 West 125th Street New York, N. Y.

**RADIO "BUGS" GET INTO BUSINESS FOR YOURSELF**

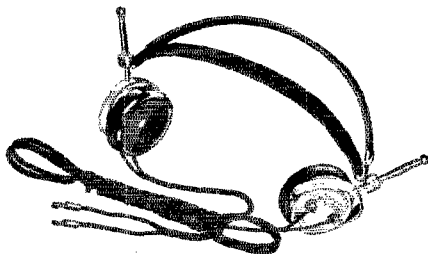
Why not turn your hobby into money? You can easily make \$15.00 a day, or as much more as you like, by our wonderful plan of selling Radio direct to the millions of people just waiting for our better parts or sets. We furnish everything you need at lowest factory prices and tell you how to build a profitable business of your own.

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**Ampl-Tone Headsets**



**Handsome, Comfortable, Loud, Clear & Durable. \$6.00 List. Your money back if not equal to \$8.00 Phones.**

*Dealers write for attractive discounts, you will be glad you did!*

**C. M. FRENCH MFG. CO.,**  
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**Super-Sensitiveness!**

The crystal is the "bull's-eye" of your crystal receiving set. Unless it is supersensitive you are wasting time and entertainment and cannot "hit" the combination for best results. Insist upon the genuine original Arlington Tested "NAA" Detector minerals. They are carefully selected from bulk stock, individually tested and guaranteed super-sensitive. Galena, Goldite or Silicon, price for crystal, 25c. Same mounted in brass cup, 40c. Obtainable at your dealers or sent direct (post-paid) on receipt of price.

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**RUSONITE**  
**CRYSTAL RECTIFIER**

**MULTIPOINT (Patent Pending)**

A synthetic CRYSTAL DETECTOR, sensitive over its entire surface. Eliminates all detector troubles. Extraordinary clearness and volume. Endorsed by radio experts and press for both REFLEX CIRCUITS and CRYSTAL SETS. Sold in Scaled Packages only.

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 Sensitiveness guaranteed  
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 14 Karat Gold Multiple **25c**  
 Contact, Super-Sensitive

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**RADIO SWITCHES**

Be up to date—Use our concealed types single hole mounting

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# Lifelike Re-PRODUCTION

Almost as though from the throat of the artist in the distant studio float the vibrant tones of the song, actually Re-PRODUCED, created anew, faultlessly duplicated through the marvelous musical-radio instrument—the *Atlas Amplitone*. Does *not* blast or distort.

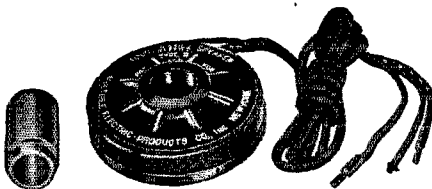
Adjustable double diaphragm fits the *Amplitone* to your set and the individual receiving conditions.

Made like a fine musical instrument by the joint study and skill of acoustic and radio engineers. In every respect, worthy of your confidence.

## *Atlas* AMPLITONE LOUD SPEAKER

**\$25.00**

With connecting cord and full instructions.



### Atlas Amplitone Unit

The Atlas Amplitone, minus the horn and base, can be purchased separately for use with your own horn or for attachment to any phonograph (except the Brunswick) With phonograph attachment ..... **\$13.50**

Unit without attachment—\$12.50

### Insist Upon the Atlas Amplitone

Only the Atlas Amplitone can Re-PRODUCE. If your dealer has none, ask him to order for you.

### WRITE FOR ATLAS AMPLITONE BOOK

This fully illustrated book describing this greatly advanced loud speaker and including a list of broadcasting stations, directions for improving reception, the proper use of a loud speaker, and other valuable information from a widely known expert, sent upon request.

## Multiple Electric Products Co., Inc.

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Radio Division

Newark, N. J.

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**BARGAIN**—Brand new Grebe CR5 and RORK amplifier. Cost \$135.00 sell \$99.50. A. E. Alger, Lorain, Ohio.

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**FOR SALE:** 1 Western Electric C.W. 938 transmitter-Receiver, and single tube Reinartz receiver. Also Radiolas, Grebe and DeForest sets, tubes and accessories. Let me know your wants. I can supply you. Send for prices. Orders shipped promptly. H. Blomeley, 68 Columbia Heights, Brooklyn, N. Y.

