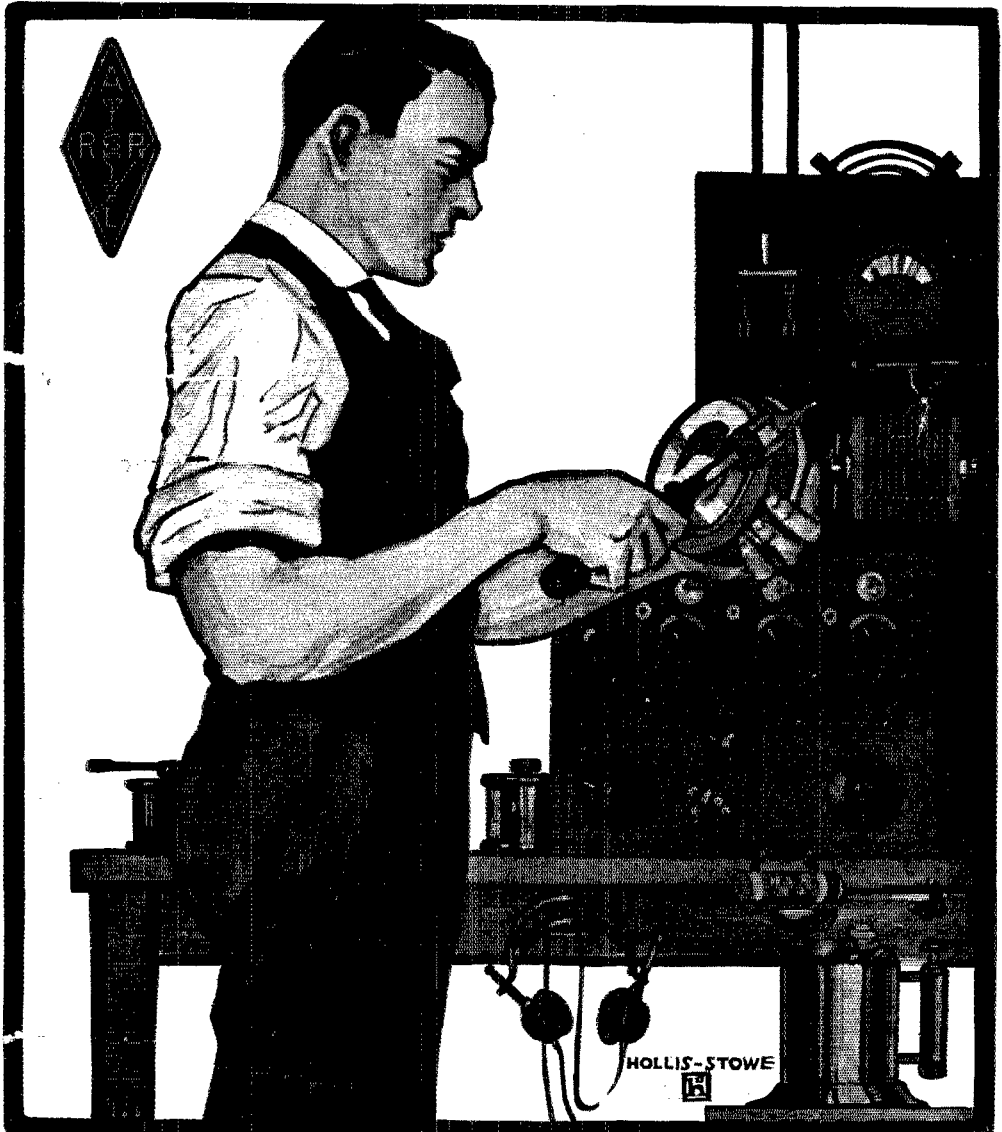


# QST

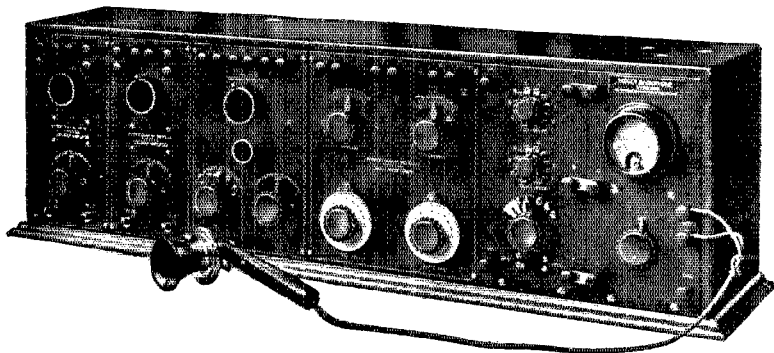
A Magazine Devoted Exclusively to the  
WIRELESS AMATEUR



Published by the American Radio Relay League

JUNE 1921

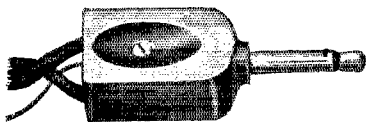
20¢



## De Forest Interpanel Radio Equipment

*Shown above, consisting of four units, five panels, without tubes or batteries. Price, complete, \$189.50*

The Interpanel set consists of a series of panels, each complete in itself, but designed for combination with the other panels. Panels sold separately, with or without cabinets. Radiophone and receiving equipment in this form provide the utmost in simplicity of operation. *Request Special Literature.*



### THE PACENT UNIVERSAL PLUG

May be used to "plug in" a telephone headset, a microphone transmitter, a manipulating key, a loading inductance, etc. In fact, its adaptability renders its name synonymous with its uses.

*Price, \$2.00*

*(Shipping Weight 1 lb.)*

### Westinghouse

The high grade Westinghouse regenerative Tuner and tube detector-amplifier provide a most efficient set for code and phone reception over all amateur and normal ship wave length ranges. Tests conducted in our own laboratories justify us in recommending this apparatus unreservedly. Its operation is simplicity itself,—its tuning exceptionally sharp,—its performance, day in and day out, remarkable.

**Type R A Short Wave Tuner Style 307189, 180-700 meters. Price \$65.00**

*Literature gladly sent free on request.*

## ATLANTIC RADIO COMPANY

INCORPORATED

**88 Broad Street  
Boston, 9 Mass.**

**Branch:—15 Temple Street  
Portland, Maine**

"This mark  
your guarantee"



ALBANY, N. Y.  
Shotton Radio Mfg. Co.  
8 Market St.

ASHEVILLE, N. C.  
Hi-Grade Wireless Instru-  
ment Co.

ATLANTIC CITY, N. J.  
Paramount Radio Supply  
518 N. Connecticut Ave.

BOSTON, MASS.  
Atlantic Radio Co.  
88 Broad St.

BROOKLYN, N. Y.  
Kelly & Phillips.  
312 Flatbush Ave.

CHICAGO, ILL.  
Chicago Radio Lab.  
1316 Carmen Ave.

EUREKA, ILL.  
Klaus Radio Co.  
Branch, Peoria, Ill.

KANSAS CITY, MO.  
McCreary Radio Supply  
4th and Delaware Sts.

NEW BRUNSWICK  
NEW JERSEY  
Geo. N. DeLaplaine  
306 George St. and  
8th & Magnolia Sts.

NEW ORLEANS, LA.  
Rose Radio Supply,  
604 Gravier St.

NEWARK, N. J.  
A. H. Corwin & Co.  
4 West Park St.

OMAHA, NEBRASKA  
O-B Radio Supply Co.  
406 Brown Building.

PHILADELPHIA, PENN.  
Philadelphia School of  
Wireless Telegraphy  
Broad and Cherry Sts.

PITTSBURGH, PENN.  
Radio Electric Co.,  
3807 Fifth Ave.

PORTLAND, ME.  
Atlantic Radio Co.,  
15 Temple St.

PROVIDENCE, R. I.  
Rhode Island Elec. Equip.  
Co.  
45 Washington St.

SCRANTON, PENN.  
Shotton Radio Mfg. Co.  
P. O. Box 3  
Branch, 8 Kingsbury St.  
Jamestown, N. Y.

SEATTLE, WASH.  
Northwest Radio Service  
Co.  
609 Fourth Ave.

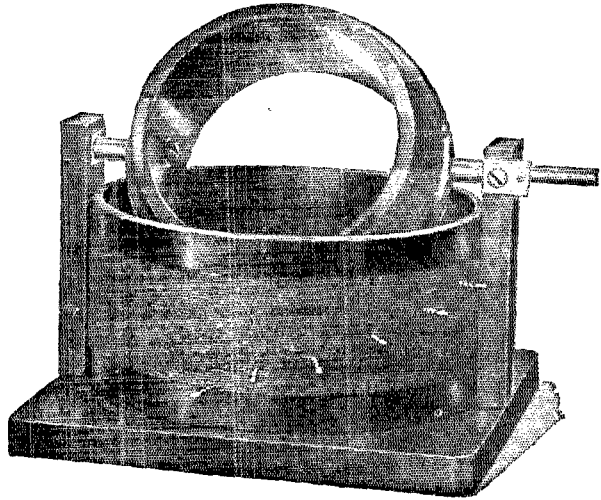
WASHINGTON, D. C.  
Eastern Radio & Elec-  
tric Co.  
1405 Florida Avenue.

WICHITA, KAN.  
The Cosradio Co.  
1725 Fairmount Ave.

Canadian  
BIENVILLE, QUE. CAN.  
Canadian Radio Mfg. Co.  
MONTREAL, P.Q. CAN.  
J. E. Miller  
136 Vendome Ave. N.D.G.  
TORONTO, ONT. CAN.  
The Vimy Supply Co.  
567 College St.

# RADISCO

"Your Assurance of Satisfactory Performance"



## Accurate as a high priced watch:

One five hundredth of an inch, (.002), a tiny frac-  
tion of a hair's breadth,—that's the standard of  
measurement that makes the

### NEW RADISCO VARIO-COUPLER

the most perfectly constructed coupler you can  
buy.

You can take replacement parts for this coupler  
at random, and find that in all essential dimen-  
sions they will vary less than one five hundredth  
of an inch. Anything but a perfect fit is im-  
possible.

And, the standardized methods that produce such  
unvarying accuracy, also result in savings that  
give you unequalled value per dollar.

Examine this new coupler at the nearest Radisco  
agency listed at the side. See for yourself the  
excellent quality Formica, Brass, and moulded com-  
position used thruout. Then invest \$7.50 in per-  
manent satisfaction!

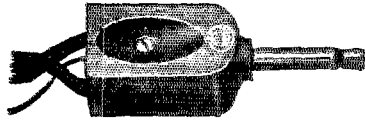
RADIO DISTRIBUTING COMPANY  
NEWARK, NEW JERSEY

# RADISCO

"Your Assurance of Satisfactory Performance"



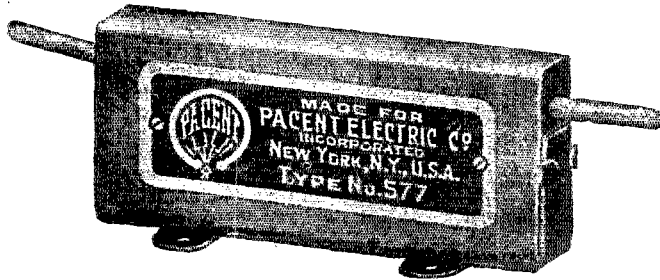
## PACENT UNIVERSAL PLUG



PRICE, \$2.00

THE ONLY PLUG FOR RADIO. NO CONNECTIONS TO SOLD-  
ER. CONNECTED IN A JIFFY. ESSENTIAL FOR MODERN RADIO.  
FOR TRANSMISSION AND RECEPTION. APPROVED BY THE  
NAVY DEPARTMENT. USED BY COMMERCIAL COMPANIES. EN-  
DORSED BY FOREMOST AMATEURS. OBTAINABLE FROM YOUR  
DEALER.

## Dubilier Universal Condenser



Price  
\$2.00

SUPPLIED IN MOST USED CAPACITIES. FOR TRANSMISSION  
AND RECEPTION. ESPECIALLY DESIGNED FOR C. W. WILL  
CARRY ONE AMPERE AT 1000 VOLTS. RUGGEDLY CON-  
STRUCTED. HAS CONSTANT CAPACITY. APPROVED BY OUR  
GOVERNMENT. EASILY MOUNTED ANYWHERE. OF UNIVER-  
SAL RADIO USE.

We shall be pleased to send you bulletins describing the above and our  
other products on receipt of five cents in stamps.

AMATEURS AND EXPERIMENTERS—Get in touch with your dealer.  
DEALERS—Write immediately for our liberal discounts.

### SOLE DISTRIBUTORS FOR

Wicony's Complete Line of "Eventual" Apparatus.

Duo-Lateral Coils,

Pacents Universal Plugs,

Sullivan Apparatus,

Standard VT Batteries.

Dubilier Condensers,

Seibt Condensers,

Special Distributors for Brandes Phones

## Pacents Electric Company, Inc.

Louis Gerard Pacents, President

150 Nassau Street,

Telephone  
Beekman 5810

New York City

# QST

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

VOLUME IV

JUNE, 1921

No. 11

A Receiving Tuner for C.W.	5
Rotten Nerves	<i>The Old Man</i> 7
The Ideal Relay Spark Station—Part 1	<i>R. C. Denny</i> 11
A Radiophone Employing A.C. and a Chemical Rectifier	<i>H. E. Bussey</i> 17
The Radio Work of the Department of Commerce	<i>J. H. Dellinger</i> 18
Coming—The Static-Puncturing Contest!	21
Results of Washington's Birthday Relay	<i>W. H. Kirwan</i> 22
Amateurs Wanted to Join Signal Reserve Corps	25
A Suggestion	25
We Are Paying Our Bonds	25
The Invisible Minister	26
Tubes Without Filaments	26
Editorials	27
The Operating Department	30
Amateur Radio Stations	40
Who's Who in Amateur Wireless	43
"Strays"	44
Calls Heard	46
April Station Reports	50
With the Affiliated Clubs	51
Radio Communications by the Amateurs	53
Classified Advertisements	116
Index of Advertisers	119

QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A.R.R.L.), Manager and Editor.  
Subscription price in United States, Possessions, and Canada, \$2.00 per year.  
Foreign, \$2.50. Single Copies, 20 cents.  
Entered as second-class matter May 29, 1919, at the post office of Hartford, Connecticut, under the Act of March 3, 1879.  
Copyright, 1921, by The American Radio Relay League, Inc.  
Title registered at United States Patent Office.

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

# THE AMERICAN RADIO RELAY LEAGUE

"A national non-commercial organization of radio amateurs, bonded for the more effective relaying of friendly messages between their stations, for legislative protection, and for scientific growth."

## OFFICERS

President  
**HIRAM PERCY MAXIM**  
Hartford, Conn.

Vice President  
**CHAS. A. SERVICE, JR.**  
Bala, Pa.

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

Treasurer  
**A. A. HEBERT**  
Nutley, N. J.

Secretary  
**K. B. WARNER**  
Hartford, Conn.

## DIRECTORS

**A. E. BESSEY**  
Sunnyvale, Calif.  
**V. F. CAMP**  
Brightwaters, L. I.  
**J. M. CLAYTON**  
Little Rock, Ark.  
**F. M. CORLETT**  
Dallas, Tex.  
**S. KRUSE**  
Washington, D. C.  
**W. T. GRAVELY**  
Danville, Va.

**F. F. HAMILTON**  
Indianapolis  
**A. A. HEBERT**  
Nutley, N. J.  
**HIRAM PERCY MAXIM**  
Hartford, Conn.  
**C. A. SERVICE, JR.**  
Bala, Pa.  
**J. O. SMITH**  
Valley Stream, L. I.

**H. L. STANLEY**  
Babylon, L. I.  
**C. H. STEWART**  
St. David's, Pa.  
**K. B. WARNER**  
Hartford, Conn.  
**M. B. WEST**  
Waukegan, Ill.  
**F. H. SCHNELL**  
Hartford, Conn.  
**H. M. ANTHONY**  
Muncie, Ind.

## OPERATING DEPARTMENT

**ATLANTIC DIVISION**  
Manager  
Chas. H. Stewart  
St. David's, Pa.  
Asst. Mgr., Central Sec.  
C. J. Goette  
1624 Hamilton Ave.  
Woodhaven, L. I.  
Asst. Mgr., Southern Sec.  
Edw. B. Duvall  
3909 Cottage Ave.  
Baltimore, Md.  
**EAST GULF DIVISION**  
Manager  
E. H. Merritt  
192 W. North Ave.  
Atlanta, Ga.  
**CENTRAL DIVISION**  
Manager  
E. H. G. Mathews  
6433 Ravenswood Ave.  
Chicago  
Assistant Manager  
L. A. Pease  
2256 W. 24th St.  
Chicago  
**ALASKAN DIVISION**  
Manager  
Roy Anderson, 71T  
P. O. Box 206  
Ketchikan, Alaska

**WEST GULF DIVISION**  
Manager  
Frank M. Corlett  
1101 East Eighth St.  
Dallas, Tex.  
Assistant Manager  
Raymond L. White  
900 No. Preston St.  
Ennis, Tex.

**PACIFIC DIVISION**  
Manager  
A. E. Bessey  
Sunnyvale, Calif.  
Assistant Manager  
E. G. Arnold  
181 No. 17th St.  
San Jose, Calif.  
**ST. LAWRENCE DIVISION**  
Manager  
Albert J. Lorimer  
243 Mackay St.  
Montreal, Que.  
**ONTARIO DIVISION**  
Manager  
A. H. Keith Russell  
353 Markham St.  
Toronto, Ont.  
**DAKOTA DIVISION**  
Manager  
Boyd Phelps  
3344 First Ave., South  
Minneapolis, Minn.

**NEW ENGLAND DIVISION**  
Manager  
Guy R. Entwistle  
157 Sutherland Road  
Brookline, Mass.  
**ROANOKE DIVISION**  
Manager  
W. T. Gravelly  
854 Main St.  
Danville, Va.  
**DELTA DIVISION**  
Manager  
John M. Clayton  
1801 Welch St.  
Little Rock, Ark.  
**ROCKY MOUNTAIN DIV.**  
Manager  
M. S. Andelin  
Richfield, Utah  
**MIDWEST DIVISION**  
Manager  
L. A. Benson  
4942 Wiesehan Ave.  
St. Louis  
**NORTHWESTERN DIV.**  
Acting Manager  
R. T. Galyean  
460 Miller St.  
Portland, Ore.  
Asst. Mgr., Eastern Sec.  
H. E. Cutting  
Box 517,  
Bozeman, Mont.

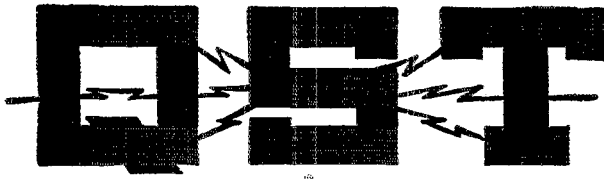
## ADVISORY TECHNICAL COMMITTEE

**C. S. BALLANTINE**  
**WM. C. BALLARD, Jr.**  
**LEROY M. B. CLAUSING**  
**FRANK CONRAD**

**MINTON CRONKHITE**  
**J. H. DELLINGER**  
**C. L. FARRAND**  
**PAUL F. GOBLEY**  
**LEO C. YOUNG**

**L. A. HAZELTINE**  
**C. D. TUSKA**  
**R. H. G. MATHEWS**  
**J. O. SMITH**

Address General Correspondence to Executive Headquarters, Hartford, Conn.



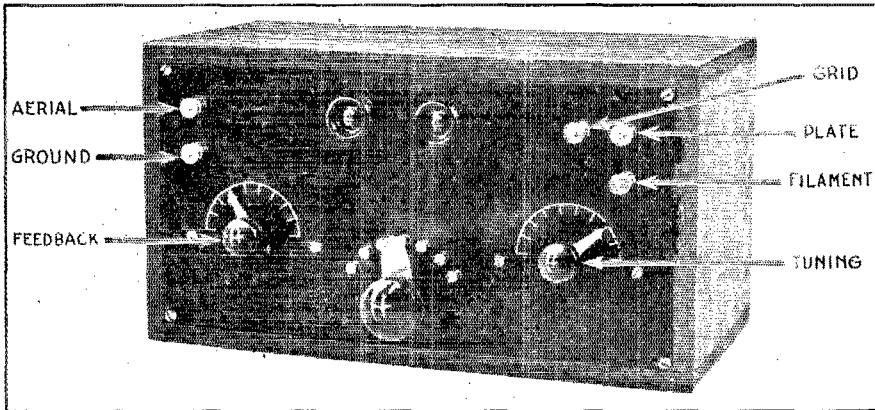
A Magazine Devoted Exclusively to the Radio Amateur

## A Receiving Tuner for C.W.

**D**O you believe it possible that C.W. can be tuned in much easier than spark? Accustomed as you are to the modern regenerator with its multi-controls, where the plate circuit has to be carefully tuned to the grid circuit and then retuned each time the grid circuit is varied, to say nothing of critical adjustments of antenna circuit and coupling, no doubt it sounds improbable, and indeed it is a hard job on our regenerators. But can you imagine a tuner that

has been devised by Mr. John L. Reinartz, 1QP, of South Manchester, Conn., and forms the basis for this article.

C.W. transmitters have been progressing faster in recent months than C.W. receivers, and the difficulty of tuning it in has been holding back development. Our regenerative tuners, expressly designed to work almost but not quite up to the oscillating point, are being found unsuited to C.W. reception because of the length of time required to perfect the various ad-



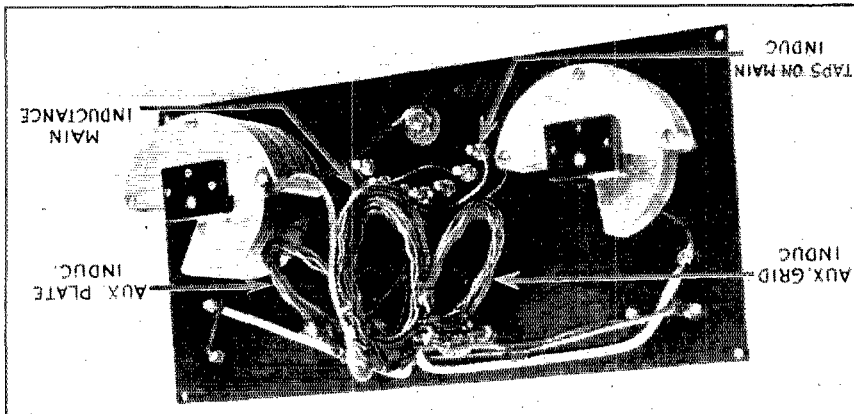
would oscillate nicely at whatever wave length the grid circuit was tuned to, and in which the aerial circuit and coupling didn't have to be adjusted at all, so that all that would be necessary would be to start it oscillating and vary the secondary and then be able to hear the C.W. stations as you pass their waves, be able to stop without effort on any of them or to switch almost instantly back and forth from one to the other and find them always in the same spot, and all totally free from capacity effects? A set that does these things

justments on a given signal. Most of the circuits finding favor for receiving C.W. employ a capacity feedback in one form or another, rather than the tuned plate circuit, which former gives stable oscillation over a wide range of secondary-circuit wave lengths. The new Westinghouse tuner with its tickler feedback and with variometer and condenser on the same shaft, is also very convenient for C.W. The tuner described below can be built by any amateur at a trifling cost, and altho C.W. is its *piece de resistance* it is almost as

good as the tuned-plate-circuit regenerators for spark work.

The photographs show the outside and interior of Mr. Reinartz' tuner, and the hook-up (with an extra switch, to be mentioned later) is shown in the schematic diagram. The main inductance TL is a home-made "spider-web" type with a 2-inch center hole, wound with No. 22 cotton-covered wire with turns and taps as shown in detail under the hook-up, the taps being made by making long loops at the proper turn, baring the wire and soldering close to the winding, and continuing. Now this main inductance is the only one entering into the actual tuning of the set, and the feedback is primarily by means of a condenser, but difficulty is experienced in

the photographs has no taps on the secondary and this condenser is therefore the sole means for tuning it. However, Mr. Reinartz finds that somewhat better results are obtained by having a few taps on the winding so that more inductance can be used and less capacity be necessary for reaching the longer waves. Accordingly a switch TS is shown in the hook-up, and is the right-hand switch in the detail drawing of the main inductance. GC is a 43-plate variable grid condenser, which is often an advantage over the fixed grid condenser altho very good results are obtained with the latter. RC is a 43-plate variable to control regeneration. The 7-point switch AS varies the aerial circuit inductance, which is part of the main in-



making such a circuit oscillate at very short wave lengths and for this reason two auxiliary inductances are introduced into the circuit to give a greater measure of coupling between grid and plate circuits. These are indicated at T<sub>1</sub> and T<sub>2</sub> and consist of 25-turn coils of construction similar to the main inductance but without taps. If the constructor desires, these coils can be made by "jumble-winding" the proper number of turns on a 2-inch tube, taking off, and taping. In the set illustrated the spider-web form was followed, and the shape of the coil preserved by applying a little sealing-wax at various points to stiffen it. The auxiliary inductances are mounted on each side of the main one, by fastening them with sealing wax to short shafts actuated by the two small knobs at the top of the panel. Their coupling, therefore, is via the main inductance. There is one adjustment of these couplings that will be found best for a given aerial and tube adjustment, and when once secured the coupling need never be disturbed.

TC is a 23-plate condenser for tuning the secondary circuit. The set shown in

ductance and therefore very closely coupled to the secondary winding, from 1 to 12 turns. This is the switch appearing in the lower center of the panel. If the 3-point switch TS is added, the two switches could be placed side by side at the bottom of the panel. The detail drawing of the main inductance shows the number of turns between each switch-point and should be carefully followed.

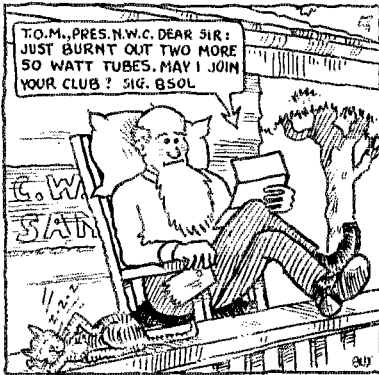
The initial adjustments of the set are a little tricky. The negative terminal of the B battery *must* be connected to the positive terminal of the A battery, and this point grounded. When an amplifier is used the grid circuits of same should connect with the negative side of the A battery. The polarity of the two tickler coils must be right—they will work in one direction and not in the other.

On an average amateur aerial the set will tune from 150 to 450 meters and will regenerate or oscillate over the entire range. It requires a somewhat greater detector filament current than is necessary for the same tube in a tuned-plate-circuit regenerator, and if results are not at first obtained, the filament should be crowded





so passionately, and we sit up to such deadly hours at night and take so little sleep that we just naturally get edgy and jumpy. It takes less to start a row among radio bugs than in any other class of people on earth, I reckon. Sometimes it gets downright funny, if you have a sufficiently sensitive bulb in your sense of humor, but during the heat of the argument it is far from funny. The funniest case of nerves yet recorded happened here



...organize the N. W. Club...and get cheap rates at some sanatorium.

the other night, and I think the parties involved may stand for a recital of it. I have carried a smile around on my face for a week thinking about it and by Heck I believe I will break my long silence and tell it to the gang.

It was one of the many by-products of our C.W. experiments. C.W. has a good many by-products, as some of the fellows well know by this time. You all remember our Radio Club, and Final Authority with his glasses, Radical with the eternal chip on his shoulder and the direct way of going at things, and our husky President with the determined manner and the strong right arm. Well, as per usual, Final was the goat. Final always was considerably touchy as to nerves. It never took much to scare him. He was always strong on theory and weak on the practical things of life. When anything got to turning over faster than 2500 r.p.m. Final was for stepping one pace to the rear and wrinkling up his finely chiseled brow in expectation of the worst happening. He belongs at a receiving set and not where the machinery is noisy and moving fast. Radical, on the contrary, has no nerves. They ran out of nerves when they built him. He fears neither man, devil, nor the Radio Inspector and has an insatiable desire to feel of everything with his bare hands. The more noise it makes and the more fire it vomits the better he likes it. He keeps your heart in your mouth most

of the time, when he is loose in the vicinity of a transmitter. With C.W., where it is an easy thing to get a jolt that will kill you, he makes me nervous and jumpy. It was Radical who taught me you could grab hold of the lead in when you were transmitting, provided you grabbed in real man fashion. He gave me palpitation once when he grabbed my lead-in one night when I was working my one k.w. Thor on full power. He says if you grab hold good and solid it only prickles, but if you dally with it any it bites a piece out of you. Old Kruse down at the Bureau of Standards ought to make some researches into this.

Final, Radical, the President, Yours Truly and Final's Dad were all assembled in Final's cellar not many nights ago, trying to find where the daggoné C.W. juice was going to that ought to have been going up the antenna via the hot wire ammeter. There was a bunch of stuff laid out on a table, and a mad tangle of wires and instruments and things lying around all over the place. Final knew where things went, but I had not the remotest notion and I am blessed if I believe either Radical or the President were much better off. On the floor directly back of them was an A.C. motor coupled to a D.C. generator, both of which had seen better days. The coupling was a huge monstrosity of cast iron, leather disks, bolts, nuts and rubber tape. The rubber tape was depended upon to hold the business together. A couple of big U tubes were mounted upon the table among the maze of wires and if you were an acrobat you could stand between the table and the motor-generator set and make readings of a milli-ammeter, and not get the seat of your pants chewed up by the couplings. The plates in the U tubes were white hot most of the time and threatening to burn out and bring financial ruin upon their owner and the D.C. commutator on the poor miserable generator was screeching bloody murder and spitting blue fire, and the evil coupling between the motor and the generator was snarling and snapping something dreadful. Under the circumstances it may readily be imagined that there was an air of nervous tension pervading that cellar.

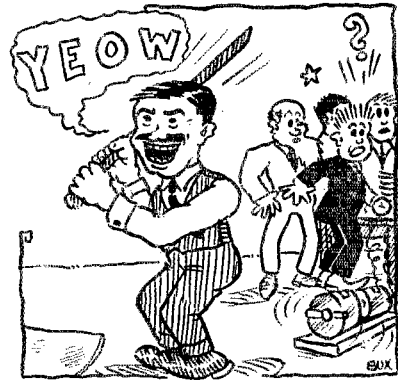
Final's Dad had been attracted to the cellar by the racket and the smell of brimstone, as he put it, and was an interested observer. He carried around with him a sly little twinkle in his eye and I had a hunch in the beginning that he might be up to something. Dad is a real dyed-in-the-wool sport. He is not a whole lot older than I am, and drinks home brew and plays poker Saturday nights with a gang of his age. He made you wonder how such a real he-man ever could have such a nervous young lady for a son as Final. I think he has wondered at it several times

himself. Final's Dad regards radio from the same slant that he regards hunting, fishing, base ball and prize fighting. If it is a case of sitting silently at a receiving set for a few hours he gets sleepy and loses interest. But if there is something red hot and making lots of noise and offering chances of busting up, he is Johnnie-on-the-spot. So Dad stuck around on this evening, watching the D.C. fireworks and listening to the snapping coupling with admiration. The coupling blew up several times during the tests and scattered cast iron and bolts and nuts and leather disks over the face of Nature, and Dad thought it fine business. Final tried to explain to him the formula governing centrifugal force, and how unhealthy it might be to stand in the plane of rotation of the coupling when it busted, but Dad could not take it in. Once or twice he slyly kicked the generator bearing with his foot, hoping, I honestly believe, to make it bust again.

It was getting late and we had been there some time working hard making adjustments of inductance and capacity and cursing Colpitts for ever getting up such a circuit, and getting just exactly nowhere, when Dad passed me a wink and we drew apart from the young men and went up stairs and took a couple of bottles out of the ice box. After emptying them and lighting two fresh stogies and hearing about how he mixed his hops and his malt extract, and when to add the yeast, we returned to the cellar to see how the coupling was getting on. Radical sniffed frankly and asked us how we got that way in these dry days, but went on rowing with Final about the effect of large capacity and small inductance, the latest article in QST by Warner to the contrary notwithstanding. This was more or less tiresome to Dad and he strolled around the cellar blowing great clouds of smoke from his free burning stogie. There was a big piece of about number twenty gauge sheet iron on a bench and Dad felt of this and reflected. Standing over against the other end of the bench was a big brute of a crow bar. Dad looked at the crow bar and at the sheet iron and seemed to be sunk in thought. I caught him steal a glance at the three young fellows bending over the instruments on the bench, but I looked away in time not to be caught watching. I guessed the old boy with the twinkle in his blue eyes was up to something, but I never dreamed what it turned out to be. I smile now as I reflect upon how skillfully he hatched his plot.

Final and Radical and the President had decided to try an entirely new kink and Dad came back to look on. He stood eyeing the crazy coupling for a while and whether he did something to it or not, I don't know, but anyway she gave a savage slap and

with a terrible roar busted again. Final as usual nearly jumped out of his skin and everybody dodged the flying hardware. I put in a bid to stop long enough to fix the blamed thing up right, but the younger fellows vetoed my motion. Just like young fellows, they did not want to stop long enough to fix anything. Their nerves were on edge and they wanted results. Dad butted in here and took my side. He pointed out the obvious fact that rubber tape was not the best thing in the world with which to fix a coupling which had to revolve at the tremendous speed of 7000 r.p.m., the point where Final said the generator must run in order to get the plate voltage which theory demanded. Dad also pointed out the effect of getting hit in the bean with one of the half-inch nuts. He seemed to think it was taking chances. He said the darned coupling shook and rumbled too much to suit his taste and that he considered it an altogether grossly disreputable piece of machinery. It might go off any minute and kill them all right there in their tracks and muss up the cellar. He said it always made a fizzy sound before it busted and he did not believe in a machine that made fizzy sounds. He considered that a very bad sign. He had heard of a fly wheel that had busted once and had killed most of the inhabitants



Dad let loose the most blood-curdling yell in him.

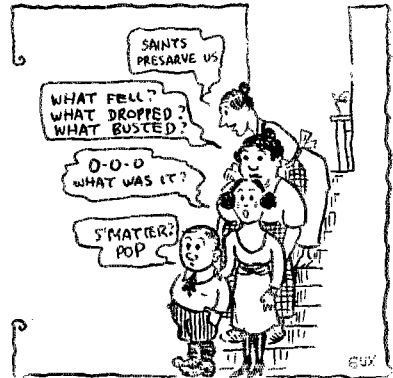
of the town, cutting off arms and legs and heads regardless of consequences. This crazy coupling was likely to explode the same way and send them all to Kingdom Come. He grew eloquent, and I could not help wondering why he was laying it on so thick. I found out later he was engaged in setting his stage for the big show he proposed to pull off in a few minutes.

Final and Radical and the President took his words partly to heart. They spent fifteen minutes putting back the bolts and nuts and leather things, and got some new tape and wrapped it around good and

thick and then wired it down so it would not come unstuck. Then they cleaned and adjusted the business end of the D.C. generator and started in once more to take readings with the new circuit. I got interested and watched them closely. I took note that Dad was over by the sheet iron and the crow bar, but I did not pay much attention to what he was doing. While we were at our busiest he came over and let out a holler right back of us to look out. The coupling was fizzing again. Final thought something had let go somewhere and nearly jumped through the ceiling. Radical himself gave a jerk. He was getting screwed up himself after all the trouble and the talk by Dad. I confess the yell brought me up all standing too. My nerves were as edgy as anybody's. They decided the fizzy sound did not portend anything serious and we went back to changing the capacity and the inductance and taking readings. We were right in the middle of the last combination when there came the most blood-curdling gawdawful yell I ever heard from a white man. Following it immediately came a perfect whale of an explosion and crash. It was right back of us, and of course all hands thought of the coupling and what Dad had said. Well sir, you never heard such a goldarned ripping and roaring nor saw such a mix up in all your born days. I went clean over the motor-generator set and landed out in the cellar floor. Every nerve in my body was taut as a fiddle string. Gasping for air, I glared around wildly to see whatinhel had got adrift and where the heavy parts were likely to come down. I remember being surprised when I looked up and saw that the roof was still on. I expected to see the stars above me. My mouth tasted of copper. It always does when I get a real sockdolager of a fright. I suppose my eyes blazed and my hair stood up. I acknowledge I had the fright of my life. What between the hoarse yell and the terrific explosion, and the state of my nerves, I thought the biggest bust-up America had ever figured in was right here in town.

Final happened to be leaning over the instruments and he projected himself half way over the table and lit in among the bulbs and wires and odds and ends. He had jerked so when the bust-up happened he had bumped Radical in the jaw with the milliammeter. Radical said later he thought one of the hunks of cast iron had lit on him. He knew he was mortally wounded because he could feel the hot life-blood flowing down his chin. He was convinced his jugular vein had been severed and that he was bleeding to death. He had recoiled sideways and had caromed off the President and was heading in the general direction of the coupling. He said he had

visions of sitting down hard upon the rapidly rotating remains. To save himself and the seat of his pants he had made a frantic grab at the President in passing, and had hooked into him somewhere. The two of them got mixed, the wires connecting the instruments they were holding pulled taut and snapped, and these two agile young men went into a tail spin. They spiralled and side slipped and executed the darndest hootchie-cootchie you



By this time Final's family had poured down the stairs.

ever beheld trying to make a landing elsewhere than on top of the coupling, which they both knew was directly behind them. Goshamighty, I never imagined such a whirling around of things and people!

When Final got himself unsnarled from the tangle of wires and instruments and settled down out in the middle of the floor, all he could do was to jitter. He held tight hold of a miserable bit of insulated wire. What he thought he was going to do with it I give up. After gazing wildly around and muttering incoherently he looked hard at his Dad. By this time I had caught on. My nerves were unstrung, but I could understand things. Not so Final. He was in a beastly state of funk. Radical was looking at the coupling which was running still and entirely normal, or as near normal as it ever was. I saw at once that Dad was standing over by the big piece of sheet iron, and was having an awful time trying to control himself. His blue eyes were twinkling away like stars. The big crow-bar rested upon the sheet iron and a big welt showed across the full width of the latter. Dad had taken the crow-bar, lifted it high over his head, let loose the most blood curdling yell in him, and had brought the crow-bar down on the sheet iron with the huskiest wallop he could command. The whole thing was as plain as the nose on your face.

Final could not grasp anything. His nerves were shattered. He could see and

also hear the coupling running, but he was so sure of his theory that it had busted that he did not take into account what his eyes and his ears showed. The noise and the yell told him something big and dangerous had let go and as the coupling was on his mind it must be the coupling that had busted. His face was pale green. You could see that every nerve in him was raw. He jittered something and staggered over toward his Dad. The two of them looked hard at each other at close range for what seemed five minutes, and then the following edifying conversation ensued, each one yelling at the other in order to be heard above the racket of the coupling. (As yet not a one of us had the brains to shut off the motor-generator.)

Final jittered, "What hap—you—did some—where—?"; to which Dad replied, "Sure." Final glared around to see if anything heavy was coming his way, and still clinging fast to the bit of wire, said, "What was—where—I—Gosh!" Dad thought this over and came back with "Yes, that's right." It seemed like a perfectly good answer to Final. He asked then something like, "What was it—why is—you—yell—where—my head aches." I don't know how long they would have kept this drool up. Radical saw they were getting nowhere, and as customary with him he came right to the point. He walked up to Dad, and looking at the sheet iron and the welt across it and the crow-bar said, "What for gawdsake happened?"

By this time Final's younger brother and his pretty sister and the hired girl and his mother had poured down the stairs into the cellar. Mother was trying to make up her mind whether to be frightened or mad. She demanded to know what had fallen down and broke. You could see she was in doubt between some wireless bust-up or some home brew bust-up. Pretty sister

was frightened and expected to see blood and gurry scattered around. Young brother thought it great stuff and searched for some sign of the explosion. The hired girl was all of a tremble and eyed me with open suspicion. She had seen Dad and me with the bottles earlier in the evening. Radical had the brains to shut off the motor-generator at this point and as the thing dawned upon him he began to laugh. Dad explained to the assembled multitude that they were conducting some new wireless experiments and once in a while it made some noise. No one had been chewed up and the family would please go back upstairs. The experiments were over and they would all be stopping pretty soon now.

Final looked around vacantly after the crowd went, and no one seemed to want to fool with C.W. any more that night. Everybody's nerves were pretty well frazzled and so we went home. On the way home with Radical the latter chuckled to himself every minute or so and when I dropped him at his house he grinned and allowed as how a rattling good time was had by all, and that Final's Dad was some radio bird. I don't know when we will pick up the Colpitts matter again. I am going to lay off a while until my nerves get straightened out and my fingers get well. Somebody says to cut out the motor-generator idea and use the sixty cycle juice on the plates. But if it can't be made to drum and grunt less than what I have heard in the air coming from those hooligans with the five watt tubes, I shall stick to the motor-generator. But when it comes to coupling up an A.C. motor to a D.C. high voltage generator, I shall fix me up something that does not have to turn up to 7000 r.p.m. and make a noise like a drunken pneumatic hammer badly out of repair. But by Heck it will not be until I have taken a week to rest up my nerves.

## The Ideal Relay Spark Station

By R. C. Denny, 6CS

In two parts: Part I.

This is the Second Prize article in QST's contest for practical material on spark sets. As we stated in our mention of the subject in April QST, we cannot fully subscribe to some of Mr. Denny's views, and attention is asked to the notes at the end of the article. We frankly admit that many of these questions are matters of opinion and we do not wish to disparage Mr. Denny's article, which is excellent and in the constructional data it contains in particular will be welcome information to many of our readers.—Editor.

### The Mast

It is generally conceded that the high, vertical aerial is the most successful for transmitting the greatest distance with a given amount of power. Then, since the ideal relay transmitter should cover the

greatest possible distance with the rather limited power of 1KW, a vertical aerial system should be the choice for such a station. Inasmuch as the natural wavelength required in an aerial for 200 meter transmission should be 160 meters, or an

electrically equivalent actual length of 100 feet, a mast or tower of that height would be required for a truly vertical aerial. The construction of a single mast or tower and vertical aerial of the same height would be impractical, as it would be difficult to insulate the aerial from the mast and from the guys. To build two or three masts to get sufficient clearance for a vertical aerial of the same height would prove costly, and require considerable space. However, by sacrificing say 25% of vertical height (and it is doubtful if this would

reduce the transmitting range appreciably) it is perfectly feasible to suspend a 100 foot aerial from a 75 foot mast or tower, and get plenty of clearance. A minimum of space is required for erecting and guying a mast or tower of this sort, and that is the principal restriction at most locations.

The following description of a triangular section, latticed tower is taken from an actual amateur installation, shown in the accompanying photograph entitled "95 Foot Amateur Aerial". In this particular case the tower sits on the roof of a building 20 feet high, but this fact does not alter or in anyway affect the design. It will be seen from the accompanying triangular section drawings that the tower is 50 feet high, and that it rests on a square

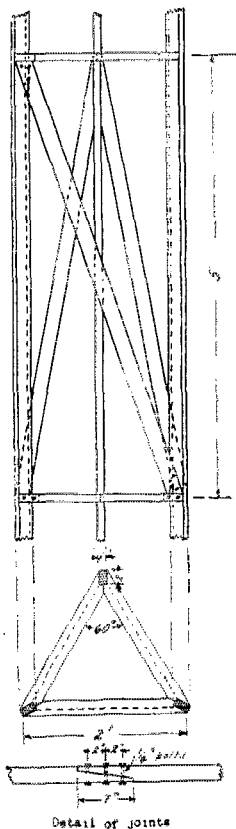


FIG. 1 (B)

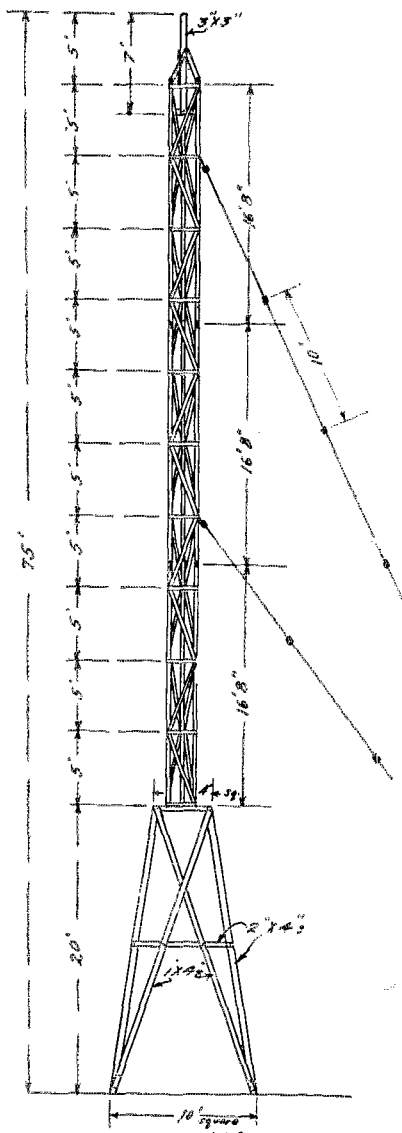
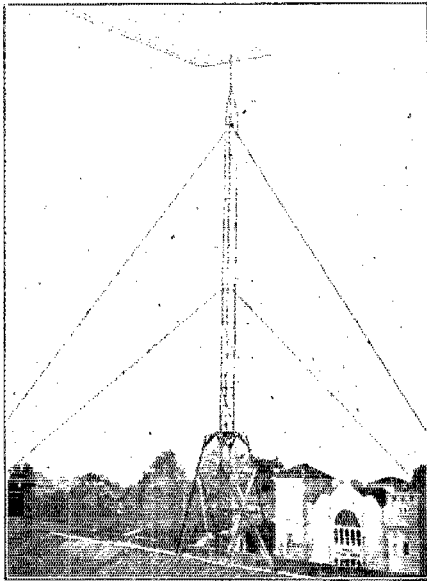


FIG. 1 (A)

structure 20 feet high. The triangular tower is built entirely of 1" x 2" material, which may be clear soft pine or spruce. It is made in three sections which are bolted together as shown. (Fig. 1.) The strut members should be fastened to the vertical members with round head wood screws, as they hold much better than nails and are not so likely to split the wood. The braces should be sawed to fit and screwed in place to the vertical members. The pole at the top is a 3" x 3" seven feet long, which projects from the top 5 feet. Through the top of this pole is fastened the eye bolt, which holds the single sheave galvanized iron pulley. The square tower is a 2" x 4" structure 20 feet high, braced as shown with 1" x 4" pieces. The legs are spaced 10 feet at the bottom and taper to 4 feet at the top. There is ample space within this square structure for the radio station if such be the desire of the builder.

There are two sets of guys, three wires each; i.e. guyed in three directions out 35 feet from the foot of the tower. It is not

absolutely necessary to guy out that far, but in general the farther out the better, depending somewhat upon the character of the anchors. They should be in the ground very firmly, as heavy winds exert a con-

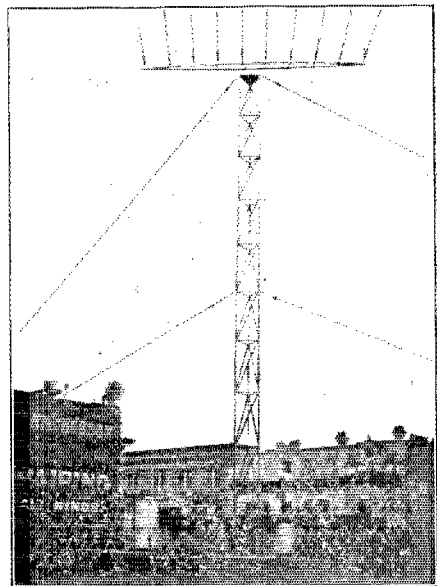


95 Ft. Amateur Aerial

siderable pressure on such a tower. The guy wires are of No. 12 galvanized iron, and are insulated every ten feet by a heavy porcelain knob. The idea of this insulation is to break up the lengths so that they will not absorb energy from the aerial and set up oscillations at anywhere near the normal wave length. It is a good idea to paint the tower, and this should be done with the three sections apart, so that the joints get a coat also. Probably the easiest way to erect this tower is to stand the three sections on end inside the square structure, and having run a 150 ft. length of heavy sash cord through the pulley, boost a section up through the top. Fasten on the top set of guys and bolt to the second section; then boost again, and bolt on the third section. Fasten on the second set of guys and give the final boost, allowing the tower to rest on top of the square structure. The tower shown in the before mentioned photograph was erected in this manner, requiring three men to handle the guys, and four to boost and lift on the tower. The photograph entitled "75 Foot Commercial Aerial" illustrates another application of this same style of triangular section tower of the same general dimensions, one of two supporting an inverted L aerial.

### The Aerial

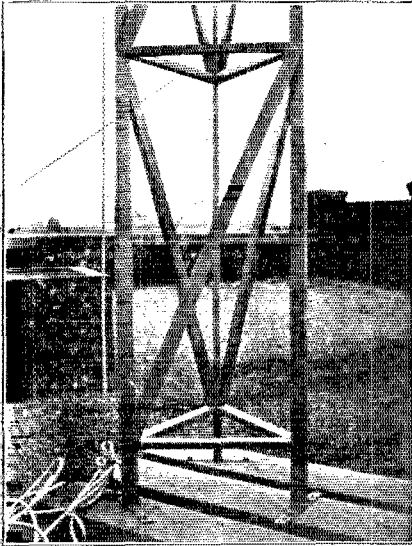
The arrangement of an aerial on such a tower as described depends somewhat upon the location of the operating room. If at the base of the tower, as is often the case, the wires should be fanned out between two of the sets of guys, and guyed out by means of marlin twine. They are then brought back together at the base of the tower as shown. (Fig. 2.) The more nearly vertical an aerial, the more wires there will be required to obtain a given capacity, owing to the decreased capacitance to ground in a vertical system. However, by using more wires than are ordinarily used in a flat horizontal aerial, and spreading them out over a great area, sufficient capacity may always be obtained. Stranded or braided copper wire may be used with very beneficial results; however, solid copper wire of the larger sizes, No. 12 or 14, is generally very satisfactory. All connections should of course be soldered, and it is very good practice to lay out each wire of sufficient length to reach the apparatus, so that the lead-in may be formed by simply twisting all the wires into a cable. A single wire might be brought in on the opposite side of the tower from the multiple aerial, and used for receiving. A single wire so nearly



75 Ft. Commercial Aerial

vertical would have very little capacity, and the tendency for static charges to collect would be nil. Very little if any induction should be noticed on an aerial such as described. Neither will such a

system interfere with telephone lines in the vicinity to any extent, when trans-



Detail construction of wooden triangular section tower.

mitting. A glazed porcelain tube or corrugated composition bushing of some sort should be used for the entrance of the lead-in. It is a wise precaution to provide a ground switch especially in localities where electrical storms are prevalent. This should be a single pole double throw knife switch, of 60 to 100 amperes capacity, mounted outside the operating room, and on some other material than slate, which absorb moisture. The switch should be of such dimensions that there is no leakage or brush discharge from the center stud to the ground clip while transmitting.

#### The Change-Over Switch

This may be either a single-pole double-throw or a double-pole double-throw switch; in either case it is generally provided with an extra blade to start the spark gap motor operating when thrown to the transmitting position. It should be a quick operating device, and conveniently located, preferably just back of or at one side of the sending key. This switch also should be of sufficient dimensions to prevent sparking or brushing across from aerial to ground connections, and should have large surfaces in the clips. A good simple design of such a switch is shown in the accompanying drawing, Fig. 4, which is self explanatory.

#### The Ground

The best ground connection that most amateurs have available is the water pipe. This is not a bad ground at all, if a clean tight contact of considerable area can be made close to where the pipe enters the ground. Ground clamps should be used for this purpose, making sure that the pipe is absolutely clean. A heavy copper wire or cable should be soldered to the clamp, and led by the shortest possible route to the apparatus. Precaution should be taken to ground gas pipes, by bonding them to the water pipes at several points, so that no difference of potential exists to cause sparking and possibility of fire in event of a gas leak. Very good grounds have been made by burying several lengths of galvanized chicken-wire fencing a few inches underground, and then keeping the ground wet down quite well. (Note 1.)