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**EVERYTHING FOR THAT EDISON B COMPLETE 100 VOLT BATTERY WITH GENUINE EDISON SOLUTION AND RECTIFIER \$16.00. 5 LB. WELDED STEEL CAN SOLUTION, ENOUGH FOR 100 VOLTS. \$1.50. COMPLETE 500 VOLT TRANSMITTING BATTERY \$60. HIGH VOLTAGE BULB CHARGERS \$14 AND \$22. 3/4" TEST TUBES 3¢ IN GROSS LOTS. FOLLOWING PREPAID. TUBES 5¢ 50 CENTS DOZ. EDISON ELEMENTS 6¢ AND 10¢ PAIR, READY WIRED. PURE NICKEL WIRE FOR CONNECTORS 1 1/4¢ FOOT. PERFORATED HARD RUBBER SEPARATORS 1/4¢. WOOD FRAMES \$2.50. LISTEN FOR CLEVELAND 8ML, 4837 ROCKWOOD, GARFIELD HTS., CLEVELAND, OHIO.**

**TUBES** at cut prices. We buy, sell & repair all makes. Can use several more agents—no capital needed. Send for complete price lists. DeForest Tubes \$3.00. Radio Tube Exchange, 453 Washington St., Boston, Mass.

**NEW REINARTZ** Tuners with Detector—\$18.00. Write. Alva Smith, Caledonia, Minnesota.

**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.

**WANTED:** Omnigraph quick. Gordon Carr, Summit St., Batavia, N. Y.

**SELL:** Clapp-Eastham H.R. receiver complete, \$65. Write H. Crawford, Olds, Iowa.

**EXCEPTIONAL OPPORTUNITY** to purchase one "Electrical Specialty" D.C. Generator Primary 110 volts, Secondary 350 volts, Type H 113—retails about \$65. Never used—guaranteed perfect. Send your bid to Clark & Mills Electric Co., 75 Newbury St., Boston, Mass.

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Det. and two step amplifier in cabinet, \$28.00. Keystone arresters, \$1.50. Chesaning Electric Co., Chesaning, Mich.

**FOR SALE:** Jewell A. C. Voltmeter, Federal 500 M.A. Double Choke Coil, both new, never used, \$12.50. Write Walter Conn, Race St., Dover, Ohio.

**BARGAINS**—Burgess large "B" \$2.10 each. Westinghouse storage "B" \$4.00 each. Burgess small "B" \$1.00. UV-201 tubes \$4.85 each, UV-200 \$3.95 each. All guaranteed new. Chesaning Electric Co., Chesaning, Mich.

**FOR SALE:** Crosley Model X Receiving Unit \$44.75; Crosley Model VI Receiving Unit \$23.50. Both new. Also 6 WD11 Tubes, new, \$5.35 each. Arthur Dunlap, Bowerton, Ohio.

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**RADIO AGENTS** wanted in every city and town to sell standard radio apparatus on liberal commission basis. Stocking agencies also open. Delfelco, 19 Meeting Street, Pawtucket, Rhode Island.

**TWEET LOOP ARRANGEMENT**—No Radio Frequency. Good long-distance reception on detector only. Proportionately better with Audio Frequency Amplifiers. Both coasts have been worked from here on detector and two stages Audio Frequency. Description and diagram for One Dollar. T. J. M. Daly, Little Rock, Ark.

**HAMS!** Pure aluminum for rectifiers 1/16 inch \$1.50 per sq. ft. Electrical Specialty Company, 407 Indiana Avenue, Valparaiso, Indiana 9DVK

**FOR SALE** or trade one Robbins & Meyers 115 volt 4 kilowatt D.C. generator with meter and central panel. Want transmitting apparatus or motor generator. E. N. Ebeling, Atwood, Kansas.

**FOR SALE:** Standard Navy receiving equipment, Type C.N.240 long wave receiver 1,000-10,000-25,000 meters; S.E.143 (IP500) medium wave 250-3,000-6900 meters; W.I.176A short wave 200-3,000 meters; W.I.125A 2 stage Audio Amplifiers; Type 21 Standard Navy station wavemeter 100-4,000 meters. Marconi manufacture. These materials are ideal for laboratory use. Prices on request. Wanted 1,000-1,500 volt motor generator set 500 watt. State make and best prices. Ekasaf Trading Company, 1515 Eastern Parkway, Brooklyn, New York.

**WE BUY** and sell anything. Write us. F. R. Fletcher & Co., 553 S. Livingston St., Brookfield, Missouri.

**LARGE** aerial ammeter 0-5 bronze case, 8" plate glass, list \$25.00, first \$7.50 takes it. W. E. Francisco, 1236-7th Ave., Oakland, Calif.