#### Transmitting Apparatus

It has probably been the experience of a great many amateur radio operators that the consistent operation of the transmitting set is a matter in which a great many factors are involved. Blinking the neighbors' lights results in the power company getting "ruffled up", and buzzing the neighborhood phones rouses the ire of the telephone company. Often one's own family objects to being kept awake by the spark, to say nothing of the neighbors' views on this breach of etiquette. Those difficulties obviated, troubles develop elsewhere. Condensers shoot out or the rotary motor gets a kick-back and burns a field open, or maybe the key gets all "het" up and sticks, or the contact points get loose. These troubles can pretty nearly always be remedied or obviated entirely by the proper choice and layout of apparatus, and the use of protective equipment.

#### The Transformer

If a man builds a transformer because it seems cheaper than to buy one, he is quite likely to skimp on materials to make it still cheaper. Very few amateurs are competent to design and build transformers. Usually due to poor design they draw excessive current, and frequently they have poor or insufficient insulation between the primary and secondary windings, leading

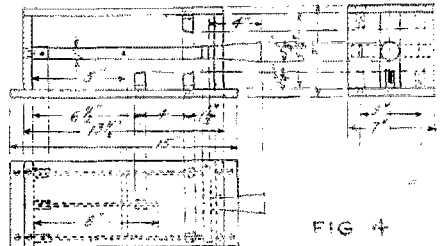


FIG. 4



eventually to leakage and breakdown. Home made transformers very often cause the power and telephone companies considerable trouble, and incidentally the owner also.

on the best condenser, to say nothing of what they do to a poor condenser. Such voltage further necessitates exceptionally good insulation of the spark gap, and all conductors of the oscillatory circuits. They also result in abnormally high voltage on the aerial, causing it to brush and lose a great amount of energy. Secondary voltages of 5000 to 10000 have been found entirely satisfactory in the case of the non-resonant type of transformer. (Note 2.)

**Protective Apparatus**

In the leads from the transformer secondary to the condenser there should be reactance or choke coils, to prevent high frequency currents getting back into the transformer. Across the primary terminals of the transformer there should be connected two 1 MFD. telephone condensers in series, with the center or common connection grounded. In addition to this there should be spark gaps from each side of the circuit to ground. This protection is to bleed off to ground any high frequency current caused by induced potentials of high frequency in the transformer. Such protection has generally been found very effective.

**The Condenser**

This piece of apparatus is probably the most troublesome of all to contemplate. It is no doubt less understood by the average amateur than any other part of the apparatus. Dielectric strength of a material should not be confused with its insulating property. Many good insulating materials are poor dielectrics. The property of a material of being able to store an electro-static charge is probably by reason of its peculiar molecular make-up. The charge, no doubt, disarranges the molecules, which are held in a state of strain or tension, and the discharge is caused by the reaction, when they resume their original arrangement. A great many insulating materials simply do not have the proper physical make-up.

Of all dielectrics, glass and mica are the best. Good glass is easier to obtain than good mica, and is much cheaper. A condenser develops a certain amount of heat, the same as any power consuming device; therefore provision should be made for properly cooling it. For this reason, regardless of the dielectric material, the plates should not be stacked together in a solid pack, but rather separated appreciably to allow for the circulation of the cooling medium. This is not done in the moulded condenser, and is probably the reason why so many of those units fail.

The accompanying drawing (Fig. 3) gives data and dimensions of a very reliable glass plate condenser to work under oil. It is of sufficient capacity, about .01 MFD., for a 1 KW installation, and good

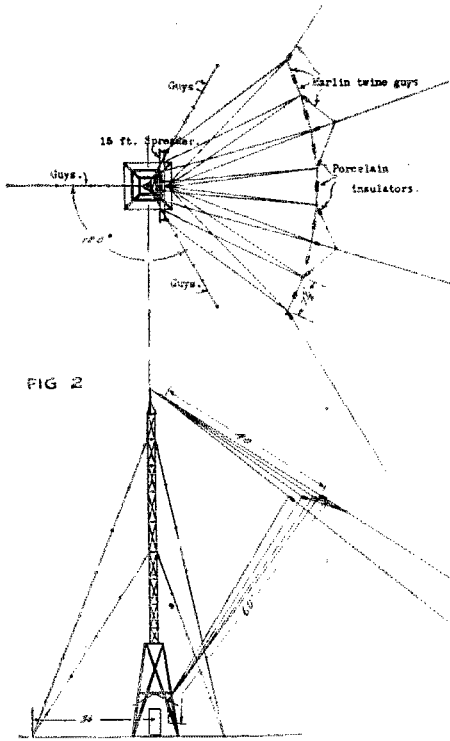


FIG 2

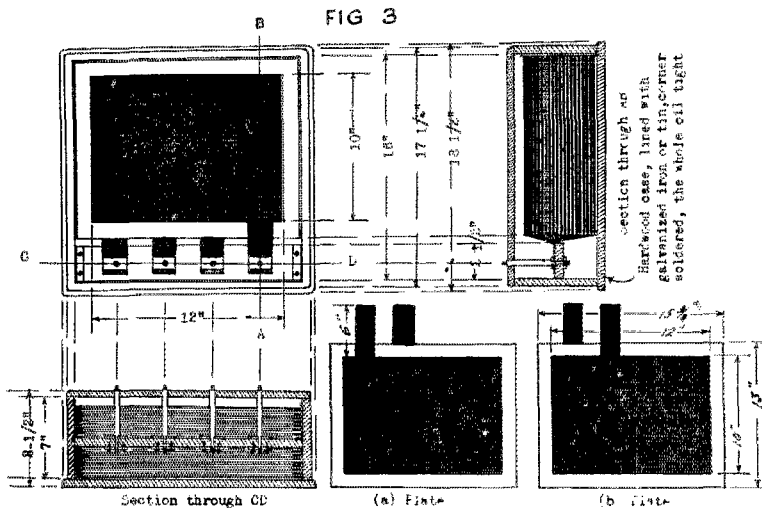
The better idea is to buy one of the reliable make of transformers on the market. It would be commendable of the manufacturers if they made these transformers with two-coil primaries, so that they could be used in multiple on 110 volts or in series on 220 volts. In the case of a 1KW installation, the power companies would very likely be more consentient to running in a third wire, and changing the meter for three wire 220/110 service, than to hang a separate transformer for a special 110 volt circuit, which would require a separate meter also. Naturally a given transformer working on 220 volts draws only half the current that it would on 110 volts; consequently the lights would be affected only slightly, and the duty on the sending key would not be nearly so severe.

A closed core transformer of the non-resonant type is undoubtedly the best, as this type of transformer will hold up their voltage under load, and consequently work very satisfactorily over quite a range of spark frequencies. The high voltages of 20000 and thereabout are not at all essential. They only inflict a punishment

for voltages up to 20,000 or more. First a galvanized iron or tin tank should be made, to fit snugly into a stout wooden box, of inside dimensions 16" x 16" x 7". Twenty one pieces of clear double strength window glass, which is about  $\frac{3}{8}$ " thick, should be selected and cut to size, 13" x 15 $\frac{1}{4}$ ". Cut also 40 strips 1" x 13" to serve as separators. The plates should be thoroughly cleaned and dried. Forty pieces of tinfoil should then be cut to size, 10" x 12". Cut also forty strips  $1\frac{1}{4}$ " x 10", these to serve as leads to the terminals.

Give one plate at a time a coat of white shellac, and allow this to very nearly dry, when the strips should be placed as shown, one on each side, with the 6 inches projecting over the edge. Then immediately

the side opposite the terminal board. Then place two of the glass strips on this, along each end of the plate. Upon these strips place one of the (a) plates, bringing the leads up on top of the terminal block. Then place two more of the glass strips as before and add a (b) plate. Proceed thus alternating (a) and (b) plates, until ten plates are in position. The last plate will be a (b), with separating strips along the ends of it. Now reverse a (b) plate end for end and place it in position next to the other (b) plate. Now add an (a) plate reversed, and proceed thus, alternating (b) and (a) plates, reversed as mentioned, until the ten are in place. The terminals may now be screwed in place, clamping the leads together tightly against



apply a sheet of tinfoil to each side, placing them centrally on the plate, and brushing all air bubbles out along the edge as applied. Now apply a coat of shellac all over, excepting on the leads, and place in a warm oven till the shellac is thoroughly dry. Twenty plates should be thus prepared, being exceedingly careful not to tear any of the leads.

Attention is called to the fact that the leads are not placed the same on all plates, for the reason that when assembled, the adjacent metallic surfaces must be of the same potential. The oil is used merely as an insulating and cooling agent, and not as a dielectric. Ten plates are made up with leads as shown in (a) and ten as in (b), in Fig. 3. Before assembling the condenser, a terminal block should be made of wood and fastened firmly in the position shown, by soldering metal angles to the side of the tank. To assemble the condenser, place the extra glass plate directly on the bottom of the tank, against

the block. The terminals may be of  $\frac{1}{4}$ " brass rod turned down on both ends and threaded 8/32, and insulated with a piece of rubber tubing slipped down over them. The metal plate under the terminal board should be threaded and fastened to the terminal board so that it will always be held in place properly, with no chance of working loose and falling into the tank.

The condenser should now be filled with oil, which should be done slowly, first tilting the terminal side up considerably to allow the air to issue out from between the plates as the oil rises, thus preventing any air being trapped between plates. The condenser should not be filled with oil until it is placed in its permanent resting place, as it is very heavy and awkward to handle after being filled. A cover should be provided, as well as binding posts for the terminals. It will be evident that on connecting the two adjacent terminals together and the others across the transformer, we are working the two sections in series, and

that as all adjacent metallic surfaces are of the same potential at a given instant, there will be no tendency for sparking across through the oil. Such a condenser as this has been in service for a number of years, and used in that time on several transformers, with entire satisfaction, having a very great safety factor. (Note 3.)

(Concluded next issue)

**Comment**

Note 1: We must say, as we did regarding Mr. Mathews' article, that we cannot agree with the author that he describes an ideal ground, and again we would recommend a "Round's round ground" or, failing that, a symmetrical

arrangement of buried radial wires or a radial counterpoise.

Note 2: We feel that the ideal transmitter should have the greatest possible range for 1 k.w. input, and of course the higher the voltage the more the power that can be stored in a given condenser. In our opinion, then, higher voltages than Mr. Denny recommends are desirable for average amateur operation.

Note 3: The 1/4" brass rod terminals shown in the design do not impress us as ideal. We think there should be more surface. It will be apparent that the design will permit the use of 1 1/4" ribbon for terminals, instead of the small rod, and this former we certainly recommend. —Editor.

# A Radiophone Employing A.C. and a Chemical Rectifier

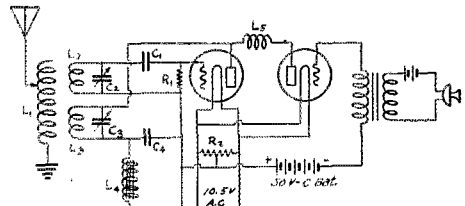
By H. E. Bussey, 4A1

**T**HE owner of the apparatus to be described had for several years experimented with spark radio transmission but, realizing the many advantages of tube transmission and being in possession of a few 50 watt tubes, decided to try out this phase of radio.

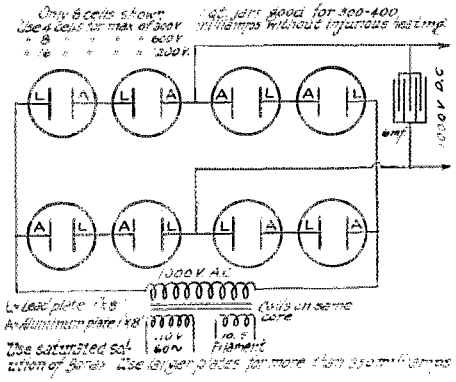
At the time experiments were started, little information of value could be obtained on circuits and circuit constants for best results, and a large amount of, what was to me, original work had to be done. This description is not offered as a model, or a theoretically correct solution of the problem, but sets forth the practical work done.

I had the tubes but no inductance or source of plate voltage. A generator was out of the question as a 1000 volt 100 watt generator was too expensive. I had a fair aerial and had done in excess of

1000 miles on 700 watts input with 60 cycle non-synchronous spark transmission. The aerial was poorly located and its capacity to surrounding objects too high and its dimensions not all that could be desired. It consisted of 4 wire flat top 63 feet long, about 35 feet high, its natural period



L<sub>1</sub> - 3 turns #16 litz on 2 1/2" O.D. tube, 5 single-turn taps  
 L<sub>2</sub> - 20 turns #16 litz on 2 1/2" O.D. tube, no taps  
 L<sub>3</sub> - 2 henry iron core choke  
 L<sub>4</sub> - 400 turn honey comb coil  
 C<sub>1</sub> - .002 M.F. cond. - C<sub>2</sub> - C<sub>3</sub> - .001 variables C<sub>4</sub> - .002 cond.  
 All inductances in radio circuits closely coupled, set L<sub>1</sub> for proper wave length then tune grid and plate circuit with C<sub>2</sub> + C<sub>3</sub>.



1000 V AC  
 100V filament  
 10.5V AC  
 Use larger plates for more than 60 mfd. capacity

being 162 meters. A counterpoise ground was used consisting of wire netting of an area about twice as great as the aerial flat-top. The counterpoise was used because the ground resistance in this section is unusually high, the city water pipes giving a resistance of 125 ohms at 110 volts 60 cycle A.C. by three-ground elimination method.

The first problem of plate supply was solved by the use of a 24-jar chemical rectifier. I foresaw plenty of trouble with this, but over a years' operation has not developed any. 110 volt 60 cycle power supply is used and, to smooth out, a condenser bank of 6 mfd. is used. The A.C.

hum is very slight, and while it can be heard when not speaking into transmitter, it does not in the least interfere with speech.

The rectifier is made up of 24 quart jars. The electrodes are of lead and aluminum, each electrode 1" wide by 8" long, supported 1" apart. The electrolyte is a saturated solution of borax.

Filaments are lighted by A.C. from a winding on same core as used to step up 110 volts to 1000 for the rectifier.

Many circuits were tried and the choice narrowed down to the one indicated as

being the best under my conditions.

With one 50 watt tube, the antenna current is 3.3 amperes, and CW telegraphy has been reported at 700 miles—readable 6 feet from phones—with 2 stages. Phone and buzzer-modulated have been heard QSA at 350 miles, but modulation is not as large a percentage as it will be later with an improved modulation scheme.

The accompanying sketches illustrate rectifier arrangement, also oscillation and modulation circuits, and with their legends will convey the necessary details of construction.

## The Radio Work of the Dept. of Commerce

By J. H. Dellinger, Ph. D.

Chief of Radio Laboratory, Bureau of Standards.

All of us should be informed on the activities of those departments of our government charged with the development and administration of civilian radio. In this article, written especially for QST, Dr. Dellinger tells in interesting fashion of the work of the Inspection Service and the Bureau of Standards. The Editor particularly asks the attention of A.R.R.L. members to the extent to which these branches of our government are shown to be handicapped by lack of funds, and after reading this article you are requested to read the Editorial in this issue entitled "Friends of Ours."  
—Editor.

**S**INCE 1911, when regulation of radio communication was begun by the Department of Commerce, radio has undergone a wonderful development.

The apparatus used has been changed, the methods have been greatly improved, and radio methods have become indispensable in marine and aerial navigation, in commerce, transportation, and the dissemination of information. The Atlantic has been spanned by the human voice, not only in a high power demonstration specially prepared by the joint efforts of the most powerful naval and commercial communication organizations of the world, but such a feat has also been reported in the ordinary working of the private amateur.

The technical progress and increasing scope of radio has required increasing activity in the Department of Commerce. Indeed the resources of the Department are at present inadequate to do justice to the work which it is called upon to perform. The two Bureaus principally concerned are the Bureau of Navigation and the Bureau of Standards. Because radio, in its beginning, was principally used to insure safety of vessels at sea, the administration of the radio laws was placed under the Bureau of Navigation, which supervises safety and other matters pertaining to ships.

The Bureau of Navigation inspects ship radio installations, issues station and operator licenses, and enforces the provisions of the radio laws, international conventions, and Department regulations. The Bureau of Standards is the technical

branch of the Department in radio, and assists the Bureau of Navigation in its inspection and other work with technical information, instruments and methods for measurements, and conducts special investigations on problems that arise in the course of law enforcement.

Most of the radio and other work of the Bureau of Standards is directly for the public. A considerable part of the work of the radio laboratory is of interest to the amateur. Broadly, the work includes radio research, engineering, standardization of apparatus, a certain incidental amount of operating, and the preparation of technical information.

The radio laboratory is housed in a two-story laboratory building, adjacent to the electrical building of the Bureau. This building is devoted exclusively to radio work. The Bureau laboratory occupies the upper floor, the lower floor being the location of research laboratories of the Navy Department and the Signal Corps.

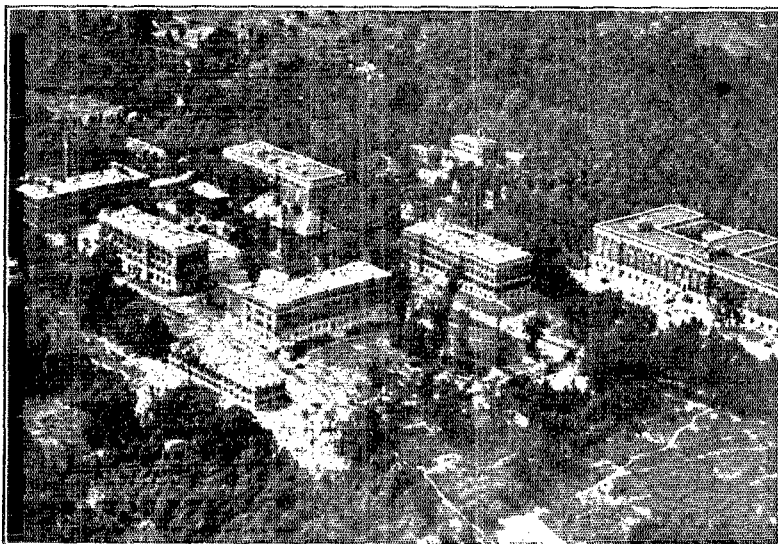
Standards are established and improvements made in the accuracy of standardization of frequency (wave length), capacity, inductance, and resistance, all at radio frequencies. The radio laboratory assists in the standardization of definitions for radio terms, symbols for radio instruments and apparatus, and endeavors to keep an up-to-date file of standard definitions, abbreviations, etc. A comprehensive reference list (now containing about 10,000 references) is maintained and kept up to date by the examination of current periodical and other radio literature. A detailed

radio subject classification has been devised and is used in the filing of references and other information. In these ways and by reports, publications, etc., the laboratory serves as a clearing-house for radio information.

The Bureau's research work is largely on fundamental principles and methods of measurement in such fields as radio waves, antennas, electron tubes and amplifiers, high-frequency telephony, radio instruments, and properties of materials. The work on antennas includes studies of coil antennas, condenser antennas, and other types, to determine the basis of correct design of an antenna for any particular purpose. One object of such work is to secure enough data about antennas so that

proved wire telephony, has been one of the principal objects of research in the Bureau radio laboratory. The work on this includes the measurement of properties of various types of tubes and the relation of these properties to performance as generators, detectors, and amplifiers of alternating currents. Special methods of measurement are developed for this work, and standard tubes prepared. Among the principal applications of electron tubes are radio telephony and high-frequency wire telephony. The various circuits and methods are studied, including novel methods.

The Bureau co-operates in radio research and does radio engineering work for a considerable number of other



AIRPLANE VIEW OF THE BUREAU OF STANDARDS

it will be possible to predetermine received current when transmitting current and distance are known. This is closely related with the research work on radio waves.

A good example of research on radio wave phenomena is the study of fading, made jointly by the American Radio Relay League and the Bureau. The nature of the subject studied made large-scale tests of this kind very much more valuable than any work which the Bureau could do unaided. The data secured are most valuable, and supplement satisfactorily theoretical studies made by the Bureau. The understanding of fading and also of strays and other radio transmission phenomena is materially advanced as a result of these tests.

The electron tube, which has revolutionized radio communication and greatly im-

proved wire telephony, has been one of the principal objects of research in the Bureau radio laboratory. The work on this includes the measurement of properties of various types of tubes and the relation of these properties to performance as generators, detectors, and amplifiers of alternating currents. Special methods of measurement are developed for this work, and standard tubes prepared. Among the principal applications of electron tubes are radio telephony and high-frequency wire telephony. The various circuits and methods are studied, including novel methods.

The Bureau co-operates in radio research and does radio engineering work for a considerable number of other

our coasts when the Bureau of Lighthouses secures funds for the purpose.

The work of the Bureau of Navigation is carried on mainly through the radio inspectors, there being one in each radio district with assistant inspectors in some districts. The offices of the inspectors are at Boston, New York, Baltimore, New Orleans, San Francisco, Seattle, Detroit, and Chicago. One of their first duties is the inspection of radio apparatus on ships. During the last fiscal year they made 5400 inspections of ship radio apparatus, resulting in the discovery of over 800 defects in apparatus. In many cases they assisted and instructed operators in the proper care and use of the radio equipment.

The inspectors' duties are by no means limited to ship inspections. They examine prospective operators and issue licenses. In the year preceding July 1, 1920, about 5000 commercial operators' licenses were issued, three times as many as during any previous year. This was not the total number of applicants examined; over 3000 applicants failed to pass the examinations, showing that a high standard of skill was maintained in the granting of licenses. During the same period over 6000 amateur first and second grade licenses were issued. This kind of work continues to increase; thus over 1000 amateur licenses were issued in February, 1921, and still more in March. The examination and licensing of stations also keeps pace with the increasing task of licensing operators.

The radio laws require the Department of Commerce to enforce all laws, regulations, and international conventions ratified by the U. S. relating to radio. Outside of the licensing and ship inspection work mentioned, the Department has been able to do relatively little with the small force at its disposal. There are many provisions of the laws, notably the requirements as to wave length and decrement, which the Department should be able to enforce more actively. To be sure, the Department has received excellent co-operation from the radio fraternity generally, but the radio inspection force should be adequate to assist people to comply with the law and cope with such offenders as do exist.

As far as the amateurs are concerned, particularly whole-hearted co-operation has been the rule. The amateurs seem to appreciate that the Department has always had their interests in mind. They have even come forward with plans for policing themselves. Such a plan has had particular success in the Chicago area, and it may well be extended widely.

The necessary provisions to insure adequate administration of the radio laws include increases in the number and in the qualifications of inspectors and in the

equipment at their disposal. In one district one inspector, single handed, has jurisdiction over one quarter of the United States; he has more than he can do to keep up with the routine of licensing and certainly can not undertake inspection of existing stations. Not only must more inspectors be provided but the Department must be able to hold good men when they are obtained. The low salary paid the inspectors is notorious among radio men and most of the experienced inspectors have naturally left the service.

The inspectors must have a certain amount of modern equipment if they are even to attempt to enforce the laws. Each inspector should have a well designed direction finder and receiving outfit to assist in locating offenders. To make the examination of operators more practical, and for other purposes, the inspector should have a radio transmitting set. For the inspection work now being done, it is imperative that the inspectors' measuring instruments be extended to cover the long wave lengths and very small decrements now used.

In the technical laboratory work done at the Bureau of Standards as well as in the field and inspection work done by the Bureau of Navigation, the Department needs increased support for its radio work. The work of the radio laboratory has been in part carried on by allotments of funds from other departments. Such allotments cannot be continued because of reductions in the other departments' appropriations and the result is that the money available for carrying on the Bureau of Standards' radio work this year is half of what it was two years ago, and the sum appropriated for the next fiscal year is only a third. This is especially regrettable at a time when the Bureau is receiving more calls for service along radio lines than ever before, and when the use and importance of radio generally is so rapidly advancing.

The increased appropriation necessary to perform the radio inspection and licensing work more adequately has been requested by the chief of the Bureau of Navigation in his annual report. Additional funds have also been asked for the Bureau of Standards. The general necessity of economy, however, by which Congress is confronted may result in refusal of these requests. Unless the appropriations are adequate it is obvious that the Department's radio work can not be performed properly.

The progress in radio communication has rendered many provisions of the radio laws and of the 1912 London Radiotelegraphic Convention unsuitable to modern radio practice. The Department of Commerce is working actively with a

view to changes in the fundamental laws and agreements, both national and international, to accord with the latest developments. The Department had a representative in Paris last year, attending a preliminary international conference, which prepared a protocol or report that is already influencing practice in the choice of wave lengths, in the classification of modern types of radio systems, etc. The Department subsequently appointed a com-

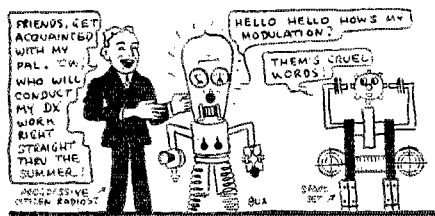
mittee representing American radio interests, which prepared valuable modifications of the protocol. Legislation is also being prepared which eliminates obsolete features in the present radio law and provides for keeping the radio administration up to date. In all of its work, the continued interest of the radio men of the country, including the amateurs, will be of the greatest assistance to the Department.

## Coming---The Static-Puncturing Contest!

COME on, you fellows who have packed your sets away for the summer. Come on and get in line with the rest of the gang and take part in our big summer QRN puncturing contest. We are going to try to knock this old buzzard QRN into a cocked hat, and to do that successfully we need all the help we can get. We want every A.R.R.L. member and every other amateur who is interested in citizen wireless to get in on the fun. It will take quite a bit of hearty co-operation to put Old Man Static under the quilts, but by the Ever-Leaking Grid, we can and will do it! It makes no difference whether you operate a steen-step radio frequency amplifier or have a set consisting of a hunka coal with a safety pin for a holder and a bed spring for an aerial. Come on, everybody, and let's hit Old Man Static with a crash that will jar him loose from his nipperdrink.

The idea, in the main, is to settle once and for all the question whether or not C.W. will come thru when the spark falls down. You all remember the argument that makes every man wish he had never heard of spark gaps. Just you mention the high note vs. low note to some gap fanatic and then make your preparations for a hurried retreat if you don't care to hear what drove so many amateurs to sea, where the rotary spark gap is as free from mention as our straight C.W. is from decrement. The scheme, tentatively, is this: In each division of our organization we will have pairs of stations, consisting of the most powerful spark and C.W. transmitters in their respective classes, transmit a message for you to copy. At a specified time and on given wave lengths each station in turn will test for a few minutes so that you may tune your receivers to the respective waves of each transmitter. The preliminary test will take place on July 16th, and on July 19th the final messages will be broadcasted, a different message from each station transmitting. Now your part will be to copy every message from

every station, if you can. At any rate copy as much from each station as possible, which will be to your advantage. While you are copying, you must have at least two witnesses to your reception and their signatures must be affixed to your copy of each message. You may select your witnesses from the following list: mother, father, sister, brother, uncle, aunt, grandmother, grandfather, a blacksmith, clergyman, policeman, doctor, or lawyer. After the entire transmission is completed, determine in air-line miles the distance of each transmitter from your station. Then add



all the distances of the spark stations and C.W. stations together, which will give you a grand total of air-line miles. The man having the greatest number of miles to his credit wins the contest. The winner will be asked to furnish a photograph of himself and a description of the receiving equipment with which he won the contest. Other men with big scores will be given honorable mention in QST. Mail your records to A.R.R.L. Headquarters, 1045 Main Street, Hartford, Conn.

We are going to have two nights of real fun and you should not miss it. Watch July QST for the whole story and how you can join the gang in this contest of good receivers. We will find out who is the best receiver thru Old Man QRN. This will be the first time that we have attempted anything like it right when Old Man Static is at his peak, and we are going to "get" that peak.

## Results of Washington's Birthday Relay

By W. H. Kirwan, *Content Manager*

**O**N the night of Feb. 21st the biggest free-for-all relay was run thruout the United States and Canada. An actual count of the answers received showed that over 7240 amateurs sent in reports. The message was one from Mr. Harding, now President Harding. It consisted of 30 words and 14 of them came thru from the Atlantic Coast in great shape, 14 from the Pacific Coast in better shape, and the other two words were easily copied from the middle west.

Complete correct message: "May the spirit of Washington be our guide in all our national aspirations and may the current year mark the return of tranquility, stability, confidence and progress thruout entire world."

Fourteen of these words, representing the first, third, fifth, etc., were sent from the Atlantic Coast; fourteen representing the second, fourth sixth, etc., came from the Pacific Coast, and the remaining two from the Mississippi Valley. Some perfectly wonderful receiving was done and some real records made and as a whole it was a very creditable performance of the real amateur body. If this magazine were large enough it would publish names of all those who participated, but we don't believe that it would be interesting. As far as getting the message across the country was concerned, no trouble was experienced; but the fact remains that without, say, about six stations, the relay would have been a failure, particularly in the east where there was the most noticeable QRM, QRN, QSS. These stations are NSF, 8XK, 9ZN, 9LR, 5YH, and a few others. Nearly all the reports show that sigs. were hard to read and the boys waited until either one or the other of these stations sent in order to check up the msg. A slip-up occurred somewhere between 9LR and 8XK of one word only and even NSF, who could not do otherwise, sent the word as they received it. This caused a lot of stations to get one word incorrectly and naturally marked for the error, as there was no other way to do it.

### Incidents of the Relay

Hertz of Washington State, who was to send the relay east, got into trouble at the last minute, but we had him covered by 7YS, St. Martin's College, Lacey, Wash., who sert in his stead. Bessey of Sunnyvale, Calif., who was to start the MSG. east from Calif., went fishing and forgot it, but was located thru our frantic efforts

and put the southbound MSG. thru in great shape.

Personally I want to thank each and every one that helped in this relay for their most wonderful assistance and co-operation. I do not believe that there is in this world a body of men or boys that works closer together for the common cause, than our amateur radio workers.

H. P. Maxim's station in Hartford, Conn., started the west-bound MSG. and was considerably handicapped by local QRM but his sigs were clearly read in the middle west as the report shows.

No attempt was made by the writer to notify anybody to keep real quiet as the conditions were wanted real bad so that only the real hard workers would get the msg. and those without the real experience would have lots of trouble. This was just as it turned out, as some seem to think that all you have to do now is to stick a piece of wire in the air and tie a phone to it and listen in. This relay started some few thinking, you may be sure, and took some of the swelling out of others who can receive real well under good conditions. The reason that the relay results were not printed sooner, boys, is on account of the magazines wanting the story about two months before you get your magazine and after crawling thru about two tons of letters and sorting them, reading, checking, tabulating, marking, etc., I found that two months were gone.

### Results of Relay

Fourteen governors of as many states received this message from the amateurs, several of them being called out of bed to sign for it. A certain Catholic priest got the Governor of his state out of bed to sign for the message, and this governor, who lives in the south, thought it was a MSG. from the Night Riders. Our friend the priest told him, "No, it's the Night Radioers".

Two hundred and forty seven mayors of as many cities were disturbed at all hours to sign for the MSG. and did so like real fellows.

One enterprising amateur had the nerve to give to the then president Wilson at Washington a copy of Mr. Harding's msg. Thought that this was carrying out orders in great shape. Twenty-two U. S. senators, 35 state senators, over 500 Chiefs of Police, Selectmen, City Councilmen, Sheriffs, Postmasters and News Editors, received the msg. This was a most wonderful showing and some of the reports sent in were really masterpieces. Some made errors in time of sending stations, call letters, etc., and



will have a whole year to improve their receiving in order to get the next national msg. correctly. Some amateurs worked in pairs, but the results were only put in the name of the one to whom the receipt was given. Everyone in the U. S. engaged in the wireless business was solicited for prizes and willingly gave to the limit allowed, which was one prize only from each one. All the sending stations that helped in the relay have been sent a complete report of it by the writer and can tell easily who received their sigs and just how far they went under the bad conditions prevalent. The tabulated reports on the relay were submitted to the Prize Committee:—Dr. A. N. Goldsmith Institute of Radio Engineers; Mr. E. H. Armstrong, of Yonkers, New York, whom you all know; and Mr. Hiram Percy Maxim, President of the American Radio Relay League of Hartford, Conn. All three of them agreed on awarding the prizes on the basis of **SPEEDY AND CORRECT RECEPTION**, together with the marks for the perfect wireless report about the conditions. All of this figured down to miles per minute in receiving and delivering.

Very few of you will be able to comprehend the great amount of work in connection with this relay and I hope that the awards will meet with your approval and that you all will thank the many dealers who made the distribution of prizes possible. The first prize winners were consulted as to their pick of the prizes and the others awarded on the basis of their report marks and the relative value of the prizes. The prize winners are listed below without their addresses, which the writer has here, and to get your prize merely send a letter to W. H. Kirwan, Box 148, Davenport, Iowa, stating what prize you get and the writer will approve it and send it on to the donor of that prize. If anyone has any trouble getting their prize, merely drop another line and we will get you straightened out. All the possible advertising you can do with your prize please do, as it will show the real world who the co-operative dealer is that takes enough interest in the game to make the relays worth while. Do not judge the prizes by their value but from the fact that they are prizes.

As stated before the only lady in the United States who received the message correctly and made good time and turned in a good report was Miss Winnie Dow of Tacoma, Wash. I have not written to anyone yet about the prizes, as the magazine they read is the place to find out all about it. Lots of ladies sent in reports but a great many considered the report as a joke and their marks were likewise.

A certain man in the middle west sent in a report as a lady and used a lady's name, but a little wireless detecting soon found him out and we sent his report back to him to frame and show his children when he grew up, how he nearly won a prize—almost. The first prize is won by Leander L. Hoyt, of Haywood, Calif., whose report decided all the judges. Hoyt worked with Mr. S. D. Browning in his city and says that he also deserves credit. Mr. Hoyt also won in 1917 the Long Wave Chambers Coupler as fifth prize. Mr. Hoyt says nothing will satisfy his craving but the Clapp-Eastham ZRF Regenerative Receiver and when he complies with the request in the story we will see that he gets it and tells us all later how it works.

### A Testimonial

R. E. BRIGHAM  
Jeweler

Oneonta, New York

April 30th, 1921.

Mr. K. B. Warner, Sec.,  
Hartford, Conn.,

Dear Mr. Warner:

Check received in payment of the A.R.R.L. Certificate of Indebtedness which I held.

I wish to commend the management of QST which has made it possible to pay off the Bonds. I would have been satisfied if the money had not ever been paid back as the QST has grown so much better that I was sure the money was being well spent.

Yours very truly,  
(Signed) R. E. BRIGHAM.

### Prize Winners

- 1—Leander L. Hoyt, & friend, Hayward, Calif., Clapp Eastman ZRF Reg. Receiver.
- 2—Miss Winnie Dow, Tacoma, Wash., the Navy Type Tuner donated by Sears-Roebuck Co.
- 3—M. S. Andelin, Richfield, Utah—gets the Chicago Radio Lab. Zenith Regenerator.
- 4—N. Hood, Casper, Wyoming—gets the Grebe CR3A regenerative receiver.
- 5—D. I. Bailey, Clinton, Iowa—gets the Electric Specialty Co. ESCO Receiver.
- 6—H. Berringer, Burlingame, Calif., gets the 2-step Amplifier from Montgomery-Ward Co. This will help him to get even better signals from the east.
- 7—J. K. Hall, Washington, Penn.—gets the one-step Amplifier donated by the General Radio Co., Cambridge, Mass.
- 8—E. Statts, Sacramento, Cal.—1 Illinois watch—donated by the Illinois Watch Co., of Springfield, Ill.
- 9—V. McIlwaine, Auburn, Ala.—1 NSR-300 or 600 Rotary Gap—donated by Wireless Mfg. Co., Canton, Ohio.
- 10—R. McCommon, East Palestine, Ohio—1 Storage Battery—donated by Klaus Radio Co., Eureka, Ill.
- 11—Xenia Radio Club, Xenia, Ohio—1 \$50 Coupon for goods from catalog of the AMRAD, New York.
- 12—E. W. Wilson, Olympia, Wash.—1 Spider Web Inductance tuner—donated by E. Turney, Radio Hill, Holmes, N. Y.

- 13—D. A. Wheelow, Pierre, S. Dak.—1 Pair Lattice Variometers—donated by A. Hallbauer, Chicago, Ill.
- 14—G. Robinson, Richmond Va.—1 Antenna Switch—donated by Atlantic Radio Co., Boston, Mass.
- 15—J. E. Cain, Nashville, Tenn.—1 20,000 Meter Tuner—donated by TRESCO, Davenport, Ia.
- 16—S. Ruth, Lacey, Wash.—1 pair 50,000 ohm phones—donated by C. Brandes, Inc., New York.
- 17—Lowell Radio Club, Lowell, Mass.—1 CW 20B. Enclosed Gap—donated by Karlowa Radio Corporation, Rock Island, Ill.
- 18—J. Biekel, Whittier, Cal.—1 No. 14A Rotary Gap—donated by The Wilcox Laboratories, Lansing, Mich.
- 19—W. Arnold, Southbridge, Mass.—1 Pair Phones—donated by John Firth, Inc., New York.
- 20—W. Shoop, Vandergrift, Penna.—1 Pair of Brownie Phones—donated by John Firth & Co., New York.
- 21—R. Parker, Augusta, Maine—1 Pair No. 55 Phones—donated by W. J. Murdock Co., Chelsea, Mass.
- 22—E. Thatcher, Oberlin, Ohio—1 Acme 200 Watt, C.W. Transformer—donated by Acme Apparatus Co., Cambridge, Mass.
- 23—J. Coleman, Pittsburgh, Pa.—1 New Type Microphone for Radiophone—donated by Federal Tel. & Tel. Co., Buffalo, N. Y.
- 24—R. Willison, Portland, Ore.—1 No. 3 condenser with dial—donated by Chelsea Radio Co., Chelsea, Mass.
- 25—S. Ayer, Waterville, Maine—1 Radisco Coupler—donated by Radio Distributing Co., Newark, N. J.
- 26—R. Benning, Atlanta, Ga.—One quarter KVA Transformer—donated by Thordarson Elec. Mfg. Co., Chicago, Ill.
- 27—A. Klenner, Fairmount, West. Va.—1 Oscillation Transformer with clips—donated by Shotton Radio Mfg. Co., Scranton, Pa.
- 28—A. Selby, Boise, Idaho—1 R37 Tuner Set—donated by Signal Elec. Mfg. Co., Menominee, Mich.
- 29—G. Barnes, Stanbridge East, Quebec, Canada—1 No. 181 Inductance—donated by the C. D. Tuska Co., Hartford, Conn.
- 30—Major H. Stehen, St. John's, Canada—1 Pair of Brownie Phones.
- 31—Rev. Father Burns, Marshall, Texas—1 Pair of Brownie Phones.
- 32—B. Phelps, Minneapolis, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
- 33—J. Gjelhaug, Baudette, Minn.—1 O-5 Eldredge H.W. Meter—donated by J. Firth & Co.
- 34—F. Mahr, San Francisco, Calif.—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
- 35—J. Martin, Amarillo, Texas—1 O-1 Eldredge H.W. Meter—donated by J. Firth & Co.
- 36—Reizee Cos., Buffalo, N. Y.—1 O-3 Midget Advance Meter—donated by J. Firth & Co., N. Y.
- 37—J. Dewitt, Nashville, Tenn.—1 Pair Brownie Phones—donated by J. Firth & Co.
- 38—A. Lorimer, Montreal, Can.—1 Set honey-comb coils—donated by Coto-Coil Co., Providence, R. I.
- 39—C. Jones, Northfield, Vt.—1 No. 21 Variable grid Leak—donated by Chelsea Radio Co., Chelsea, Mass.
- 40—F. Fallain, Flint, Mich.—1 No. 182 Inductance—donated by C. D. Tuska Co.
- 41—E. Brack, Midville, Ga.—1 No. 41 Bakelite dial—donated by Chelsea Radio Co., Chelsea, Mass.
- Two following get one Connecticut Variable Condenser—donated by Conn. Tel. and Elec. Co., Meriden, Conn.:
- 42—O. Bowers, Marietta, Ohio.
- 43—J. Miller, Hammond, Ind.
- Each of following get a HV-200 bulb donated by the Radio Corp. of America. These bulbs may be had by writing direct to QST, Hartford, Conn., and explaining your wish:
- 44—M. Powell, Warren, Arizona.
- 45—D. Culbert, Warren, Arizona.
- 46—L. Runey, Belmont, Mass.
- 47—R. Taggart, Pasadena, Calif.
- 48—F. Weyerhauser, Pasadena, Calif.
- 49—K. Lloyd, Erie, Penna.
- Each of following gets a UV-301 bulb donated by Radio Corp. of America by writing to QST., Hartford, Conn.:
- 50—T. Banks, Williamstown, Mass.
- 51—H. Brewer, Emeryville, Calif.
- 52—A. E. Bessey, Sunnyvale, Calif.
- 53—T. House, Dublin, Texas.
- 54—M. Apple, McKinney, Texas.
- 55—R. Stott, Douglas, Arizona.
- Following get a bulb from the Audiotron Mfg. Co., through E. T. Cunningham, San Francisco:
- 56—L. Peine, Houston, Texas, 1 C-301. The writer has these bulbs at Davenport, Ia.
- 57—G. Riddell, Sheboygan, Wis.
- The following get a yearly subscription to the "Pacific Radio News" of Frisco.:
- 58—C. Lundquist, Winfield, Iowa.
- 59—H. Dunn, Oxford, Ohio.
- 60—R. Brigham, Oneonta, N. Y.
- 61—J. Kolb, Louisville, Ky.
- 62—H. Sars, Ambridge, Penna.
- 63—J. Copeland, Ashland, Ohio.
- 64—R. Winchester, Syracuse, N. Y.
- 65—P. Harnegules, Rapid City, S. D.
- 66—L. Mathias, Antigo, Wis.
- 67—W. C. Bridges, Superior, Wis.
- The following get a one year's subscription to "Radio News" of New York:
- 68—F. Breene, Iowa City, Iowa.
- 69—E. Beardmon, Glasco, Kansas.
- 70—J. Imsdahl, Pitt, Minn.
- 71—D. L. Custon, Gainesville, Ga.
- 72—M. Koupal, Eugene, Oregon.
- The following get a one year's subscription to "QST," of Hartford, Conn.:
- 73—A. Welch, Gardiner, Maine.
- 74—G. Turner, Independence, Mo.
- 75—M. Flynn, Madison, Maine.
- 76—F. Miller, Emporia, Kas.
- 77—W. Harris, Marshfield, Oregon.
- 78—E. Anderson, Marshfield, Ore.—2-year subscription to "Radio Topics" of Chicago.

### Notes on Relay

Everybody interested in this relay claimed that it was real sport, instructive and very interesting, and gave the boys a chance to do some real long distance work at least once a year. It also brings to the attention of the public the wonderful strides made in citizen radio, thereby helping the game.

For a prize to repay the writer for all the hard work and money spent on this relay the Prize Committee were unanimous in stating that the prize would be given in RADIO HEAVEN, wherever that may be. Hope the static is not bad, at least.

Hundreds of amateurs thruout the U. S. and Canada have requested that Washington's Birthday be set aside as a National Relay for the amateurs and that all the amateurs would stand by for one big relay once each year. Have been appointed chief of these relays by at least 500 who probably mean well but don't know that the writer is getting old and each relay has added another handful of grey hair on the back and removed the same amount from the front of my head. Let's have some opinions, anyway, about this National Relay so that irrespective of color, creed, or previous servitude, all may join in once a year at least in a free-for-all contest.

## Amateurs Wanted to Join Signal Reserve Corps

IT will be of interest to amateur radio operators throughout the United States to know that the War Department, thru the Chief Signal Officer of the Army, is now making arrangements for the training of amateur radio operators and devising plans for their service should the Nation need them in an emergency.

The proposed plans provide for the recognition of organizations of amateurs within each Army Corps Area. The headquarters of these various Army Corps Areas are as follows:

Headquarters 1st Corps Area—

99 Chauncey St., Boston, Massachusetts

Headquarters 2nd Corps Area—

39 Whitehall St., New York City

Headquarters 3rd Corps Area—

Fort Howard, Md. (Near Baltimore)

Headquarters 4th Corps Area—

Fort McPherson, Ga. (Near Atlanta)

Headquarters 5th Corps Area—

Fort Benjamin Harrison, Indiana  
(Near Indianapolis)

Headquarters 6th Corps Area—

Fort Sheridan, Ill. (Near Chicago)

Headquarters 7th Corps Area—

Fort Crook, Nebr. (Near Omaha)

Headquarters 8th Corps Area—

Fort Sam Houston, San Antonio, Texas

Headquarters 9th Corps Area—

Presidio, San Francisco, California

At each of the headquarters there is to be established a transmitting radio station with a range sufficiently great to cover the entire Corps Area, and also a receiving set.

Courses of instruction will be prepared and sent out by radio and by mail. Questions will be received and answered.

The amateur radio personnel will be formally inducted into the Signal Reserve Corps and called to active service where practicable for approximately two weeks' camp during the summer.

We believe this plan will produce results of far-reaching importance. Interested amateurs are requested to communicate at once with their proper Corps Area headquarters.

## A Suggestion

THE following communication has been received at A.R.R.L. Headquarters and is published for comment:

Say Son, may I make a suggestion? I've been chewing it over for some months.

Some of us would like to listen to the Sixth and Seventh Districts once in a while. Maybe we can get across to them in one hop some night. It cannot be done now on account of the DX QRM. Most of the latter comes pouring out of the Second and Third Districts. What ails those ginks over East anyway? The way they roar and beller is something scandalous. Have they found a way to push more energy into a watt or what is it? But anyway, what I want to suggest is that we have some quiet hours. What's the harm of having some quiet once in a while? It wouldn't hurt anybody. If we who live in the eastern half of the country would all QRX for an hour or so twice a week and if those who live in the western half would do the same a couple of other nights there would be some new and interesting records established. Your Uncle thinks it would not be long before some of the wise ones would arrange schedules and you would soon see traffic going across from coast to coast in one hop.

What's the matter with making it Tuesday and Thursday nights in the eastern half of the country, say between eleven and one Central Time? And then make it Wednesday and Friday nights in the western half between eight and ten Pacific Time. Every Hooligan who broke the rule and did any transmitting during the quiet hours, to be taken out at sunrise and boiled in transformer oil until he is rendered pliable.

The Old Man.

What does the Gang say, fellows? Shall we have them or not? Is it worth the effort? Is the majority willing to stand by for the general good so that some records may be established? We want to hear from A.R.R.L. members on this, and if the decision is in favor of having listening hours our Operating Department will dope out a plan and launch it this summer so that it will be in full operation and a recognized thing by fall weather.

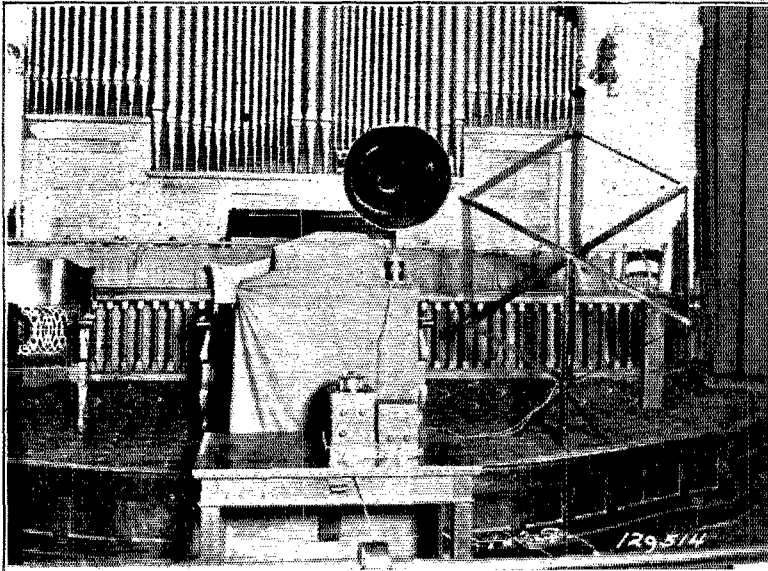
## We Are Paying Our Bonds

THE A.R.R.L. Certificates of Indebtedness were called for payment as of May 1st. Not all of them have been turned in. Notice is hereby given to all parties holding such bonds to return them at once for payment. If not turned in within ninety days from their maturity the A.R.R.L. cannot accept responsibility for their payment, nor can payment be made in any case unless the original certificate is surrendered.

K. B. WARNER, *Secretary.*

## The Invisible Minister

FOR the first time, as far as known, wireless telephony has been used to transmit services from one church to another in order that a congregation without a regular pastor could have the benefits of Sunday evening worship. The churches involved are the Calvary Episcopal and the Herron Avenue Presbyterian, both of Pittsburgh, Pennsylvania.



During a period of months the Sunday evening services of the Calvary Episcopal Church have been broadcasted from KDKA in East Pittsburgh, Pennsylvania. These services have been eagerly awaited by radio amateurs all over the United States.

The Herron Avenue congregation has been without the services of a regular pastor for some time, being forced by circumstances to use any substitute available. One or two of the congregation being wireless enthusiasts got in touch with the Westinghouse Company, requesting it to install a small receiving outfit in the church in order that the members could hear the Calvary services. This was done and a compact set consisting of a loop antenna, amplifier and condenser was placed upon the rostrum in front of the pulpit, as shown in our photograph. The loud-speaking horn rested directly on the pulpit.

An expectant throng filled the church and were not disappointed for the voices and music of the Calvary choir, rector and organ were received clearly and distinctly. In spite of the difference between Episcopal and Presbyterian services, the latter congregation followed the pastor in the

former throughout. Even during the offertory hymn, contributions were accepted. During the sermon of the Calvary rector, intense interest was maintained at the Herron Avenue church so clearly and distinctly was the message received.

It is hard to say just what demonstrations like this will lead to, but certainly it proves the great flexibility of wireless telephony. There may be in the future a central pastor who will talk to thousands

of congregations situated in all parts of the world, but this may take time. The idea is not far-fetched by any means, as the transmitting of the Calvary services proves.

## Tubes Without Filaments

WONDERS never cease—in radio! A new and startling idea has been developed by two prominent radio engineers, Mr. C. G. Smith and Dr. V. Bush, of the Amrad research staff at Medford Hillside, Mass., in the shape of a new type of audion that will rectify, oscillate, amplify, and otherwise perform the work of modern three-electrode vacuum tubes, all without a filament. The tube was displayed and explained at a recent meeting of the Boston Section of the I. R. E. and we presume the paper delivered there will soon be available to the radio public in the Institute's Proceedings. As yet QST has only bare details of the "S-tube", as it is called, but we are asked to imagine a couple of metallic salt-shakers as used in any household, separated by a distance equal

(Concluded on page 52)

# EDITORIALS

## de AMERICAN RADIO RELAY LEAGUE



### Friends of Ours

**I**F we are good Americans and love our radio we ought to rise up on our hind legs and do something about the Department of Commerce appropriations. It is something we have worried about for a long time. When we read Dr. Dellinger's fine article in this issue and realize that the Bureau of Standards and the Bureau of Navigation are among the most important bureaus of our Government, it rouses us to action. It is a shame that they should be limited so pitifully as to money that they are unable to properly carry out the duties imposed upon them by law. They are both good friends of ours and what hurts them hurts us. The conditions in the Radio Inspection service are notorious and have been so for a long time. With the money that has been doled out it has been absolutely impossible to carry out the inspection work either of ships or amateurs. This ought not to be and it spells trouble later on. The service will lose its splendid *esprit de corps*, and the first thing we know it will degenerate into something which will not be pleasant to have around. It seems hard to understand why Congress will go on wasting money on some branches of the Government and allow such fine things as the Radio Inspection Service and the Bureau of Standards to go hang. In one breath we hear about the grand things the Government is going to do and in the next we see the most vital bureaus cut down in their money allotments until there is not enough to pay for stenographers to write necessary letters let alone perform the duties specified in the law.