**8CGI** moved to 2434 Pennsylvania Ave., Detroit. Pse QSL.

**WANTED:** Sink Gap, 1000 or 1500 Volt D.C. generator. Sell or Trade For Above, 2 K.W. 80 cycle Robbins Meyer Generator 110 D.C. drive and other apparatus. Write, 2CCX 1000 Surf Ave., Coney Island, New York.

**I WANT** to buy one or two fifty watt tubes and sockets; can be slightly used. I have to sell or trade 350 volt Radico M.G. Set, also 500 volt 100 watt Emerson M.G. Set. J. S. Friede, 411 Main St., Texarkana, Texas.

**FOR SALE:** Western Electric 50 watt type "G" tubes at \$25. Radiotron 50 watt tubes \$22. Kenotrons UV217, \$20. Western Electric 250 watt tubes price on request. Arthur Faske, Radio 2AGD.

**BARGAIN:** Detector & 2 Step Amplifier in one Cabinet 7x12 Bakelite panel, Paragon dials, rheostats & sockets, Thordarson transformers, Interstate jacks, Walnut stained hinged top, oak cabinet. Price \$25.00. H. A. Fischer, 146 Myrtle Ave., Irvington, N. J.

**1BBO QRA** now Harris Fahnestock, Jr., Lenox, Mass.

**CORRECT YOUR CALL BOOK,** 4MA has been re-assigned to J. B. Gray, Jr., Wilson, N. C. Would appreciate a card describing your station.

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**BARGAINS:** WD-11's, \$5.95; Variable Condensers with indicators, 21 plate, \$2.00; 43 plate, \$2.80. Order now. Other prices on request. Grauel Radio Shop, Lebanon, Ill.

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**1CDN's** Transatlantic Spark, Record France and Switzerland! Thordarson transformer; Dubilier condenser; Benwood Super rotary; Amrad quenched gap; Westinghouse induction motor; large O.T. 0-10 Weston ammeter; line protector; resistance unit; key. Will exchange for C-Melody Saxophone or will consider cash offer. George James, Hardwick, Vermont.

**FOR SALE:** 5 watt A.C. C.W. set mounted on panel complete with new tube radiation and milliammeters, \$39.00. C.W. transformers, primary 160 V 60 cycles sec. (4, 0, 4) 8V and 500V for 2 5 watters mounted \$10.00. 110V electric soldering iron \$3.75. Hollingsworth Elec. Co., Russiaville, Ind.

**FOR SALE:** 500 watt plate transformer, \$20.00; 150 watt filament transformer, \$8.00; R.C. Inductance, \$8.00; Bakelite UV-203 sockets, \$2.00; New Vibroplex, \$12.00; Tungar, \$9.00; UV-203's, new \$22.00. A. Hengelbrok, 624 Monroe St., Newport, Ky.

**FOR SALE:** 1 KVA Thordarson type R spark set condenser and OT, \$30.00. Frank Hollingsworth, Russiaville, Ind.

**SPECIAL SUMMER PRICES—Mu-Rad 6** bulb sets, brand new, \$115.00; Residon set \$85.50; single tube regenerative set, molded parts, \$34.50; Atwater Kent 2 step Amplifier \$11.25; Dayton one step Amplifier \$5.75; loop aerial \$4.70; molded Variometers \$1.75; Rheostats \$.65; molded dials \$.23; 43 plate condensers \$1.95; Grid & Phone Condensers \$.10; Bakelite tubing 3/8" diameter, 2 1/4" length \$.15; 4 diameter 8 length, \$.95; Jacks \$.40; Connectors 1 to 4 head-phones \$1.05; sockets \$.30; Panels 1 1/2"x7 1/8" \$1.05; Antennas \$1.20; nickeled Binding posts, Points, Stops \$.01; Bradleystats \$1.05; switch levers \$.20; R.F. Transformers \$2.95; Vernier adjusters \$.50; Rectifier tubes slightly used \$2.00; 2 mfd. C.W. Condensers slightly used \$2.00; Telefunken Wavemeter 200-6000 meters direct reading \$50.00. J-Ray Radio Co., 925 Chestnut, St. Louis, Mo.

**WANT TO TRADE** a Crosley eight Special, or Hatfield Senior all Wave for ten watt Paragon Transmitter, or two stage Power amplifier. J. F. Hladky, Victor, Iowa.

**SELL:** Omnigraph, \$8; Grebe CR9, never used \$100; Atwater-Kent detector and two step with tuner, never used \$40. Chris Jurgensen, Forest City, Iowa.

**MAGNAVOX TYPE R3.** Latest nationally advertised models in original sealed factory cartons. List \$35. Special introductory offer \$25. Radio Central, Dept. Q, Abilene, Kansas.