It is a public disgrace in the case of the Bureau of Standards. Here is the one truly efficient and disinterested place in America where a citizen can go for technical assistance. It is the one place also where business concerns may go for disinterested help in technical matters. And the appropriations have been so cut that they can no longer keep their organizations together. The word has gone forth to prune expenditures and instead of applying the knife to places using thirty and forty percent of the public funds the knife is taken to the Department of Commerce which uses only a very few percent. If the whole blooming Department were

thrown overboard it would not save an appreciable amount. The Government spends on silly partisan investigation as much as would run ten Inspection Services and Bureaus of Standards. It spends on printing and distributing hog-wash which no one even pretends to read all that would be needed to enable the Inspection Service and the Bureau of Standards to properly function to the benefit of millions of citizens. It spends upon tours of inspection of certain committees all the money needed to maintain ten times the *esprit de corps* of the Inspection Service and to maintain several of the organizations at the Bureau of Standards. It may be argued that we are a great nation and we can afford to enjoy ourselves with petty partisan investigations, and the printing and distribution of congressional hot air and the sending of committees on tours of inspection. Maybe we can, but it seems to us that if we afford these things then by the gods we can also afford to have a Radio Inspection Service and a Bureau of Standards. Our Board of Direction will be asked to take this matter up at its next meeting if we live.

### The Aurora

**I**N middle May this little old globe of ours was the victim of a magnetic storm which for many hours and in some cases days completely tied up wire and cable communication and put a great big crimp in radio operation.

We hereby call upon A.R.R.L. members who made any careful observations during the disturbance to send in copies of their logs to Headquarters, as we would like to find out something about how this business affects our amateur radio. A lot of information has already come out. It seems there was another solar disturbance, a huge sun spot, which caused a violent magnetic storm on our earth and ionized our upper atmosphere with the resulting display of Northern Lights. The magnetic storm resulted in the establishment of earth currents which greatly disturbed the values of voltages being used on telegraph lines, in some cases the values of these potential differences between two points in the earth's crust being sufficient to reverse the current thru the lines. Con-

stantly shifting in value, it was impossible to correct the voltages on the lines to overcome the disturbances of the earth currents.

A totally different action of the sun spot seems to have been the cause of our radio troubles, for it is doubtful if the earth currents have much effect on our operation. The thing that has bothered us is the ionization of our upper atmosphere, resulting in the high absorption of our radiated energy, so that signals do not get thru. It has been very interesting to note that signals from stations within the daylight range were not affected in any way. This is a strong confirmation of the theory now rapidly spreading that radio transmission has to be considered in two classes: direct propagation over the surface of the earth, the limit of which transmission marks the reliable non-fading (and incidentally, daylight) range of the station; and transmission which depends upon the traveling of the radiated energy along the so-called Heaviside layer, a medium normally of very low absorption but subject to disturbance which may be either local, resulting in fading or poor reception in one or more directions, or general, as in the case of ionization evidenced by aurora display, where the absorption is so great as to prevent the signals getting thru. As a side point it is to be noted that in this theory there probably would be an intermediate zone just outside the daylight radius of a given station where conditions would not permit the reflection of signals, accounting for the difficulty of maintaining communication over distances that are too great to work in daytime but which should be ridiculously easy at night—a phenomenon with which every amateur is familiar. Incidentally, all the increase in range that we amateurs experience at night over our daylight range is due to the easy passage of our signals over or thru some medium of much less absorption than the earth's crust, and unfortunately it seems such transmission will always be subject to irregularities. We should bear in mind that absolutely dependable communication at night cannot be expected over distances materially exceeding the daylight range.

Getting back to the aurora, what did you observe and what effect did it have on signals? Did any real DX come thru? Did you hear any weird noises? Let's find out something about Miss Aurora.

### The Legislative Situation

**I**T never rains but it pours. There are seven bills relating to radio in the present Congress! Two of these are minor and have no bearing on us amateurs. Another is Senator Poindexter's infamous S. 31, on which it is expected further hearings will be held. This is the autocratic

bill that was before the previous Congress under the number S.4038, and which would result in giving the Navy control over radio. To offset this bill Congressman White of Maine has introduced a bill, H.R.4132, now before the House Committee on Merchant Marine & Fisheries, which instead of forming a radio commission would empower the Secretary of Commerce to regulate radio, with an advisory committee to examine problems and report for his guidance. Another bill, H.R.5889, identical in important points but improved in many details, has since been introduced by Mr. White and referred to the same House committee; and both bills have been introduced in the Senate by Senator Kellogg, given numbers S.1627 and S.1628 respectively, and referred to the Committee on Interstate Commerce. It is our understanding that the second bill has the active approval of the Department of Commerce.

Our Legislative Committee and our secretary spent several days of this month in Washington investigating conditions. Mr. White is a friend of the amateur, and as chairman of the Merchant Marine's sub-committee on radio he has invited our A.R.R.L. to present its views on his bills and promised us every consideration. Hearings on his bills will be held soon. They are not half bad, but we do not feel that we can actively support either of them. They provide that the Secretary of Commerce shall classify stations and assign wave lengths, decrements, power, working hours, etc., for each class. No regulations are contained in the bills, as in our present law, the idea being rather to create a framework that will provide for the administration of radio regulations and let the actual regulations be subject to change as the art progresses so that it will not be necessary to frame new laws in years to come. With this principle we agree in the main, but because we amateurs are in such a peculiar condition we think that the law ought definitely to specify our domain. We think we can consistently ask this because our wave length band is at one end of the radio scale and if definitely specified in the law it would stabilize the use of wave lengths immediately adjacent to ours; furthermore, we amateurs are not like the vast commercial companies who have the means to constantly guard their interests: we do not believe our future would be safe unless it was written into the law so that no amount of political pressure, change in officials, etc., could result in the unceremonious change in our wave length or other drastic action which would make junk out of our millions of dollars' worth of equipment.

Therefore we are going to ask that any new legislation shall specifically state that

one of the classes of stations shall be citizen or amateur stations, and just what our wave length, decrement and power shall be. Every radio interest in the country admits the value of the amateur, and most of them are friendly towards us. We are sure they will see the reasonableness of our request that our future be written into the new law.

### Our National Convention

**H**ERE is news: from August 30th to September 3d, inclusive, the A.R.R.L. will hold its First National Convention at Chicago. There will be five Big Days as chock full of amateur radio as anyone can think of. Other amateur meetings have been heralded as the biggest thing that ever happened in amateur doings, and all of them were fine, but here is one that will outstrip them all, because it will be the first national convention of radio men ever held in this home of the ether-hound. We are telling you right now that you want by all means to get there, and come prepared to see the thing thru, for real amateur radio history is going to be made and you must be in on it. Never before has so pretentious an affair been attempted and if you miss it it will be the outstanding regret of your radio life. So take a tip from us, save up your money—make your vacation be at the Chicago convention!

Details of the program have not been completed but it is hard to imagine a schedule more enthralling to an amateur than is now in preparation. There will be business meetings at which we will discuss our co-operative problems of interference control, time division, traffic regulation, legislation, etc.; technical meetings to hear nationally-known authorities speak on spark and C.W. apparatus, both transmitting and receiving; educational lectures bearing on the fundamentals of electricity and radio; meetings to discuss club organization and activity; a meeting of the entire huge personnel of the A.R.R.L. Operating Department; a meeting of our Board of Direction; and the president of these United States and the secretaries of the departments of Commerce and Navy are to be invited to address us on our opening night. Not all of the convention will be brain food, tho, for automobile and motor bus tours, yacht and motor boat and hydro-aeroplane trips, swimming, tennis and golf, will all be available; a Liar's Contest will be held, with a big prize for the owl that can tell the worst yarn; a get-together absolutely without speeches or business will be held at one of Chicago's best cabarets; stunt parties; an indoor baseball game between the A.R.R.L. Board of Direction and the Chicago Executive Council; a whopping big banquet and dance on the

famous beach walk of the beautiful Edgewater Beach Hotel on the last night; and thruout the convention a radio exhibit, open to the general public, that it is expected will surpass anything ever held. Arrangements are being made for the accommodation of the ladies, these plans including shopping tours thru the various stores, automobile and lake trips, etc. Everyone knows that Chicago is a most delightful place at that time of the year, and a radio man's vacation could not be spent with so much fun and keen interest as he will get at the coming meeting.

So start planning and saving, O.M., for we're looking for about five thousand like you to show up, and we can assure you that it's going to be so good that you simply can't afford to miss it.

### Summer Arrives

**I**T has been the custom for some time for warm weather to come upon us about this time of the year. Personally we can't see why the air doesn't stay crisp and clear and shy of strays all the year around, but somehow things just started going this way and now it seems too late to correct them. We're confidently expecting, therefore, that it's going to get hot and that the air is going to have quite a lot of static in it before long.

But let's not let a little thing like that bother our radio work. The A.R.R.L. proved conclusively last summer that there isn't any such word as "season" in the bright lexicon of the amateur, or the lexicon of the bright amateur, whichever it is. Static gets rotten at times, it's true, and the long DX of winter isn't always possible, but it isn't half bad. Every so often in the worst summer weather there are nights as clear as winter and DX is fine. The fellows that locked up their sets last summer won't do it again for they have been told what they missed—how things rocked along just as merrily as of old. Don't *you* make that mistake.

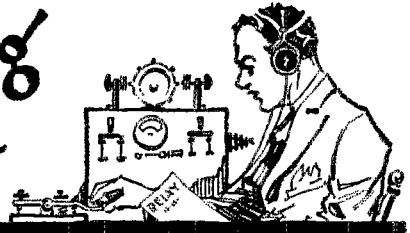
It's time to revive the Home-to-Lunch Club. All you have to do to be an H.T.L. is to sit in when you are home at noon and get in on the fun. There will be lots of fellows within your range and you will find QRN practically nil during daylight. Daylight work is a thing that needs our serious consideration right now, fellows. Our Operating Department is looking for stations to form daylight routes, because traffic is surely going thru this summer.

Do you ever get up early? Of course not, when you operate all night, but on these hot nights when static is bothersome, try getting up about daylight in the freshness of the early morn, and notice how Old Man QRN seems to belong only with the night

(Continued on page 50)

# The Operating Department

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



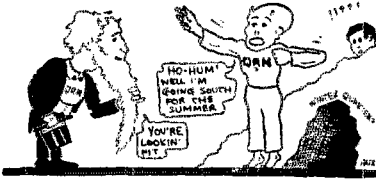
**W**OULDNT it be wonderful if Old Man Static (QRN) had lost his combination and could not tune his set to resonance this summer! Regardless of how we hate to have him and his twin brother QRM breaking up our lines of communication, he will be here just the same. Wonder if he will devise a new means of breaking up our CW operation? QRN has started his ruthlessness already and is almost back to summer normalcy. Can you imagine

over which traffic has moved during the month. The splendid spirit of co-operation combined with determination has made this possible under adverse atmospheric conditions.

Traffic has increased in the Roanoke Division thru the QRN, while the Delta Division stations are unable even to hear stations that can be communicated with under fair conditions.

Our Northern Route thru the Rocky Mountain Division is maintaining its right of way with all traffic and will continue to do so until the above mentioned "crepe hanger" (QRN) gets his set in resonance.

Your attention is invited to the report of the Atlantic Division. Every possible bit of information is contained therein and it ill becomes anyone to offer alibis for failure to move traffic into this division. A midwinter report in midsummer. F. B. Reports are missing from the following divisions: Central, Pacific, and St. Lawrence. Reports of the Division Managers follow:



QRM, who has been chopping away all winter, being greeted by his twin brother QRN who comes from under cover and looks fit as a fiddle, telling QRM to take care of the Northern stations while he (QRN) handles the Southern stations? Old Man QRN goes to work with such renewed effort that it seems as tho he did not need the assistance of QRM.

However, we have gone "over the top" with our traffic for the past month, our records showing a total of 10352 messages having been handled. 1921 is rewarding the fighters. Let us keep up the good work all thru the summer months.

For the second time in succession "Amateur Number One" leads the gang in messages handled and upholds the reputation of the New England Division, altho 2RK gave him a hot race, showing a total of 450 for the month.

\*\*\*\*\*  
 MR. I. VERMILYA, 1HAA  
 Marion, Mass.  
 457 Messages  
 New England Division  
 \*\*\*\*\*

**Thru to Florida !!!!**  
 The Division Manager and the Operating Department personnel of the East Gulf Division are to be congratulated for the successful opening of a route to Florida

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

No detailed report received.  
 Total messages 2102. Busiest station, 8ZL—183 messages.

## NEW ENGLAND DIVISION G. R. Entwistle, Mgr.

C-W stations of all kinds are increasing in New England. Most of us are preparing to keep in this summer with C-W. It seems to be the only solution, or, at least, a partial solution to the QRN problem.

Let's award a prize to 1HAA's synchronous gap. It went a year without stopping (long) and it takes a pretty good piece of apparatus to do that. But at last it has succumbed. Its starting windings and one bearing went on strike a few days ago and now VN uses a straight gap. In spite of the disaster to the rotary, 1HAA handled 457 messages during the past month.

A.D.M. Robinson, (1CK), reports counterpoises all the rage, but that they only seem to work well in the hands of experienced CQers. 1CK handled a total of 167 messages during the past month.

1EAV hopes to shake the jinx and be



with us again soon. He has a new thirty wire aerial of his own design with a 60 foot spread. Maine is heard from occasionally, 1FV and 1KAY being the ones best heard. D.S. Johnson, (1DY), reports that his detectives found that the strange QRN in Lynn was the street-car company's electric rail welder and it has stopped now. Johnson also says that he is having good success getting traffic thru to 1HAA and New York before midnight lately. The CQers in Lynn must be decreasing. 1DY handled a total of 238 messages during the past month.

A.D.M. Mix, (1TS), reports noticeable decrease in activity probably due to increasing QRN and also the Bureau of Standards' fading tests. Also that work is progressing fine on the C-W. 1TS has a 100 watt set now and is working 1RD in Brookline every night. Traffic is also handled with 1XX in Providence. The following C-W stations are now in actual operation in this section and covering good distances: 1NAQ, 1MO, 1FQ, 1GAI and 1TS. 1BM handled 20 messages, 1HO 86, and 1TS 94.

A.D.M. Castner, (1UQ), reports the advancement of this section as most encouraging. A reliable route to Bangor is in operation from Portland: 1UQ, 1FV, 1KAY, to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1OT, 1GQ. The route from Portland to Bar Harbor is: 1UQ, 1FV, 1KAY to 1CAO, 1UL, 1PAT to 1MBS to 1LAX, 1DAQ to 1MBZ. Portland has succeeded in connecting with southern QSR via 1DAC. 1MBZ and 1VT are making tests in an effort to hook up Bar Harbor with Calais. Many of the stations in Maine are planning to renew activity after school closes. 1FB will be right on the job after July 1st and will be able to clear all traffic for Maine. Stations in Portland broadcast every night at 7:15 p.m. Any stations hearing same, please send card to A.D.M. Castner at 15 Temple St., Portland, Maine.

Total msg's. 1062. Busiest station 1HAA, 457 msg's.

### ATLANTIC DIVISION C. H. Stewart, Mgr.

The Division Manager has at last realized his ambition to present a fairly complete report from all sections, and one which he believes shows steady progress is being made in the right direction.

Mr. Clifford J. Goette (2JU), A.D.M. Northern Section, reports that there have been quite extensive changes made in his section, resulting in the creation of one new district to be known as the Capitol District with headquarters at Albany. New York State outside of New York City and Long Island is now split into three districts, and

the territory distributed in such a manner that each Superintendent is closely in touch with stations handling volume of traffic in each district. Each Superintendent has given the A.D.M. assurance that everything will be done to place the Northern Section on top where it rightfully belongs.

Numerous complaints have been received in reference to traffic between New York and Philadelphia not coming through in view of the fact that a day light route between these two cities exists. All stations in New York City, including Brooklyn, should clear through any of the following stations: 2FD, 2RB, 2ZD, 2RK and 2JU who will relay to 2ZL, 2EL, 2AJW, 2BGR, 2RL or 2FS. All of the latter stations are clear of the local QRM of New York City and work 3FB, Atlantic City, with ease. From 3FB the route is as follows:—3AS Ocean City, N. J., 3NB Vineland, N. J., and 3EH Collingswood, N. J., who has no trouble in clearing Philadelphia. If this route is utilized both ways we should have no further complaints. The Northern route via 3XM Princeton, N. J., which appears to be open is not being used to any extent, but efforts will be made to get our stations along this line in action again. 3EH Collingswood, N. J., as well as several other stations in the Philadelphia District are in daylight QSO range with Princeton, and inasmuch as the latter station is always in communication with New York, quicker service can be performed over this route than over the southern route, and some of the traffic should be diverted to this route to insure more prompt action.

The Hudson Valley route to Albany, Troy and cities to Buffalo will soon be in operation. So far New York City to Troy is open via the following stations: 2BK, 2DN, 2BB, 2DA, 2AR, 2BM, 2FG, 2XQ and 2SZ. The Superintendents of the Capitol and Western New York Districts are both working on a daylight Albany to Buffalo schedule. All stations in and around New York City should take advantage of this route, as in using same it will cut down delays and eliminate QRM.

The following gives in some detail the activities in each of the Districts under the jurisdiction of the Northern Section, as taken from the local reports of Superintendents.

WESTERN NEW YORK—Benzee Bros., Dist. Supt., 196 Keystone Street, Buffalo, N. Y. (District includes counties of Niagara, Orleans, Wayne, Cayuga, Oswego, Onondaga, Seneca, Ontario, Monroe, Livingston, Erie, Genesee, Wyoming, Yates, Cortland, Broome, Tioga, Chemung, Tompkins, Steuben, Schuyler, Alleghany, Cattaraugus, Chataqua and Jefferson.) The Supt. reports that Buffalo has recently called upon the amateur to help solve the

stolen automobile problem. Nightly bulletins pertaining to autos stolen are transmitted via radiophone from station 8PJ, Buffalo. The first bulletin, broadcasted on April 4th brought about the recovery of machine the following day in Scranton, Pa. The Buffalo police are so pleased over results that they are planning to install a station of their own as in New York City.



Mr. R. W. Bissell, 8TY, has been appointed official station for Jamestown. During a visit to Jamestown, a hamfest was enjoyed with 8TY and 8AYM, who are wide awake and very much interested in our cause. The number of stations handling bulk of traffic during the past month are as follows: 8IL Lockport 138 messages, 8AMB Lancaster 42, 8AGK Niagara Falls 53, 8GI Rochester 123, 8AMM 51, 8AFA 17, 8AMZ Oakfield 200, 8AYM Jamestown 10, 8TY Jamestown 24 and 8HJ Elmira 10. The total number of messages handled by all official stations numbers 836. 8AMZ certainly has been clearing traffic in fine shape and his work is being greatly appreciated. 8ANJ has a working schedule with Canadian 3AB Toronto and traffic for Ontario Division points should be routed through Buffalo to 8ANJ.

**CAPITOL DISTRICT** (comprising counties of Lewis, St. Lawrence, Franklin, Clinton, Herkimer, Oneida, Hamilton, Essex, Warren, Fulton, Saratoga, Washington, Rensselaer, Schenectady, Montgomery, Madison, Chenango, Otsego, Schoharie, Albany and Delaware) Mr. F. H. Myers, Dist. Supt., 540 Providence St., Albany, N. Y. This is the newly created District and includes some of our best stations such as 2XQ, 2FG and 2SZ. Owing to the short time that this District has been organized nothing of much importance has yet been accomplished, but as soon as the New York City to Buffalo route gets into operation more will be heard from this District. All stations capable of doing good relay work and located in any of the above named counties are requested to send their names and addresses to Mr. Myers, so that he will be in a position to line them up.

**HUDSON VALLEY DISTRICT** (comprising the counties of Greene, Sullivan, Ulster, Columbia, Dutchess, Orange, Putnam, Rockland and Westchester) Mr. Carl E. Trube, Dist. Supt., 6 Livingston St., Yonkers, N. Y. This District has a num-

ber of excellent stations and is clearing a great deal of traffic. 2DN and 2BK both clear New York City and all traffic for cities along the New York to Buffalo route should be handed to them for relaying to 2BB, 2DA, 2BM and 2FG. These stations, in addition to 2OA, are a fine outlet for traffic destined to the New England States, and in the absence of a consistent route to New England points from New York City, messages should be routed via 2DN, 2BK or 2OA. Total number of messages handled by 2DA for past month was 177. Detailed reports from other stations are lacking. Mr. Trube has just recently taken hold of this District and it will take him a short while to get his stations lined up.

**LONG ISLAND DISTRICT** (All of Long Island east of Jamaica) Mr. Harry S. Collins, D.S., Babylon, L. I., N. Y. Although there is a comparatively small number of stations in this District each and every one of them are doing their share. Being far enough from the bulk of QRM from New York City, no difficulty is experienced in working distance. 2ZL Valley Stream has CW schedules with 1AE and 8th District stations and considerable traffic is cleared consistently. The same applies with 2BGR (spark) Bayshore, who maintains schedules with 1HO, 1BAB, 1BAZ, 1FW and 1BM. 2EL and 2AJW are also doing very good work. All of the above named stations are in communication with the Jersey resorts, and traffic for these points should be routed via them. 2AJW has recently installed a CW transmitter.

**NEW YORK CITY DISTRICT** (Manhattan and the Bronx) Dr. E. A. Cyriax, D.S., 219 East 71st St., New York City. The stations doing the bulk of the work in this District are 2DI, 2CT, 2IF and 2YM. In addition to these there are a number of others who are capable of doing distance work, but are handicapped by the terrible local interference. During the past month 2DI handled 94 messages.

**BROOKLYN DISTRICT** (All of Brooklyn and Long Island west of Jamaica), Mr. Frank A. Maher, Dist. Supt., 328 55th St., Brooklyn, N. Y. This District has quite a number of stations doing good work in face of the bad interference from local stations and ships entering the port of New York. 2RK cleared 450 messages working stations in all directions. Others that have been doing good work are 2OW, 2RM, 2BO, 2DR and 2WB.

**SOUTHERN NEW JERSEY DISTRICT**, Mr. Marcus Frye, Jr., D.S., Vine-land, N. J. Traffic conditions have been very good during the past month, a number of the smaller stations coming into the limelight. At the present time the entire district is covered with daylight route, which has been brought about only through

plugging on the part of Mr. Frye. The main stations handling traffic are as follows: 3BA 15 messages, 3AAN 23, 3EH 31, 3FB 43 and 3NB 184. The following are newly appointed official stations: 3EH, W. G. Phillips and H. Densahm, Collingswood, N. J.; 3LS, C. L. Rook, Penns Grove, N. J.; 3FB, Wm. Jordon, Atlantic City, N. J.

**NORTHERN NEW JERSEY DISTRICT:** Mr. Lester Spangenberg, 2ZM, has resigned as Dist. Supt. and Mr. Fredk. B. Ostman (2OM), 180 Broad St., Ridgewood, N. J., has been appointed in his place. Traffic in this district is being handled in very good shape. Business for Northern New York is now being temporarily diverted to other routes than through SXU (Cornell Univ.) which station is experiencing induction trouble. The following stations are all handling distance in wonderful shape and clearing lots of traffic: 2TK, 2JJ, 2VA, 2AST, 2CL and 2JN. 2PE is now getting out with his CW, as well as 2ZM and 2AJF, who are also using CW.

Mr. Goette requests that station owners wishing to become official relay stations get in touch with their respective District Superintendents.

Mr. E. B. Duvall, Assistant Manager in charge of Southern Section, reports considerable progress during the month and a steady improvement in conditions.

**WESTERN PENNSYLVANIA DISTRICT:** Mr. R. C. Devinney, D.S., 1224 Boyle St., Pittsburgh, Pa. The stations in this District have again failed to make a report of messages handled, with the exception of 8ZD, who handled 165 messages. It is to be regretted that message reports are not received, as the failure to forward these reports prevents proper credit being received by this Division for messages handled. 8RU owned and operated by Allan McChesney and Charles Rankin, Pittsburgh, has been appointed as an official relay station. They have a fine station, and they will take care of the morning trick on Trunk Line B from 3 a.m. to 7 a.m. daily.

The following stations in this District have installed phone or CW for relay work: 8DV, 8ACE, 8JQ, 8FB, 8HA and 8WY. The station of the Traffic Assistant 8ZD is also being equipped with straight CW. 8DV and 8HA are doing the most consistent work, handling relay traffic regularly on their CW sets. 8FB has the best telephone set of the lot.

This District has again hooked up with the headquarters of the Central Penna. District at Milton through 8ZD and 8BQ. As fading signals from 8BQ almost always prevented us from working last season, we are quite elated to note that 8BQ comes through perfectly now.

The Doubleday-Hill Electric Co. of

Pittsburgh are installing a high powered CW and phone set to be used largely for the purpose of handling business with their Washington, D.C., store. This station will be in working order in the near future and may be depended upon to handle A.R.R.L. traffic. Our official relay station at Uniontown, Pa., radio 8MT, is again on the job. 8VQ at Freeport is out of commission for a few weeks. 8JQ has given up his excellent spark set and is now working on a CW set. To sum up would say that, while relay traffic can be expected to decrease with the coming of heavy static and warm weather, from the number of CW and phone sets going into commission among our official stations, it seems likely that there will be more on the job this summer than ever.

**CENTRAL PENNSYLVANIA DISTRICT:** Mr. Herbert M. Walleze, 234 Vine St., Milton, Pa., states that traffic has passed through Pennsylvania during the last month much better than at any time since the reopening. The fact that 8BQ is again on the job and working a regular schedule (10 p.m. to 1 a.m.) is helping the situation. Mr. Walleze and his Traffic Assistant Cawley have consolidated their efforts on one station each using his own call (8BQ and 8HR respectively). Since reopening this station on March 15 they have handled 38 messages and are reaching out fairly well, having exchanged traffic with 1HAA, 3NB, 3EN, 8AMM and 9UU, and have worked Scranton (8ABQ) about 90 miles in daylight. Daylight tests with 8XE were very successful, both stations QSA and no fading, but at night both weaken considerably and fade badly. Daylight tests with 3AIC, 3GX and 3LP, Reading, Pa., are so far unsuccessful due to excessive QRM and induction at Reading. 3AQR at Hershey, Pa., a short distance east of Harrisburg came to life and QSR'd. This, however, opened a long closed branch into Harrisburg. This station (3AQR) should be able to pass traffic on down to York, Pa., and possibly direct to Baltimore. The ball is rolling now and with stations slowly coming to light there is no reason why we should not come up to standard with this District within a short time. Our great need now is a duplicate for 8XE for this summer.