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**CHEAP** for quick sale. Grebe CR-5, like new. Also, 10 watt C.W. set, 1-50 and 1-200 watt C.W. transformers, keys, aerial switch. Post soldering iron and other radio apparatus. Write for prices and description. Edgar M. Knepper, Maitland, Mo.

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**FOR SALE:** Nearly new Phone and C.W. set using five fifty watt tubes. Sell or in part, thousand volt four hundred watt motor generator, filament transformer three hundred watts, thirteen dollars; inductance \$6; Kick back protector \$5; Brand new fifty watt tubes nineteen dollars; slightly used twelve dollars; Two sixteen A tubes new \$7; slightly used \$5; W.D. twelves \$5; elevens \$4; reactors; condensers; leaks; Atwater variometers \$5; eight dollar phones \$4; Murdocks two seventy-five; Aeriola Jr. with phones and aerial \$7; Premiers with phones aerial \$8; Antennella tubes 75¢; Homcharger \$8, little used five watt tubes \$4; Microphone transformer, \$4. Write us your needs. Park City Radio Co., Bowling Green, Ky.

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**FOR SALE:** Paragon RA-10 and DA-2 Amplifier. Western Electric Power Amplifier and horn. 50% off list for all or 40% for any one. Western Electric 100 Watt airplane set rewired using surefire circuit with tubes, Rectifier, transformers, meters, complete \$115.00. J-Ray gap \$20. Cash only. Radio 9DXM.

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**SPECIAL—NEW FIVE DOLLAR 44-PLATE CONDENSERS** with Knob, Scale, Pointer—\$3.00 POST-PAID. Magnavox—\$28.00. THREE STAGE UNIVERSAL RECEIVER with bulbs, batteries—\$75.00. Alva Smith, Caledonia, Minnesota.

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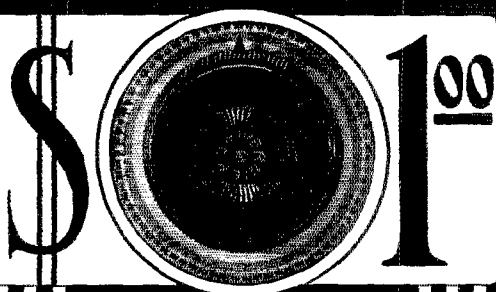


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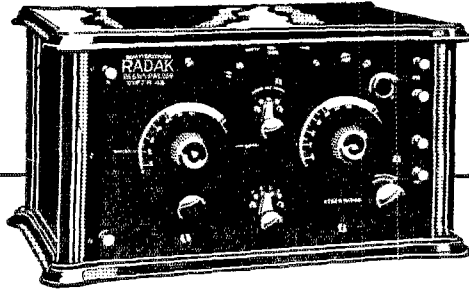


—FOR YOUR CONVENIENCE—

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## *Is Insulated with Formica*

**T**HE Radak radio equipment manufactured by Clapp-Eastham of Cambridge, Mass., and sold everywhere is made with Formica panels and other Formica insulating parts.

This well-known line has genuine prestige in the radio industry. It is sold and known everywhere—and its endorsement of Formica is a matter of moment to every dealer and amateur.

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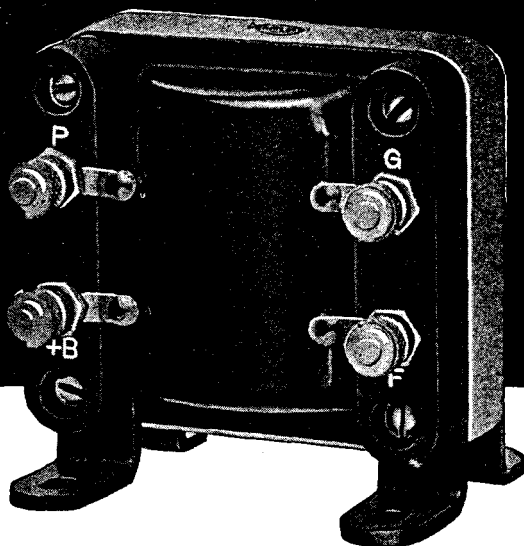
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# FORMICA

Made from Anhydrous Redmanol Resins  
**SHEETS TUBES RODS**

# CONNECTICUT RADIO



Scientifically

Correct

## Build Your Amplification Around the CONNECTICUT J-121

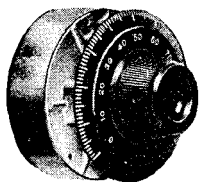
No mere handy man's idea of a transformer—this—but a scientifically correct instrument, developed and perfected in our own Radio Research Laboratories to meet the ever increasing demand for tone quality—as well as volume—in amplification.