**EASTERN PENNSYLVANIA DISTRICT:** Mr. S. W. Place, D.S., 622 Stanbridge St., Norristown, Pa., reports the following official relay stations appointed during the month: 3AIC Reading High School for Boys (Practical Arts Dept.), Chief Operator Fred. G. DeLong, in reliable communication with 3FR Allentown, 3HJ Haverford, 3WX Lancaster and 3ACS Whitford, 3AVG Yeates School, Lancaster, Pa., Operator Fred. B. Westervelt.

Traffic Assistant 8ZQ, N. E. section,

reports that conditions in the Scranton district are very dull, and that the stations seem to take very little interest in handling traffic. He has, however, located and appointed a new station in Wilkes Barre, Pa., on Branch Line No. 1.

DISTRICT OF COLUMBIA, Mr. Francis M. Baer, D.S., 1744 Corcoran St., Washington, reports a great increase of activity in his District since his last report, and the following messages were handled: 3ALM 37; 3KM 13; 3ABI 9; 3XF 48. 3IW has also handled quite a volume of traffic, but no figures were received from him.

3KM is arranging a regular schedule with 1QR who will use CW. The CW set at WWV also has some good DX work to its credit.

Trouble is still experienced in clearing traffic to the south of Washington, principally on account of NAM's QRM with the Virginia stations and also due to static conditions. It is usually necessary to forward the southern traffic by mail. Local conditions in the city of Washington are still as good as can be expected in view of the numerous transmitting stations, and practically no friction is evident between the local and DX stations. This is almost entirely due to the influence of the Washington Radio Club.

EASTERN MARYLAND DISTRICT, Mr. E. B. Duvall, A.D.M., acting Dist. Supt., 3909 Cottage Ave., Baltimore, Md. reports that a change has been made in the traffic control station schedule for Baltimore, and although the schedule given in the last monthly report was not completely carried out as announced, the traffic control in the city was found to take care of itself to a certain degree. Until further notice the following stations will control and clear traffic through Baltimore:

3IB—Monday	3UC—Thursday
3AN—Tuesday	3HG—Friday
3GU—Wednesday	3EM—Saturday
	3AC—Sunday

Station 3AN is again in operation. 3IB, 3GU, 3AC and 3EM have been getting their signals out of late and are placed on the Control in order that their stations may have a chance to handle some of the traffic through the District.

3HG seems to have the lead on the DX stations in Baltimore, but no report as to the number of messages handled has been received; in fact none of the stations have furnished this information, and they are asked to co-operate with Mr. Duvall in the future and have this information in his hands before the 20th of each month. 3HG has a daylight schedule with 3ALN in Washington, and the two cities may be considered to be reliably bridged at present.

Mr. Duvall still holds the appointment open for District Superintendent for East-

ern Maryland, and wishes to make it known that he will consider anyone who can satisfy him that they can handle the work efficiently in the full interest of the League, and possesses and operates an efficient DX station and who is a member of the A.R.R.L.

Many CW stations have sprung up in Baltimore. The leaders as far as DX work is concerned are 3CT, Hogan, who has been in touch with Pittsburgh and Cleveland on several occasions, and 3EQ, Holloway, who has been temporarily out of commission due to a habit he has formed of burning out tubes. Among the promising CW stations which are working and improving their sets for future DX work are 3IB, 3UC, 3ER, 3EM, and a set is being installed at the local store of R. Selway Collmus Co. operated by Mr. Winters Jones, who will no doubt come up with some fine DX work.

WESTERN MARYLAND DISTRICT (Comprising the counties of Frederick, Washington, Allegany and Garrett), Mr. Roger W. Clipp, Dist. Supt., Hagerstown, Md., has made no report.

Total messages 2226. Busiest station 2RK—450 msgs.

#### ROANOKE DIVISION

W. T. Gravelly, Mgr.

Reported by A. S. Clarke, Div. Traffic Mgr.

Excessive static has made good work next to impossible during the past month. Despite this the number of messages handled has shown quite a jump. There is an awakening of interest in radio throughout the division, many new stations being reported. No lagging of interest during the summer months is expected but rather more interest is being taken in developing day light communication.

District Supt. Wohlford of S.W. Virginia is making strenuous efforts to develop his section. Salem promises 3 good stations. Daylight communication one way with Salem has been established from Danville. The following appointments have been made, each man to assist Wohlford in his vicinity, Higgins at Oldtown to cover from Radford to Bristol; Gundry at Stonega for the Clinch Valley; and Fleenor at Bluefield for the territory lying between Bluefield and Williamson, W. Va.

City Manager White of Norfolk says that between NAM and busted condensers, relay men are having their troubles but msgs are going through. Both 3VV and 3FG, normally busy stations, have been out with busted condensers. 3EN takes second place for number of msgs. handled 53. XF-1 has done fine relay work handling 51 msgs.

Increasing interest in radio throughout W. Va. is evident. D.S. Heck, 3EF, reports

daylight lines open from Mannington to Washington and Uniontown, Pa., and Cambridge and Marietta, Ohio. Liller at Keyser, and Rector of Bellington, W. Va., are counted on for good work before long. 8SP continues to be the star in this division.

Reports have not been received from Blair at Richmond and Bunker at Charlotte. Blair at 3ZL is beginning to be heard. Daylight communication has been regularly established between 3BZ Danville and 4CK Winston-Salem.

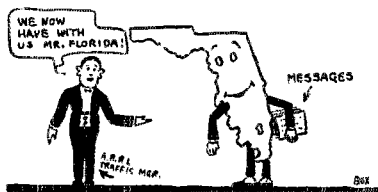
The following stations handled the majority of our messages: 8SP, 3EN, XF-1, 3GO, 8JE, 8EF, 3ACT, 3VV, 3ACE.

Total msgs. 300. Busiest station 8SP—67 msgs.

### EAST GULF DIVISION

E. H. Merritt, Mgr.

We made a record this month, fellows!! Over 25 msgs to FLORIDA passed thru 4YA, all to 4FD and 4GN. The route is at last working successfully and often thru very heavy QRM and QRN. No report from Florida D.S. Gullede, but 4DL, 4AM, 4BI and 4CS seem to do the work for the whole state. They need help too, so let's hear from other Florida stations.



4XC is now D.S. for Georgia and all Georgia men please report to him each month. He is B. W. Benning, 50 Whiteford Ave., Atlanta, Ga. Dr. Hodge, Savannah City Manager, reports that 4GL, Mr. F. A. Hill, recently of the Roanoke Division, is operating on CW and doing good work. 4BY and 4GL are taking all the traffic thru there now. 4FD, 4BK, 4AG and 4GN are all doing fine work now. 4DV (Columbus, Ga.), 4BW and 4DT are heard occasionally trying to break thru the din. In Atlanta many of the stations are trying CW and fone work.

The best report comes from Dist. Supt. McIlvaine of 5XA. Alabama is coming to life. He has appointed Mr. H. L. Crane, 5JO, City Mgr. of Birmingham. 5EQ, 5JO and 5BQ are trying to get out. In Montgomery, 5NL and several others are working hard, and in Mobile 5KB and 5JZ have opened up. A radio club has just been organized in Mobile and promises some good DX stations next fall. 5XA is now on 375 meters with spark and ICW. A club has been organized there to back up and boost 5XA and is called "I Tappa Key". Mr. McIlvaine would like to hear

from all stations in north Alabama at once.

QRN most of the time makes operation impossible now or at least very difficult but most of the stations are sticking to it and hammering thru. The D.M. earnestly requests that we keep the good work up and not close down for the summer as per usual. This QRN lets up occasionally, even in the summer months.

Total messages reported this month are 455 with only six stations reporting. Busiest station 4YA 125 msgs. Let's hear from you all next month.

### DELTA DIVISION

J. M. Clayton, Mgr.

Owing to the approach of summer weather and summer QRN relay work thruout the Division has been very spasmodic. The good relay nights have about ceased to be, and when traffic is received it is a case of clearing it the same night, or waiting two or three weeks for a good night.

The fact that relay work is so slack possibly accounts for the fact that NO reports have been received from the Delta Division personnel. Again let me emphasize the importance of getting in some kind of a report MONTHLY to the Division Manager, or the A.D.M., if we are to have any representation in QST at all. Especially is this important during the summer months, as we all are more or less away from the stations during the summer months and the A.D.M. is unable to keep up with the various stations unless he gets a report from them.

It is hoped that we can put over a little relay work thru the whole summer, if we can build up two or three good C.W. stations in the division. Spark relay work is about impossible except on occasional good nights. And while on that subject the Division Manager would like to cast a few remarks on relay conditions down here during the summer, as compared with conditions in the north. Last September the Division Manager had the pleasure of being out at 9ZN one night, and noted Matty's exclamations and profanity over the "terrible QRN" then raging in the north. Despite this "bad QRN" the 2's and 3's were coming thru to 9ZN in fine shape and even a five station or two. Possibly the night that I happened to be at 9ZN was a particularly good night but nevertheless relay work CAN'T BE done here from May to October except on very rare occasions. We can't even HEAR the stations in the south during that time, much less work with them.

5YH has closed down his spark station for the season but is talking of putting in a semi-high power CW station. 5JD is still plugging along every fair night and

clearing some traffic thru it all. 5ZAB (Pullen of Houma, La.—ex 5JE) hasn't been heard on the air for several weeks. 5EA hasn't been heard for a month or more. The surprise of the month was created when the Division Manager heard 5ZS the other night and gave him a msg. or two for Shreveport. Anthony came back with the news that he was at some fair or something. Guess Friend Willie was putting on an exhibition for the natives. 5ZK, Greenlaw, hasn't been heard on radio for some time either. DeBen, 5ZP, has been sick. We are expecting him on the air at any time. 5ZL has started up again, but this time the station is out at Camp Pike College at Camp Pike, Arkansas, where the D.M. is holding down a job as instructor in radio to men in Sam's Army. Incidentally Sam furnished the Grebe synchronous gap which is signing 5ZL now. The rest of the station except the oscillation transformer is 5ZL.

We hope to be able to run successful daylight tests thruout the division. Heretofore in past seasons these tests have been successful for maybe a week at a time and then it's absolutely impossible to get signals thru the QRN. Possibly this age of two steps and GOOD regeneratives will make some sort of relay work possible all the season around.

The Division Manager has had the pleasure of handling some traffic with Friend Merritt of the East Gulf Division. 4YA's signals certainly do come thru in fine shape over this way, and the D.M. is certainly pleased to have "connected" with the East Gulf Division Manager once during this season.

Again let me urge that you all get in some kind of a report each month to the Assistant D.M. If not at your stations let us know what you are doing and where you are. Also it is very important STILL that Greenlaw have a traffic report from you. Now that relay work has let up in this division ANY messages gotten thru will be of interest and we should get credit for any relay work done. Please let's have these reports.

Total messages, 180.

#### DAKOTA DIVISION Boyd Phelps, Mgr.

Due to the early coming of the static season the good radio weather has been shortened considerably but we are not hanging up the phones on the peg and quitting. On the contrary we are making every effort to keep traffic moving over the Northern Route in some kind of shape all summer. As no stations have appeared in the western or central part of North Dakota the jump from Ellendale to the 7th district will have to be made when static conditions permit.

Station owners are encouraged to listen in every night all summer at least half an hour per night as there are frequently nights when static is so slight that distances of several hundred miles may be covered and the few stations that happen to be on the job clear many messages with little QRM. Last summer it was found that daylight working was very satisfactory where stations were within daylight range of each other. Some stations report better working conditions at noon while others think sunrise or sunset to be the best. This perhaps varies in different localities. Stations should test with their neighboring stations in nearby towns to determine the best hours. The Division Manager would appreciate a detailed report from each station on this subject and a list of the nearby stations that can be heard and communicated with regularly.

All routes in the eastern part of North Dakota are working and traffic is handled in daylight from 9LW at Wahpeton up to 9YAF at Pembina thru 9AEJ and 9AGN, and from 9YAF to Winnipeg, Canada. 9ZC at Baudette, Minn., clears daily with 9YAF at 11:00 A.M. and with 9AGN. Good stations are needed between Aberdeen, S. D., and Sioux Falls to complete a perfect summer route from the Midwest Division to Canada. The summer route from North Dakota to the Twin Cities is complete except for the last 60 miles from St. Cloud. Working north from the Twin Cities was always very difficult and communication was never established with the best stations in St. Cloud but the Division Manager is building a station at his summer home 18 miles from Minneapolis which will be somewhat nearer St. Cloud and equipped with every anti-QRM device now known. Summer station appointments will be made on the various routes when it is seen that traffic can be handled. Stations are still scarce in the southern and northern part of Minnesota and in the central part of South Dakota. Stations of any size whatever in these parts should write to their District Superintendents whose addresses were given last month.

Mr. Bridges of NUX, A.D.S., wishes to announce that his station 9DBT (ex "BQ") now has the call 9YAC. 9HM went out of commission April 2nd.

9WU and 9EE have combined their stations and are now operating under a special license—9ZX. It is to the untiring efforts of these two men that we owe thanks for the successful maintenance of our Northern Route. We can be assured right now of a perfect route via the North with these two men on the job. (Tfc. Mgr's. note: Goddard and Leavenworth have the chance of being to the Northern route what 5ZA is to our Southern route, and every indication is that they will give 5ZA a hard tussle

for the honors. However, 9ZX will have a slight advantage in not having the QRN that 5ZA is used to, and in addition having two operators who are trying to prove that sleep is less desirable than moving traffic. More power to you, fellows.)

Individual station reports have been coming in better of late but there is still room for much improvement. Stations should get their reports to their District Superintendent by the 20th, especially their message totals so that we can prove we are handling summer traffic.

Total messages 332.

#### MID-WEST DIVISION

L. A. Benson, Mgr.

9JA, Dist. Supt. for Iowa, reports that even though QRM has been very bad and many dead nights, the traffic through the state has been heavy. Several additional stations have sent in their reports this month. Severe lightning and storms delayed somewhat, but with 9JN on again and 9AEQ coming in strong as ever, quite a bit of traffic was cleared through these stations and remarkable lot of west coast traffic is going through the state by way of 9JN and 9LW. 9MS and 9AWX are making DX records every night and 9YA has been heard several times on the west coast. 9CS is having no trouble in working the east coast regularly. 9DBS reports a route to Sioux city through 9ZU, as this station is opened again and has four operators. This station fills a link which has long been missing in the state of Iowa. Station 9MS works regularly at noon with 9CA, clearing traffic. 9YA has regular operators on every night working C.W., phone and spark. They have 1KW spark transmitter on 260 meters and 2KW on 425 meters.

9DU reports that traffic is moving over short jumps and in day time in his district due to QRN at night. 9AVK at Holden is doing good day-light work, working Columbia and Kansas City. It is sometimes impossible to work direct with 9YN but the best route so far is by way of 9AVK. Routes to the north, although still open, are not handling much traffic. Mr. Turner reports that C.W. is coming to the front in his district. 9KAB of Kansas City has a six tube set in operation. 9EL, Council Grove, Kansas, announces 9AEG Ira Graham, Eldorado, Kansas, has been appointed A.D.S. and 9OE of Wichita, Kansas, second A.D.S. These two men are working on day-light routes throughout Kansas to handle traffic during the summer months. 9EL is installing C.W.

Among some of the stations doing good work in Wichita are 9EUO, 9LAG and 9LV. 9PS and 9OE are the two most consistent stations at present. 9ZB has been

handling all traffic lately using C.W. Several messages were handled direct to New York through 2ZL on evenings when QRN was so bad that spark stations were inaudible, using two 5 watt tubes. 9ZB has been reported QSA at Hartford, Conn. All stations in the Mid-West division using C.W. outfits at present are requested to kindly communicate with the Division Manager so that C.W. routes throughout the division can be maintained. 9LC of St. Louis has been doing excellent work with his C.W.

Total messages handled, 2124. Busiest station 9OE, 267 messages.

#### WEST GULF DIVISION

Raymond L. White, Asst. Div. Mgr.

##### *Northern Texas District*

Eastern Territory: John Dorsa, A.D.S., no report; however, Greenville reports direct that station 5HV handled total of 137 messages which makes him star station of that Territory.

Central Territory: Guy Neel, A.D.S., reports a club started in Dublin and activities increasing. Star station 5XJ.

Western Territory: J. L. Martin, A.D.S., reports conditions favorable; 5IF of Amarillo is doing some splendid relay work.

H. P. Heafer, D.S. of the Northern Texas District, has had prepared a special map of which he sent a copy to the Divn. Mgr., A.D.M., and all A.D.S.'s., which is indeed very up-to-date and if used will be of great benefit to all concerned.

A very interesting report from D.S. Tilley, of the Southern Texas District advises that Austin stations are now confined to only one, that being 5ZU, as 5EJ had his ninety (90) foot tower blown over and has gone to Colorado for the summer. 5JA's antenna rope broke so the whole system has to come down to get the rope through the pulley again. 5BO had two 70 foot poles blown down and the station has been closed for the summer. The University of Texas has an appropriation of \$2,000 to equip their radio station; the antenna will consist of two 100 foot poles 200 feet apart with the latest Grebe receiving instruments installed, all of which are on the ground. A three (3) K.W., 240 cycle synchronous set is already installed and waiting for the antenna system to be finished. The station will be manned by seven licensed operators recruited from the ranks of the Austin amateurs, with District Superintendent W. H. Tilley as Chief Operator.

5XI at Kelly Field, San Antonio, has been heard from, but there still remains for a real DX station to open up in that important city. All the small towns around Austin are regularly heard from, but the

service is poor as most of the boys are beginners and cannot receive over 5 words per minute, with the wave length anywhere from 250 to 500 meters. (Note: Let's stop that 250 to 500 stuff; Wesley de White).

QRN is getting bad for summer work at night so the day-light routes are being lined up to keep the District on the map until O.M. Crimp puts in his appearance again.

Report from A.D.S. Daniels of the Houston Texas Territory, states that his office must of necessity report a very quiet district this month, unfavorable atmospheric conditions existing in that territory. Almost constant squalls and electrical disturbances have been prevailing since the last report was forwarded, this being the equinox period. On many nights it was impossible to copy 5XB who has been our most reliable short relay station.

Dist. Supt. Louis Falconi, of The New Mexico District, reports conditions exceedingly quiet, complaining of no monthly reports from his assistants, etc.

Traffic is still going west on good nights and when CW is installed at 5ZA operation may be carried on later in summer. 5XB comes through there with CW when spark is helpless.

Total msg's. 599. Busiest station 5ZA, 242 msg's.

### ROCKY MOUNTAIN DIVISION

M. S. Andelin, Mgr.

During the month of March a great deal of the trans-continental traffic went via the Southern Route. The southern stations found very little difficulty working, and constant communication was maintained. The northern stations of this division have less static and consequently bear the burden of extra heavy traffic. Messages are passing over the trunk lines with the same regularity as the winter months and showing no signs of decreasing. It is possible that all-summer communication will be maintained; most of the DX stations are very enthusiastic over the probability of keeping the trunk lines open this summer. Never before has this been done in the Rocky Mountains.

The stations handling the bulk of traffic in April were 6ZH, 6ZA, 6ZM, 6WV, 9AMB, 7KX, 6JT, 6AEZ.

Total msg's., 587.

### ONTARIO DIVISION

K. Russell, Mgr.

The past month marks both the height and approaching end of the relay work for the season 1920-21. Conditions in Toronto are such now that it is apparent that there are a number of amateurs shutting up their stations for the summer months.

In the east, the Ottawa Valley District of the Ontario Division has been formed with Major W. A. Steel, of Ottawa, as the District Supt. Under his efficient management, the Ottawa Amateur Radio Association has been formed and affiliated with the A.R.R.L. In the near future this district will form a most valuable link in the chain from Montreal to Toronto and Windsor. The most likely chain at present thru eastern Ontario is from Montreal to Ottawa, Perth, Napanee, Belleville and Kingston, Port Hope and Cobourg, and then to Toronto, with a branch line north to Peterboro, or perhaps the straight jump between Toronto and Ottawa may be managed through Peterboro, where a city Manager, Mr. F. H. N. Sherwood, has been appointed.

Reports from south-eastern Ontario are promising but things are still pretty much futurist there, with a tendency towards the development of C.W. Quite a bit of traffic is being handled between Napanee, Kingston, and Belleville, though this has been much curtailed owing to the 50 meter rule.

In Toronto, the usual amount of work is being carried on. The Manager's station has received a special license from Ottawa, new call 9AL, with allowance of 200 meters at all times, and communication with Pittsburgh and Salem, Ohio, has been established. Station 3FO reports having closed down. 3BP has dismantled his spark set also, owing to the opening of navigation, and is now using C.W. only. Communication has been had with 3B in Brantford.

There is talk of holding a convention in Toronto in the Fall, at the time of the National Exhibition, to try and get the Ontario amateur interested in relay work in the Province.

The Manager had a visit from D.S. Lloyd of Sault Ste Marie, Ontario, who reports that relay work is rather difficult in his locality, owing to the peculiar soil conditions, and metallic deposits along the north shore.

### ALASKA DIVISION

Roy Anderson, Mgr.

Whew, what's that noise? Tuned to six hundred meters the operator at 7IT, Ketchikan, had a surprise, for suddenly a sound, not unlike induction, only of a much higher frequency was heard. It was unbearably loud on one or two points of the secondary condenser. But, thru it all, came the sound of a "spark". It proved to be NVH, Ketchikan, calling K DFA, Hyder. But, the mystery remained unsolved. Suddenly the noise stopped and did not start again so it was passed up as a freak. Later, however, on POZ's tune,



some queer noise, not unlike that of a few hours previous, was heard. A little tuning on the arc set solved the mystery. It was Ketchikan's new arc. Unless on the proper tune it sounds like a sixty cycle spark, with a continuous induction-like-rumbling but when tuned properly, she delivers the goods in fine style. It marks the opening of the new thirty kilowatt arc station which has been installed by Mr. Hubbard, of Bremerton.

The installation of this arc set at Ketchikan marks a development in commercial radio, but for amateur radio, in and around Ketchikan, it hurts. One thing, they don't keep their arc burning when they're not sending. Let's hope they keep this policy up.

Ketchikan seems thus far to foster long distance receiving, regardless of QRM and QRN. Using a single bulb detector and 225 foot single wire aerial, elevated about thirty feet, POZ, NPM, NPN, NPO, NSS, WII, WSO, NPA and other high powered arcs are heard with a great regularity; most of them are heard every night or evening. On some occasions, others of less importance, commercially, are heard. Ships are heard all over the Pacific. NIO, the U. S. Navy Vessel KANSAS sent a TR report to Ketchikan naval station, and it was also heard by an amateur using a bulb detector and a makeshift tuner. At this time the NIO was using 4.2 kilowatt and was, I think, 3200 miles from Ketchikan. Anyway, it established a new record for naval 5 KW sets. Let's keep it up.

#### NORTHWESTERN DIVISION

John D. Hertz, Mgr.

Summer is nearly here but still only a slightly increasing difficulty is experienced in handling traffic, and the CW sets now on the air seem to be having even less difficulty. It is getting to be more and more difficult to work 7CC, while on the other hand more luck is had between Portland and Seattle. Work north and south is as regular as ever.

In Montana, Asst. D.M. Cutting is very optimistic over the outlook for keeping the Northern Route open all summer. And he is doing his part well, by tearing up the air with his station 7LY, which works 9's on the east, gets south well, and tears in at Seattle and Tacoma, tho is not as loud in Portland.

Mr. E. L. Wharton, 7EX takes the "cake" this month for amount of traffic handled with a total of 384. Do any of the other transcontinental routes handle as much traffic?

7ZG being a "tiller of the soil", does not find as much time for radio work at present due to spring farm work. As a result he will not be with us as often.

7ZM (Ex-7CC) is apparently suffering the worst due to QSS. Still he is on quite regular and is trying hard to keep his end of the line open.

7YA at Boise offers a good alternative route for "east and west" business, and he gets his share, most of which goes via the Montana stations 7EX, 7ZG and 7LY and some direct to the ninth district. He seems to be taking the bulk of the eastern business from Central and Northern California.



7FI and 7BQ at Pullman are also coming to the front in the relay game, and make good alternates for 7ZM. They are handling considerable traffic with 7BK and 7AD to the west, also 7CN and 7BD in Portland; but, with 7ZM, find it hard going east.

7FQ at Tekoa, Washington is beginning to get out, and works Spokane stations.

In Seattle 7BK, 7AD and 7CA are the principal stations this month, 7BK taking the bulk of the business, as 7AD is conducting research work along the radio-telephone end of the game.

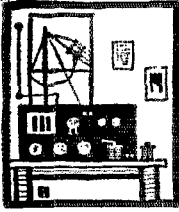
Mr. Hunter Onstine, 7LS, of Ferndale, Wash., is a new arrival in the relay game. He is in communication with 7IY at Vashon Island who in turn works both east and south. This opens up a new district which has heretofore been dead to the world. This station together with 7FO in Everett, Wash., makes up the long lost route to Canada, where 5BA and others await.

In Tacoma 7CE does the best work with 7BC a close second. 7CB and 7BA also get out and are doing their part to make Tacoma the second largest relay center in the Pacific Northwest.

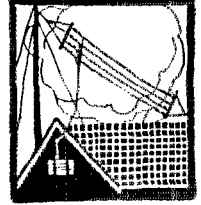
A new station appears at Hoquiam, Wash. on Gray's Harbor; 7NN, who works 7BK, 7BQ, 7BC and others. This opens a district that has been dead since before the war.