That's just the point—

Anybody can build up a core—anybody can wind up a coil—anybody can solder up a circuit—But when it comes to a determination of the best materials to be used—the right impregnation—the proper insulation—the most effective shielding—not to speak of porportioning circuits and balancing them as to input and output—the things that make or break a transformer—the things that make or break an amplifier—these are the things that must be determined by engineers and executed by experts.

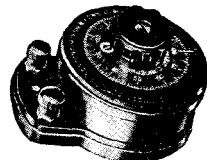
And because the CONNECTICUT J-121 A. F. Transformer was developed by one of the foremost radio engineers of the day, and because it is built by a company long noted for the excellence and precision of its products, it is an instrument you can safely depend upon to give you the kind of amplification you've always wanted. Price \$5.00.

*If your dealer cannot supply you,  
order direct.*



Panel Type Condenser  
J-108 \$5.00

Bulletin A-12 illustrating and describing CONNECTICUT Variable Condensers, one and two stage amplifiers, vacuum tube sockets, rheostats, headphones, jacks, plugs, and battery switches upon request.



Portable Type Con-  
denser  
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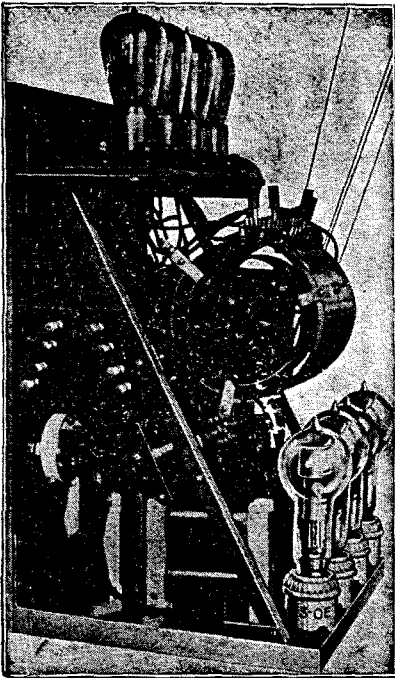
**CONNECTICUT** TELEPHONE  
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# AMRAD



Transmitter at Station 3-OE, Philadelphia, employing 4 AMRAD "S" TUBES. This Station reports remarkable DX records considering the power used.

## "S" Tubes Endorsed By Advanced Amateurs

Every day, everywhere, AMRAD "S" TUBES are finding increasing favor with expert relay men as a highly efficient rectifier of high voltage A.C.

"How do you get that note?" is the question amateurs ask "S" TUBE owners.

AMRAD has not been of great service to the Amateur—but these "S" TUBES will make up for the past. They are most efficient, most economical, as there is no filament to burn out. Price, each \$8.00.

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"S" TUBES are rigidly inspected before shipment. But—if any "S" TUBE becomes inoperative for any reason whatsoever, we will replace it at half list price, upon receipt of old Tube and data as to cause of its failure.

Demand "S" Tubes from Your Dealer.  
Write us for free Bulletins J and K

### "THEY GET BETTER AND BETTER," SAYS 3-OE

"The "S" Tubes in use here have been in daily operation since October 1922 and will stand more high voltage than when first used.

"Have been reported at Tucson, Arizona and Colon, Panama, Colorado and Florida on straight C.W. . . . . Work almost as far on I.C.W.—as far west as Iowa, north to Maine, almost any night to Vermont, Massachusetts and Connecticut. . . . ."

"This combination gives me a true D.C.—better than a generator as there is no commutator to give the famous ripple."

(Signed) Oscar W. Lummis (3OE)  
806 Kenmore Rd.,  
Philadelphia, Pa.

### "VERY BEST IN EVERY WAY," WRITES 1-CPI

Unusually conclusive tests were conducted by the undersigned from January 3 to May 15 at Watertown, Mass. between (1) thermionic, (2) electrolytic and (3) "S" Tube Rectifiers. These tests, (copies gladly furnished on request) were summarized as follows:

- "(1) Too expensive, fair results.
- "(2) Too troublesome. Good results if proper care and elements are used. Low cost. Better than (1).
- "(3) "S" Tubes. Very best in every way. Lower cost in the end."

(Signed) Waldo J. Kelley (1CPI)  
Watertown, Mass.

If your dealer has no "S" TUBES in stock, send us your remittance and shipment will be promptly made.

## AMERICAN RADIO AND RESEARCH CORPORATION

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