In Eugene a new D.S. is due for appointment. Therefore, no report has been had from there. Portland, while still the largest relay center of the Pacific Northwest, is losing many of its men. 7BP has dismantled for the summer, and is commercial operating in Alaska. The D.M. is leaving at the time of this writing for another point in Alaska. 7DS has been out of commission for some time. 7ZI has dismantled his spark set and is now con-

(Concluded on page 42)



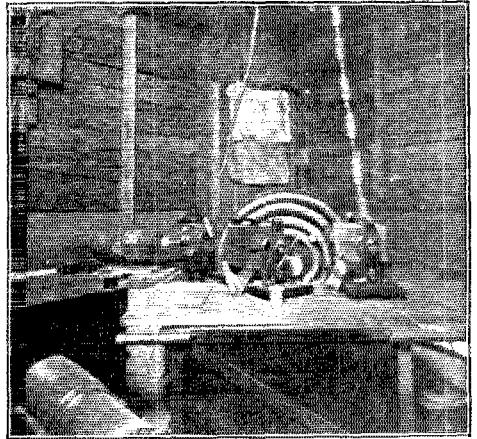
# Amateur Radio Stations



## 8ML, CLEVELAND, OHIO

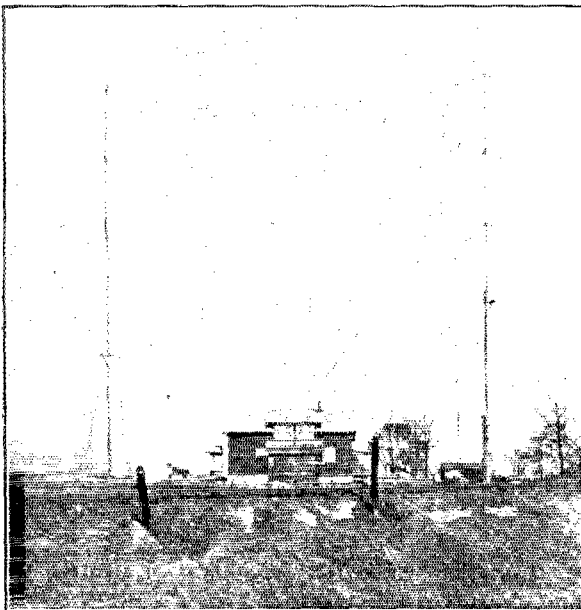
Here's a station that, like 8ZR, has a real set of masts. 8ML is the station of Mr. Frank M. J. Murphy in Cleveland, and is one of those stations that have helped to make the Amrad gap famous.

To jump right into a description, the front mast (left) is 112 ft. high, 68 ft. being of timber and the balance of 2" and 1½" pipe, while the rear mast is two feet shorter, of similar construction, with 100 ft. separating the two. In this space is hung a ten-wire fan aerial, the wires being of uneven spacing so as to provide the same length of current path for every wire and its neighbor, regardless of their distance from the center of the system. A top cable of 7-strand No. 20 bronze, insulated with two 10" Electro-seal insulators at each end, carries the fan, which is made of Jupiter 7-strand No. 22 copper. Mr. Murphy estimates that he put up these masts 50% with the help of Mrs. 8ML, 40% alone and 10% with the help of interested neighbors. He threatens to put



up another so as to have a triangular inverted cone, from which we see that a few more 112-footers are nothing in his young life.

The transmitter shack, under the center of the aerial is 10' x 12', made of scrap lumber left from the construction of the house. The transformer is a 1 k.w. open-core United Wireless with a home-made primary winding, while the condenser is made of 22 sheets of 8 x 10 copper and 44 sheets of 11 x 14 photographic glass immersed in oil, capacity not known to us. Two ½-k.w. Amrads form the gap equipment, while the O.T. is a "he", home-made with one-inch copper tubing for the primary and 2½" ribbon for the secondary. Either 8ML's aerial is a bit too ambitious or his wave meter lies, for he finds it impossible to get down to 200 meters without a series condenser, and two .002 mfd. Marconi jars are used in series in the ground lead for this purpose. Notwithstanding the inevitable loss in such an arrangement, 8ML is QSA everywhere

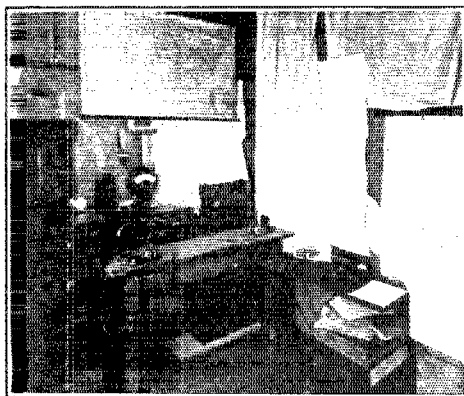


within a respectable range, and has been reported from 7ZJ, Vancouver, Wash.

8ML also uses one of "Round's round grounds", made of 8 sheets of 3 ft. x 8 ft. Armco galvanized iron, set edgewise in a trench 5 ft. deep and 21 ft. diameter, surrounding the shack. Two leads of No. 10 R.C. wire run to each plate.

The transmitter is mechanically controlled from the operating room, 40 ft. distant. The receiver comprises a Grebe CR-3, audiotron detector, home-made 2-step amplifier using Acme transformers and Radiotrons, Baldwin phones, and Edison A batteries.

The details of the arrangement, we believe, will speak for themselves.

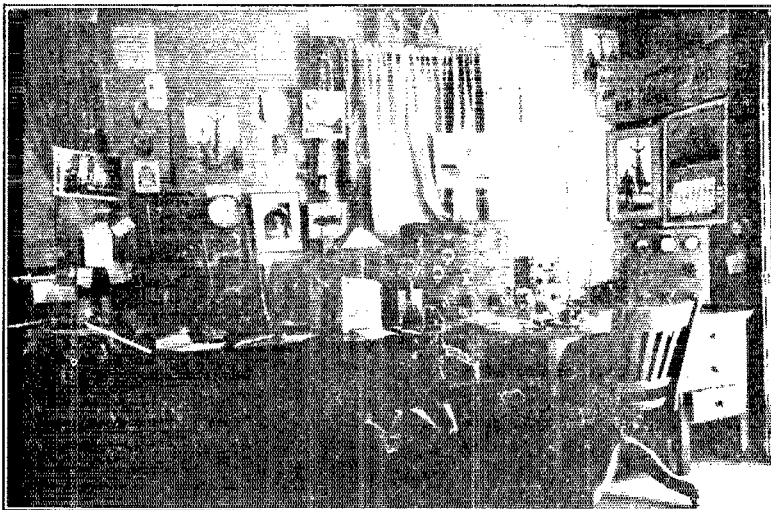


## 6XAD, AVALON, CATALINA ISLAND, CALIF.

Not a vast amount of explanation is needed, in order to grasp the details of 6XAD, ex-6BX, the very efficient station at the residence of U.S. Deputy Fish and Game Warden Lawrence Mott, on Catalina Island, thirty miles off the coast of California. Mr. Mott is the well known author, and his hobbies are fishing (note

VT-2's. Mr. Mott is now experimenting with the new U.V. 202's, finding them most satisfactory. The transmitter is so built that any of several wave lengths is instantly available.

6XAD has been reported QSA as far north as Vancouver, down in New Mexico, and as far east as Pittsburgh. The an-



the photograph—courtesy P. V. Reyes, Avalon), big game shooting, and radio. His receiving apparatus consists of a Kennedy long-wave and a Grebe short-wave CR3 regenerative receiver. He employs a two-step Grebe amplifier for both, in conjunction with an audion detector and Baldwin 'phones. The transmitter is a C.W. set, operated on city current, and using from three to five

tenna is an inverted "L", max. height 70', 4 wire, No. 14 soft-drawn copper. Grounds are water pipes and a 7' x 12' sheet of 1/4" copper, buried beneath the antenna.

For reception on his Kennedy he uses a single wire, 300' long, and he claims he hears *all* the power stations of the world. His antenna current, transmitting, is from 1.5-3 amps.

Warden Mott is extremely anxious to

make up a schedule for serious long distance work with C.W., with interested amateurs, and asks that he be reported by postal card. He uses 200 and 225 meters.

### **1QP, S. MANCHESTER, CONN.**

1QP, owned by John L. Reinartz at South Manchester, Conn., is another of the stations that are doing splendid DX work with Amrad gaps. Our photographs show that his equipment is neat and business-like, the receiver being mounted in an upstairs room from where operation of the transmitter in the cellar is remotely controlled. The aerial is a slanting flat-top of large gauge aluminum wire with one end on a mast on the house and the far



end high up in a tree. Each flat-top wire and its corresponding vertical wire are in one piece, doing away with the almost hopeless proposition of soldering joints in aluminum wire.

The receiving tuner is of the type described elsewhere in this issue, so nothing more will be said of it here except to state that it works fine. The tube equipment is a detector-three-step and is quiet. 1-Kewpie's mascot adorns the top of the tube cabinet.

The transmitter consists of a home-made transformer with a secondary wound in pies and giving a potential of about 40,000 volts; a home-made glass plate and

foil condenser immersed in oil, a Thor-darson oscillation transformer, and an Amrad quenched gap remodeled to handle a greater voltage per gap than customary. In the power line is placed a large constant-duty rheostat of commercial make capable of giving a gradual and even control. By the adjustment of this resistance 1QP can vary his note from 30 cycles to 500 cycles. The antenna current is highest at the high frequency but 1QP is wise and knows that it is the power in each wave train that counts and that his condenser voltage builds up highest at the lowest frequency. Consequently he is at present using a 30 cycle note which, while not particularly pleasant to hear and sometimes sounding like static, certainly has the punch behind it and reaches out. During the Amrad transcontinental relays 1QP gave a fine performance and was regularly QSO 9PV on 200 meters and with a note of 30 in Chicago. The normal antenna current cycles is about 3 amperes.

### **OPERATING DEPARTMENT**

Report of Northwestern Div.

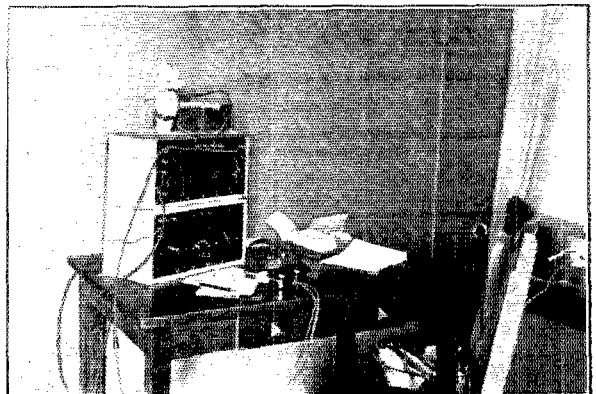
*(Concluded from page 39)*

fining his activities entirely to the development of C.W. 7JW, 7ED, and 7DA are the principal sparks handling traffic.

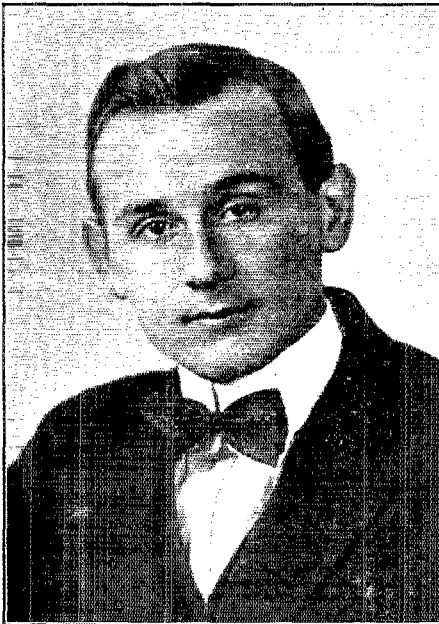
In Vancouver 7ZK and 7CM continue steady. 7BS is off for the summer, having also gone to Alaska commercial operating.

A.R.R.L. work of the Division has been turned over to Mr. R. T. Galyean, 460 Miller Street, Portland who will discharge the duties of the office from the present date.

Busiest station 7EX, 384 msgs.



# Who's Who in AMATEUR WIRELESS



**CLIFFORD J. GOETTE**

Mr. Goette, Assistant Manager of our Atlantic Division, is the well known operator of Station 2JU at Woodhaven, Long Island and accordingly needs no introduction to our readers altho we are all glad to see what he looks like.

Goette is one of the old-timers, having become interested in radio in 1908 while employed at a local railroad telegraph office on a 12-hours-per-day job. Between clearing "19's" and "31's" he managed to find time to read up on the subject, which was then decidedly in its infancy, and erected a small spark-coil transmitter. Being unable to connect up with FV, now 2ZV, A. H. Grebe, Jamaica, L. I., but little over a mile away, he decided he needed more kilowatts and so installed a transformer and eventually had a range of 25 miles.

At the outbreak of war Goette joined the Signal Corps and was assigned to Radio Tractor Units in the Military Intelligence Branch, serving along the Mexi-  
(Concluded on page 57)



**S. KRUSE**

Hurray! We finally got a photograph out of Kruse, but it was like pulling eye-teeth!

It gives us a great deal of pleasure to present this likeness of "LQ" to our readers, for we are proud of him and his ability. He was born in Halstead, Kansas, (doesn't say when) but insists he is proud of the place. The scheduled interest in radio was born upon reading an article in McClure's, describing Marconi's first transatlantic tests, and he started playing with a coherer set in 1907, eventually hearing Fort Leavenworth's 2 k.w. fixed gap set twenty-seven miles away, an accomplishment which was fittingly celebrated. He went thru engineering school at Kansas State University at Lawrence and while there operated old 9LQ (whence the present personal sine "LQ"), also old 9XP. 9LQ was a part of the old 9JW-9EP-9LO-9DM-9ABD-9MQ gang that relayed thru Kansas and Missouri in the good old days, and was a good station without question, as it  
(Concluded on page 57)

# Strays



## More Transcon Dope

The following additions to the story of the Transcons as reported in the March QST have been received:

Transcon 14 msg. nr. 2 was originally reported stalled at 6ZH. 6ZH gave it to 6ZA, but received no QSL. 6ZA passed it to 6ZO, while 6ZH continued his endeavor to pass it on. Unfortunately he developed condenser trouble but gave it on low power to 6JD who was unable to work west until 3:30 A.M. mountain time, when he passed it on to 6KA. So it finally got to Los Angeles after all.

Transcon 15 reply nr. 3 was reported stalled at 6JT. 6JT is now reported as having given it to 6KA and QSL received, but no time reported.

Transcon 16 reply nr. 1, reported stalled near 1FU, actually got through as it was copied direct at 1FV in Portland when 1AW gave it to 2RK, although no QSL could be given.

According to "QTC", published in Rochester, the reason C.W. is so popular is that it means "Caressing Women".

An amateur entered our cell the other day and talked so much about a telephone station whose carrier wave he could constantly hear but who never talked, that we were prompted to investigate, and so we went out to his shack and asked him to tune in this fellow. With a certain adjustment on his regenerator, his bulb howls beautifully. We didn't have the heart to tell him what it was.

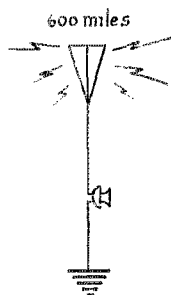
We are proud of the city of Lafayette, Indiana. Professor R. V. Achatz of Purdue University, City Manager, reports he has his city tuned down to 200 meters, and has personally checked up every station under his jurisdiction, with several of the smaller stations operating on 160 and 180 meters. Let's have more cities like Lafayette.

We have felt obliged to discontinue the two pages in QST known as "Directory of Calls" because calls are being issued at such a rate as to make it hopeless for us to keep up with them in the limited space available.

From the New York American:

"Minister's sermon carried 600 miles by wireless.... In delivering his sermon he simply spoke into the mouthpiece of an ordinary telephone transmitter which was connected with the aerial."

And all the while we have been wasting our time arguing about grid modulation versus Heising modulation and what not!



Station 2RK has been indefinitely closed for an alleged interference with the U.S.N. compass station at Sandy Hook on 800 meters. While that charge in itself is subject to considerable question, it is reported that 2RK continued operation after having his license suspended, and is now charged with that, with operating on an illegal wave length, with operating CW equipment not covered by his license, and with signing the letters "KH" for a call. If the charges against Hewitt are substantiated, it is probable that 2RK will be no more.

We again point out to our members that the radio laws must be obeyed.

In the catalogue of the Charles William Stores we find a nice picture of the well-known Arlington receiving transformer, price \$9.98, and under it these illuminating words: "Same as used at Arlington wireless station. Wave length 4,000 miles."

*Things we want to know:*

Where a ground lead ends, and the real ground begins.

The truth about power factor in an oscillating circuit.

The why of a resonance transformer.

When 1TS sleeps.

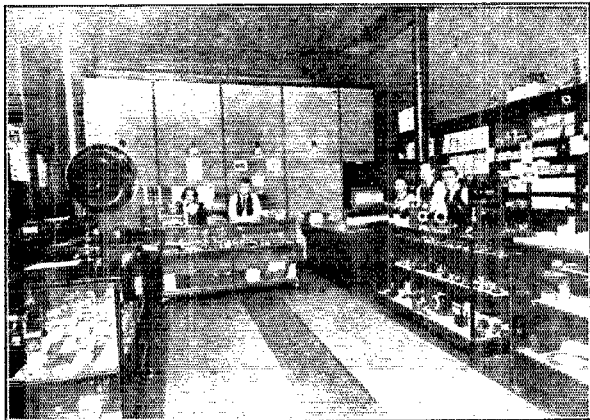
Why 8ZL reaches out.

How to eliminate induction in the nearby wiring.

In the first item in "Strays" in March QST, we requested data from A.R.R.L. men who served in radio during the war. Do you mean to say that no more of you

chaps who haven't dropped us a postal giving us the desired information were in the radio service? Shake a leg, fellows, and send in the dope as we want to have a complete roster of what we did during the war.

We certainly like the action of The Benwood Co., Inc., in stimulating summer interest by their offer of monthly prizes for the best operation during the hot months. If all the manufacturers would get behind the gang in this manner, things



The Benwood Store, St. Louis.

would certainly hum during the dog-days. We thank the Benwood Co. for this and hope that other manufacturers will evolve ideas of special interest during the summer months, as we know they will surely rebound to the benefit of all concerned.

Have you tried the Turney Spider-Webs? With a couple of variables they certainly make a neat and serviceable little regenerative tuner. They work fine and they are great for a portable set too.

If you have your transmitter in a dog-house or bird-house in the back yard, put a padlock on it. According to "QTC" a Buffalo amateur had his entire transmitter stolen recently. It was set on a pole in his yard and operated by remote control.

The "Richmond (Indiana) Palladium" announces the installation of radio apparatus as part of its regular news gathering machinery, with call letters 9SS.

Station 8AYM is owned and operated by C. M. Nichols of 8ACM and if heard please forward cards to address of 8ACM. The station formerly had another operator, R. W. Bissell, but he has dropped out of 8AYM in order to have time to operate his own station 8TY.

#### Hints for QRM Makers:

Don't sit on your key. It is tiresome and a brick is much more convenient.

Never use a Helix or O.T. They are too expensive.

Never copy a message, memorize it. Paper is too expensive.

Don't answer the fellow who calls you. He likes to call because it lets the other fellows know that he is on the job.

A correspondent wants to know, now that we have synchronous gaps, how to set the rotor so as not to blow all the condensers in the country. That's just it, OM, the idea is to adjust it so as to get that maximum voltage that punctures every ordinary condenser and then build a he-condenser that will hold it and thereby get some real juice out of the old set. But it surely does take a condenser.

Speaking of records: 2BK is reported heard by 6KA in Los Angeles about 4:38 A.M. E.S.T., April 19th. About the same time next day 9OE and 9PS both called 2BK saying "QSQ 6KA", so it would seem that 6KA heard 2BK on two occasions. But that isn't all; we have a postal from 8AGK, Lancaster, N. Y., advising that at

4:30 A.M. April 20th, he heard 6KA calling 2BK.

8ZA was copied by 6EJ, Walnut Grove, Calif. on January 19th.

3HJ has been heard 200 miles west of the Azores, a distance of 2300 miles.

9LC, Bill Woods, St. Louis, has now been heard in Portland, Maine; Los Angeles; Ontario; Telos, Cuba; and most places in between, all on  $\frac{1}{2}$  KW.

"A. Novice" recently complained about the straps on his honeycomb coils "per-spining". 2ATV discovers that celluloid makes a wonderful substitute that stands the hot weather OK.

1AW is now broadcasting reports of automobiles stolen in Hartford and other important police news daily at 9:30 P.M., E.S.T.

Not that we care, but dijanotice that Sears-Roebuck's artist found out what a radio station looks like from Hoffman's drawing on our October cover? See the circular illustration on the rear cover of their catalogue.

# Calls Heard



## HEARD DURING APRIL Unless Otherwise Specified

### Instructions to reporters:

(1) Typewrite or neatly print the calls, "double-spaced," on a separate sheet of paper, running them across the sheet, not down a column, and writing on but one side of the paper.

(2) Arrange alphabetically thru each district, from 1 to 9, with no break between districts, using commas to separate items and putting parentheses around calls of stations also worked—all as per the lists below.

(3) The period covered by the report shall be from the first of one month to the first of the following month. All lists must be received by us by the 10th of the second month, for publication in the next following QST.

### HEARD AT SEA.

J. C. Taylor and L. S. Butler, aboard U. S. S. "Buffalo", at San Diego, Calif.:  
5ES, 5ZA, 5ZZ, 6XZ, 6EA, 6ED, 6EJ, 6FI, 6GK, 6HR, 6HP, 6IC, 6IF, 6IM, 6JQ, 6OC, 6PE, 6XC, 6AIW, 6BX, 6ZI, 6ZJ, 6ZC, 6ZU, 6ZV, 6UU, 6YT, 6ACD, 6ZN, 6ZL, 6DIN.

T. W. Braidwood, Opr. KOSM, Mar. 11, 350 miles east Portland, Me.: 1CY, 1XM, 1GBC, 3HG, 3DA, NSF. Mar. 12, 645 miles east, 1AE, 1ARY, 1EAV, 2YM, 3DH, 3DN, 3HJ, 3RK, 3SK, 3ML, 3AMZ. Mar. 14, 1250 miles, 3DH.

### CAN. 9AL, TORONTO, ONT.

1RD, 2ABR, 2BML, 2XQ, 3AAE, 3CC, 3AGZ, 8BO, 8IV, 8JM, 8JW, (8LF), (8PJ), 8XB, (8ZG), 8ZN, 9ZZ, 9AZX, 9AJA, 9XI, 9XM.

### CAN. 3KU, NIAGARA FALLS, ONT.

1AW, 1CK, 1DV, 1FW, 1GB, 1IA, 1JA, 1LZ, 1QP, 1RZ, 1TS, 1VV, 1XK C.W., 2BG, 2BM C.W., 2DA, 2DR, 2EL, 2EN, 2JJ, 2RK, 2RM, 2VA, 2UK, 2XX C.W., 2VE, 2ZL C.W., 2ZM C.W., 2LR, 3AAO, 3DS, 3EN, 3KM, 3PU, 3XM, 4XB C.W., 8AAX, 8ABT C.W., 8DR, 8AGK, 8AGZ C.W., 8AJR, 8AKX, 8AMQ, 8ANK C.W., 8ANR, 8ANT, 8AOA, 8APB, 8ARS, 8AXQ, 8AXQ, 8AYJ, 8BB C.W., 8BU, 8DR, 8DS, 8FO, 8GI, 8HR, 8IK C.W., 8JW fone & C.W., 8LQ, 8MB C.W., 8NB, 8OZ, 8QM, 8SB, 8SP, 8WE, 8WV, C.W., 8WY, 8XU, 8LB, 8LN C.W., 8LR, 9AEQ, 9AO, 9BY, 9IP, 9LQ, 9MC, 9XI C.W., 9XM C.W., 9ZN, CANADIAN—3BA, 3BP, 3CA, 3CO, 3DS, 3EP, 3FK, 3LE C.W. & fone, 3AQ, 9AL C.W. & fone, 9AJ fone.

### 1TS, BRISTOL, CONN., One Tube

Spark stations: (1ACZ), (1AW), (1BBL), 1CBI, 1CBT, 1CCL, 1CK, 1CM, 1CY, 1DAL, (1DAP), 1DR, 1DY, 1EBW, 1EP, 1FBE, (1GAI), 1GAN, 1GAS, 1GBC, 1GM, (1GY), 1HAA, 1HBT, 1IA, 1JAP, (1JAU), (1JBF), 1JQ, (1JX), 1KAC, (1LAP), 1LBR, 1MAD, 1MBS, 1NAQ, (1NAT), 1NBJ, 1NBP, (1OAA), 1OAD, 1OBE, 1OEH, 1OE, 1OJ, 1OT, 1PG, (1QP), (1QT), 1RAD, 1RAK, (1RAY), 1SBS, 1SN, (1SZ), 1TBJ, 1TL, (1UJ), 1UN, 1UQ, 1WR, 1XM, 1YB, 2ACD, 2AFP, 2ALY, 2AR, 2BEH, 2BGH, 2BGR, 2BK, 2BLP, 2BM, 2CL,

2CO, 2CT, 2DA, 2DI, 2DN, 2DX, 2EL, 2FG, 2JJ, 2JU, 2MG, 2MX, 2OA, 2OM, 2OW, 2PL, 2RK, 2RM, 2SS, 2SZ, 2UA, 2ZM; 3AAN, 3ACE, 3ACM, 3ACT, 3ALN, 3BG, 3BZ, 3CC, 3CK, 3DH, 3DS, 3EN, 3FJ, 3FR, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IM, 3KM, 3LP, 3NB, 3OU, 3PU, (3RW), 3UF, 3VV, 3XF, 3XM, 3ZA; 4FD; 5ADK, 5ADQ, 5AGD, 5AGK, 5AJO, 5AL, (8AMM), (8ANT), 8AOT, 8AP, 8AFB, 8ARD, 8AVD, 8AWP, 8AXO, 8BB, 8BC, 8BQ, 8CG, 8CH, 8DR, 8DY, 8FE, 8FK, 8FG, 8GL, 8HA, 8HF, 8HR, 8HY, 8ID, 8IL, 8IN, 8KZ, 8LQ, 8ML, 8MM, 8MZ, 8NI, (8PT), 8QC, 8QE, 8RQ, 8SP, 8TN, (8VW), 8WY, 8XE, 8XU, 8ZA, 8ZD, 8ZR, 8ZW, 8ZX, 8ZY; 9HJ, 9HR, 9K, 9IQ, 9UH, 9YB, 9ZJ, 9ZN; Canadian 2DD.

C.W. stations: (1AB), (1AE), 1BAY, 1CK, 1DBZ, (1DH), 1DR, (1DT), (1FBK), (1GAI), 1HBA, 1HBP fone, (1IBF), 1IL, (1JRF), (1KAZ), (1KBL), (1MO), (1NAQ fone), 1NBA fone, 1NBS, (1RD), 1RZ, 1UD, 1XD fone, 1XE fone, 1XV fone, (1XX fone); (2ADL), 2AJF, 2AJW, 2AKO, 2AZP, 2BDU, (2BML fone), 2FD, 2HI, 2HZ, 2PE, 2UD, 2ZA, 2ZQ, 2XX, 2XL fone, 2ZM; 3AAE, (3AAO), 3ABI, 3CC, 3JC, 3LE; (3AGZ), 3AJ, 3AKE, (3APH), 3ASM, 3BO, 3DR, 3GA, 3HI, 3IB, 3IV, (3JM), 3JU, 3KM, (3LF), 3LV, 3OH, (3PJ), 3UJ, 3UK, (3VS), 3XK fone, 3XN, (3YG fone), (3ZG), 3ZN fone; 9AJA, 9AZX, 9XI, (9ZB); Canadian 3AB, 3AL; (NMW), NSF, WWV.

### -10BK, SOMERVILLE, MASS.

1HAA, 1NAQ, 1SBZ, 1TS, 2AX, 2AFP, 2AJF, 2AOF, 2BM, 2DN, 2DY, 2EL, 2FG, 2JJ, 2JN, 2JU, 2MME, 2MZ, 2OM, 2OU, 2RK, 2RM, 2UA, 2UC, 2UK, 2VD, 2XM, 2XP, 2ZC, 2ZL, 2ZM, 3AAE, (C.W.), 3CC, 3EN, 3EV, 3GO, 3HG, 3HJ, 3HX, 3IB, 3IW, 3KM, 3NB, 3OU, 3PU, 3RW, 3XM, 3YK, 3YV, 3AG, 3AGK, 3AMQ, 3AMZ, 3AVD, 3AWP, 3AXC, 3BC, 3CG, 3DZ, 3FK, 3GI, 3HR, 3KZ, 3RQ, 3SP, 3UE, 3WY, 3XB, 3XK, 3YG, 3ZD, 3ZG, 3ZW, 3KF, 3ZJ, NSF, WWV.

### 1MO, F. H. Schnell, 134 Oakland Terrace, Hartford, Conn.—All C.W.

1AE, 1BV, (1PQ), 1GAL, (1KBW), (1NAQ), 1NBA, 1NO, 1RD, 1SZ, (1TS), 1UN, (1VAD), 1XM, 1XV, 2ACZ, 2ADL, 2AJF, 2AJW, 2AKO, 2BB, 2HI, 2XA, 2XAC, 2XX, 2ZL, 2ZM, 3AAE, 3AAO, 3CC, 3CD, 3DE, 3DZ, 3IB, 3IV, 3YG, 3ZN, 3ZV, 3XI, NMW, NSF, NHT, WWV, XBI, XFI.

### 1XM, CAMBRIDGE, MASS.

1AW, 1HAA, 1MAD, 1OE, 1RAY, (1's too numerous), 2AC, 2ADD, 2ADM, 2ALD, (2BK), 2DI, (2DN), 2DR, 2EL, 2FG, (2JU), 2OA, (2OM), (2OW), (2RK), 2SZ, (2UK), 3AAD, 3AAE, 3AAN, 3AAO, 3ACM, (3ACT), 3AFE, (3AHK), 3AJD, 3ALN, 3ABC, (3BG), 3BP, 3BZ, (3CC), 3CCM, 3DY, (3EN), (3EV), (3GO), (3HG), (3HX), 3IB, (3IW), 3KK, (3KM), 3MF, (3NB), 3ND, 3OS, (3OU), 3PF, (3PU), 3QF, 3UJ, 3VJ, 3VM, (3VV), (3XF), (3XM), (4BY), 4YA, 5ZA (Continued), 5AR, 5ABZ, 5AW, 5AEE, 5ACM, 5AFF, (5AGK), 5AIO, (5ANT), 5ARD, 5AWP, 5AWX, (5BC), 5BO, (5DR), 5FU, (5ID), 5JE, 5KZ, 5LD, 5MC, 5MG, 5ML, 5MM, 5MR, 5MZ, 5NZ, 5OZ, 5PX, 5QE, (5RQ, 5SP), 5WV, 5WY, 5XE, 5XK, 5XU, 5YN, 5AR, 5AW, 5AAQ, 5AAW, 5AWZ, (5CA), (5DLX), 9GJ, 9GP, 9HJ, 9JN, 9KF, 9MS, 9NQ, 9NW, 9OE, 9UH, (9UU), 9XU, 9ZJ, 9ZN, (NSF), (WWV), (WZAA), XFI.

### 10BE, NORWICH UNIVERSITY, NORTHFIELD, VERMONT

1AE, 1AW, 1BAY, 1BB, 1CAO, 1CCY, 1CF, (1CK),



1CM, 1CY, 1DAC, 1DAL, 1DY, 1EAV, 1FV, 1GBC, 1GBT, 1GM, 1GY, 1GP, (1HAA), 1HAF, 1HBZ, 1HO, 1IA, 1JZ, 1MAD, 1MBA, 1MBS, 1OE, 1OJ, 1PAO, 1PAZ, 1PG, 1QR, 1RAD, (1RAY), 1RV, 1SBZ, 1SW, 1SY, 1SZ, 1TS, 1XM, 1XF, 1YB, 1YP, 2AH, 2AJ, 2AJF, 2AR, 2ARA, 2AS, 2AWF, 2AWO, 2BG, 2BGR, 2BK, 2BM, (2BML), 2CC, 2CT, 2CM, 2DA, 2DD, 2DI, 2DM, 2DN, 2DX, 2EI, 2FM, 2GR, 2IM, (2JJ), 2JU, 2OA, 2OO, 2OW, 2QR, 2RB, 2RK, 2RL, 2TK, 2TS, 2UA, 2UK, (2VA), 2XA, 2XK, 2YK, 2ZM, 2AHK, 2ABG, 2AGR, 2BZ, 2CC, 2DM, 2DS, 2EN, 2EV, 2FR, 2GO, (2HJ), 2HX, 2KM, (2NB), 2OBD, 2OU, (2PU), 2UC, 2VV, 2XI, (2XM), 2ZE, (2ZL), 2ACE, 2ADQ, 2AGD, 2AIO, 2AGK, 2AGO, 2AMM, 2AVD, 2AWP, 2AXC, 2BC, 2BV, 2CD, 2FE, 2GI, 2HR, 2IN, 2IL, 2JM, 2KZ, 2LQ, 2ML, 2NI, 2MI, 2OW, 2PO, 2QM, 2RQ, 2SP, 2WY, 2XE, 2XU, 2XK, 2ZA, (2ZD), 2ZN, 2ZR, 2ZJ, 2ME, 2ZU, 2ZJ.

**2BML RIVERHEAD, LONG ISLAND, N. Y.**

1AE C.W., (1BAB), (1BBL), (1CBT), 1CK, 1CP, 1CY, 1EBW, (1FBV), (1FV), (1FW), (1GAI), (1GAV), (1GM), (1HAA), (1HO), (1JAP), (1KBM), (1LBR), 1MAD, (1MX), (1NAZ), (1NBP), (1OAL) C.W., (1OBE), (1OE), (1QP), 1QW, 1RAK, 1RAS, 1RAY, (1UQ), 1XM, 1YB, 2ADL) C.W., 2AHK, 2AJW, (2BGR), 2CT, 2FG, (2HI) C.W. & fone, 2OM, 2RK, 2SZ, 2UK, 2ZL, 2ZM, 3AAE, 3AAO, 3ACK, 3AHD, 3BZ, (3CC), 3DM, (3EN), 3FG, 3GO, 3HB, 3NB, 3OA, 3PU, 3UC, 3UQ, 3XM, 3YK, (4BI), 8AC, 8ACC, (8ACF), 8AGD, 8AGK, 8AHD, 8AOT, 8ARU, (8AXC), 8BC, 8BO, 8BV, 8FU, (8HR), 8HY, 8IL, 8IN, 8KP, 8NI, 8PJ, 8PM, 8Q, 8RQ, 8SP, (8SH), 8TT, (8XE), 8XK, 8XM, 8KU, 8XW, 8ZG, 8ZQ C.W., 8ZR, 8ZV, 8ZW, 9HL, 9KF, 9MC, 9ZJ, NSF.

**2AVE, JAMAICA, N. Y.**

1AE, 1AW, 1CK, 1CM, 1DY, 1JQ, 1OE, 1XM, 1GAX, 1HAA, 1JAP, 1MAD, 1CBJ, 1GBC, 1GBT, 2's too numerous, 3AT, 3BC, 3BG, 3CC, 3EN, 3EV, 3GO, 3GL, 3HJ, 3IW, 3KM, 3NB, 3OW, 3VV, 3XF, 3XM, 3AB, 3ACT, 3ALT, 3APT, 4BY, 4FD, 8BC, 8CG, 8DP, 8DZ, 8FE, 8FG, 8GI, 8HG, 8HR, 8HY, 8KZ, 8LF, 8LQ, 8NL, 8NZ, 8OL, 8OS, 8OZ, 8QE, 8RQ, 8SP, 8TN, 8TT, 8TY, 8XE, 8XK, 8YN, 8ZD, 8ZV, 8ZW, 8ZY, 8AAZ, 8ACF, 8AKE, 8AFP, 8AGK, 8AGO, 8AIB, 8AIO, 8AMM, 8AMQ, 8AOA, 8ACT, 8APP, 8ASF, 8AUQ, 8AXC, 8AYN, 8BP, 8GP, 8LQ, 8MC, 8ME, 8OY, 8QH, 8UH, 8UK, 8UU, 8ZJ, NSF, WWV.

**2KV, BRONXVILLE, N. Y.**

1AW, 1BBL, 1CK, 1DY, 1GM, 1JAP, 1JQ, 1MAD, 1OE, 1QP, 1YB, 2FG, 2SZ, 3ABC, 3ACM, 3AHK, 3ALN, 3ATA, 3BG, 3CC, 3EH, 3EN, 3FG, 3GO, 3HJ, 3HX, 3IB, 3IQ, 3KM, 3NB, 3OU, 3PU, 3RW, 3TA, 3UC, 3UQ, 3XF, 3XM, 3YK, 3ZO, 4CK, 4SL, 7IM, 8AAZ, 8ABZ, 8ACF, 8ACS, 8APG, 8AGK, 8AHG, 8AHZ, 8AIO, 8AXC, 8BC, 8BO, 8BQ, 8BZ, 8DR, 8FK, 8FQ, 8FT, 8GI, 8HG, 8HR, 8HY, 8ID, 8IN, 8JO, 8KE, 8KZ, 8ML, 8QE, 8RQ, 8SA, 8SK, 8SP, 8TT, 8WY, 8XE, 8XU, 8ZD, 8ZN, 8ZW, 9AWX, 9JQ, 9LQ, 9MC, 9ME, 9UH, 9UU, 9ZJ C.W., 1NBA, 1QR, 1XM, 1XX, 2ACT, 2AJF, 2AJT, 2AJW, 2AKO, 2AWK, 2BDU, 2BH, 2BML, 2DF, 2FD, 2FZ, 2HZ, 2PM, 2RB, 2UD, 2XAC, 2XK, 2XQ, 2XX, 2ZL, 2ZM, 3AAO, 3CC, NSF, WWV, 1GL, 8DR, 8IV, 8JM, 8XK, 8ZG.

**2OM, RIDGEWOOD, N. J.**

(1AE), 1AW, 1BY, (1CK), (1CY), (1CZ), 1DY, (1GM), 1GBC, (1GBS), (1HAA), (1MAD), (1MAU), 1CE, 1RAY, (1SN), (1UL), 1W, (1XM), (1YB), (3AAG), (3ABG), 3ACT, 3AG, (3CV), 3FI, 3HG, (3HJ), 3HX, 3IT, 3IW, (3KM), (3NB), 3UF, (3VV), 3XF, (3XM), 4YA, (8ACF), 8AGK, 8AIO, (8BC), 8DR, (8GX), (8ID), 8NI, (8RQ), 8SH, 8SP, 8TT, 8WL, 8XE, (8XU), 8ZW, 9AAF, 9AAW, (9AWZ), 9CP, 9DLX, 9FF, 9LQ, 9UU, 9ZJ, 9ZN, NSF, WWV.

**2DK, SCARSDALE, N. Y.**

1AW, 1BBL, 1CBJ, 1CK, (1CY), 1DY, 1FV, (1GBC), 1GBT, 1HAA, 1JAP, 1LAX, 1OE, 1QP, 1RAS, 1RV, 1RZ, 1UN, (1XM), 1YB, 2AIF, (2BB, fone), 2BM, 2DA, 2FG, 2SZ, 3ALX, 3CC, 3CC, 3CV,

3DR, 3EN, 3FJ, 3FR, 3GO, 3GU, 3HG, 3HJ, Daylight, (3IW), 3OU, 3PU, 3UF, 3UQ, 3XM, 3YO, 3ABZ, 3AGD, 3AJT, 3AMQ, 3ARW, 3BC, 3DC, 3DP, 3DY, 3DZ, 3EF, 3GB, 3GX, 3ML, 3MM, 3NL, 3OJ, 3PT, 3RQ, 3SP, 3TT, 3WY, 3XE, (3XU), 3AAW, (3ACJ), 3AJH, 3AWZ, 3CP, 3DLX, 3FF, 3KL.

**3AGI, READING, PA., on s/licon**

1BBL, 1JQ, 1GBT, 1HAA, 1MAD, 1OBE, 1RAY, 1AW, 1BZ, 1CK, 1CZ, 1IA, 1JQ, 1QP, 1XB, 2BM, 2EL, 2FG, 2JU, 2OA, 2OW, 2QR, 2EI, 2FM, 2GR, 3AWV, 3BZ, 3BV, 3GO, 3HG, 3NB, 3VV, 3XF, 3XM, 3YK, NSF-fone, 3ABE, 3AGK, 3AGO, 3ABP, 3AXC, 3AYN, 3BC, 3BO, 3FK, 3GL, 3IL, 3KZ, 3ML, 3NI, 3QE, 3RQ, 3SP, 3VQ, 3XE, 3XU, 3YN, 3ZN, 3ZR, 3ZW, 3ZY, 9ABL, 9HJ, 9MC, 9QH, 9WE, 9ZJ, 9ZN.

**3CA, ROANOKE, VIRGINIA**

1AW, 1GBC, 1OE, 1TS (C.W.), 2BK, 2BML (C.W.), 2DA, 2FG, 2JJ, 2RK, 2ZL (C.W.), 2ZM (spk and C.W.), 3AAO (C.W.), 3ABC, 3AHK, 3BBE, 3CC, 3DH, 3EN, 3GO, 3HJ, 3HX, 3KN, 3OV, 3PU, 3UM, 3VV, 3XF, 3XM, 3YK, 3YU, 3YA, 3ZJ, 4AU, 4BY, 4DY, 4EY, 4FD, 4GN, 4YA, 5DA, 5EK, 5XA, 5ABZ, 5CV, 5AB, 5AMP, 5ANK, 5AOV, 5ARW, 5BC, 5CE, 5CF (C.W.), 5DC, 5PT, 5JE, 5JM (C.W.), 5ML, 5OW, 5RG, 5RQ, 5RY, 5SP, 5TN, 5WY, 5XE, 5YM, 5YN, 8ZY, 9AAF, 9ABG, 9ANV, 9ATW, 9AZX, 9FS, 9LQ, 9MC, 9OL, 9PS, 9SP, 9UH, 9UK, 9US, 9YA, 9YB, 9ZB, 9ZJ, 9ZL, 9ZN.

**BLACKSTONE MILITARY ACADEMY.**

**BLACKSTONE, VA.—March**

1NA, 1XX, 2NF, 2QR, 2XE, 2XX, 2YC, 3AA, 3CK, 3CY, 3DH, 3DN, 3ER, 3GO, 3GX, 3HG, 3NB, 3RG, 3PU, 3XM, 3XJ, 3YO, 1AW, 4DA, 4BA, 4BY, 4CA, 4CK, 4FD, 4YA, 4XB, 5AM, 5DA, 5ER, 5JE, 5AH, 5BV, 5FM, 5IK, 5IN, 5IV, 5JV, 5JY, 5KZ, 5OY, 5RX, 5RY, 5TM, 8WE, 8XE, 8XJ, 8XK, 8XM, 8YA, 8YR, 8ZD, 8ZG, 8ZL, 8ZJ, 8ZR, 8ZY, 8AAH, 8AGK, 8AGD, 8ARS, 8ARW, 9AF, 9A, 9BD, 9CD, 8GJ, 9GN, 9MF, 9SX, 9TS, 9VX, 9YB, 9YD, 9YN, 9ZA, 9ZD, 9ZN.

**4CK, WINSTON-SALEM, N. C.**

1QP, 1GBC, 1AW, 1CK, 1MAD, 2BK, 2JN, 2BGH, 2EL, 2UA, 2DA, 2RK, 2JJ, 2DN, 2BGR, 2JU, 2ZL (C.W.), 3BP, 3XM, 3AHK, 3CC, 3FG, 3FX, (3GO), 3HJ, 3EN, 3ACT, 3AB (C.W.), 3PU, 3AN, 3FV, 3AVV, 3UG, (3VV), 4XF, 3OU, (3ACE), 3KM, 3YV, (3BZ), (3AEV), 4YA, (4XC), (4BK), (4BY), (4FD), 4AU, (4GN), 4AM, 4CF, 4GL (C.W.), 4DV, 4DT, 5XA, 5YE, 5DA, 8QE, 8ZN, 8ZI, 8AMJ, 8YK, 8ZW, 8AFB, 8LV, 8SP, 8HG, 8ADE, 8ACF, 8YN, 8LY, 8RU, 8AYN, 8ARW, 8ZV, 8GX, 8AOU, (8RQ), 8WY, 8ZA, 8CF (C.W.), 8MM, (8AGD), 8NL, 8OM, 8IN, 8ZD, 8FG, 8DC, 8ABE, 8XI, (8AXC), 8XE, (8AKH), 8DI, 8AIC, 8DJ, 8ZR, 8AIE, 8GW, 8AKV, 9WE, 9FN, 9ZB, 9AAW, 9LQ, 9YC, 9LP, 9AIR, 9APS, 9FD, 9MC, 9FS, 9NJ, 9ZN, 9LF, 9AWU, 9UH.

**5LO, MIAMI, OKLA, March**

5YA, 5BL, 5BM, 5CL, 5EA, 5ER, 5EU, 5EW, 5FB, 5GW, (5HJ), (5HL), 5IB, 5JD, 5JM, 5JR, 5JS, 5LR, 5SL, 5XS, 5YE, (5YH), 5ZA, 5ZR, 5ZS, 5ZV, 5ZW, 5ZX, 5IK, 5ZL, 8AGD, 9AP, 9DF, 9DY, 9EL, 9EQ, 9GS, (9HI), 9IZ, 9JA, 9JG, 9JN, 9JQ, 9KF, 9LQ, 9LE, 9MS, (9OE), 9OO, 9PS, 9QO, 9RC, 9RR, 9SI, 9TK, 9WQ, 9WS, 9WU, 9XI, 9XM, 9YA, 9YI, 9YY, 9ZA, (9ZB), 9ZG, 9ZJ, 9ZL, 9ZR, 9ZV, 9ACL, 9ACN, 9ACX, 9AEG, 9AEY, 9AEZ, 9AFX, (9AIZ), 9ANF, 9AOJ, 9AQE, 9ATN, 9ATO, 9AWG, 9AXU, 9HB, 9XAE fone.

**5JY, DALLAS, TEX.**

(5AL), 5AL, 5BM, (5CE), 5OW, 5ER, (5EW), 5ES, 5EL, 5FA, 5FB, 5FE, 5GU, (5HF), 5HL, (5HV), (5IB), (5IE), 5IF, (5IS), (5IU), (5IX), 5JA, 5JD, 5JE, (5JG), (5JL), (5JU), (5K), (5KK), 5KQ, (5LC), 5MC, 5ME, (5MK), (5ML), (5MM), (5MR), (5NC), 5NG, (5NY), 5XA, 5XB (5XM), (5XG), 5XJ, 5YE, 5YH, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG, spk-fone-mod. C.W., 5ZL, 5HG, 8AKV, 8KK, 8MR, 9AAC, 9AAZ, 9AEG, 9AEG, 9ABY, 9AL, 9ANP, 9AWO, 9AON, 9AUO, 9CA, 9DKP, 9EL,

9FF, 9FU, 9HL, 9HT, 9JA, 9JN, 9JQ, 9LA, 9LC, 9LW, 9MC, 9MM, 9NQ, 9OE, 9OR, 9PS, 9QO, 9QQ, 9UT, 9WN, 9WU, 9WW, 9XI C.W., 9XM C.W., 9YA, 9ZA, 9ZL, 9ZQ, 9ZY C.W.

SOD. QUINLAN, TEXAS

5AL, 5CE, (5DW), 5ER, 5EW, 5FB, (5HF), (5HV), 5IB, 5IF, 5IS, 5IU, 5IX, 5JG, 5IU, 5JY, 5KK, 5LC, 5MM, 5NC, 5ZA, 5ZB, 5ZC, 5ZF, 5ZG C.W., music and phone, 5ZL, 5ZS, 5XB, spk. C.W., fone, 5YB, 5HG, 5YQ C.W., 5YJ, 9BW C.W., 9HL, 9JA, 9JY, 9LY, 9OE, 9OR, 9PS, 9ZC, 9ZN, 9ACN, 9AEG, 9UG, 9ALG, 9YO.

6EN, LOS ANGELES

5HL, 5IF, (5ZA), 5ZL, 5XD, (6AE), 6AF, 6AG, (6AJ), (6AK), (6AFN), (6AH), spk. C.W., (6AV), (6AN), (6APY), (6AAW), (6AAT), 6AFU, (6AAZ), (6BN spk. C.W.), 6BU, (6CC), 6CE, 6CH, 6CL, 6CO, (6GO), (6CP), (6CA), 6CS, (6CV), 6CW, 6CY, (6DP), (6DY), 6ET, 6EV, (6EP), (6EX), (6FE), (6FI), (6FS), (6FM-C.W.), (6FH), 6GA, 6GK, 6GQ, (6GV), 6GO, (6GR), (6GF), (6HH), (6HO), (6IC), 6IM, 6II, (6IY-C.W.), (6IZ), 6GX, (6JD), (6JK), (6JN), (6JA), 6JO, 6JQ, (6JD), 6KL, (6KM), 6KZ, 6LD, (6MZ), (6OC), (6OW), (6OH), 6OT, 6PM, (6PR), (6PJ), (6VL), 6VS, 6VK, 6LT, 6QU, 6QM, (6QR), (6SK), (6UM), (6TC), (6TV), (6HP), (6WV), 6AID, (6AEA), (6BX-C.W.), (6BAB-C.W.), (6ZA), (6ZE), 6ZE, (6ZH), (6ZK), 6ZM, (6ZO), (6ZR), (6ZU), (6ZX), (6ZY), (6ZZ), (6WV), (6WN), 6ADA, 7AD, 7CC, 7CW, 7CR, 7BP, 7BQ, 7GQ, 7DA, 7DK, 7EC, 7GH, 7ZI, 7ZJ, 7ZG, 7ZE, 7IN, 7IM, 7GY, 7GC, 7YA, 7YS, 9WU, 9JE, (9OE), (9PS), 9LR, 9ZN, 9ZJ, (9XM-C.W.).

6ABA, ALTADENA, CALIFORNIA, March

6BX, 6DD, 6DS, 6EF, 6EN C.W., 6EX, 6FX, 6GF, 6IC, (6IQ), 6IX, 6KL, 6KP, 6no 6KY, 6LLC, 6LU, 6MH, (6MW), 6ND, 6NQ, 6PO, 6QS, 6SK, 6TB, 6VH, 6VZ, 6ZH, 6ZU, 6ZX, 6AAG, 6ACR, 6ADN, 6AGF, 6AGN, (6AHA), 6AID, 6AIV, 6AKH, (6ALD), 6ALL, 6ALU, 7BQ (865 mi.), 7YA.

6ZX, ex 6EJ, WALNUT GROVE, CAL., March

(5ZA), (6AAK), (6ABP), (6ADX), (6AGF), (6AIK), 6AJX, (6DP), (6ED), (6EF), 6EN, (6ER), 6FT, (6GP), 6ID, (6IF), 6IV, 6JT, (6KP), 6KS, 6MH, (6MZ), (6LC), 6OH, (6PG), (6RN), (6SK), (6XZ), 6ZB, (6ZH), 6ZM, (6ZN), 6ZY, (6ZZ), 7AD, 7AX, (7BC), (7BK), (7BP), (7BQ), (7BR), (7CU), (7CW), 7DS, 7ED, 7FL, 7FG, 7FL, (7GG), (7IN), 7JW, 7BY, (7ZD), (7GM), (7GJ), 9YW.

IRVING PINKERTON, NOGALES, ARIZ.

5BW, 5IF, 5ZA, 5ZJ, 5AC, 5CV, 5EN, 5ER, 5JI, 5MZ, 5SK, 5WV, 5XW, 5XY, 5XZ, 5ZA, 5ZH, 5ZM, 5ZR, 5ZT, 5AJH, 5AFP, 7CC, 7EX, 7JE, 7YA, 7YW, 7ZG, 7ZO, 9AR, 9EE, 9KG, 9OE, 9PS, 9SQ, 9ABX, 9AEG.

7YA, BOISE, IDAHO

2RK, (5RA Can.), 5IF, (5XD), (5ZA), 6AD, (6AE), (6AH), (6AK), (6AN), (6AT), (6BJ), (6BK), 6BW, 6BX C.W., 6CH, 6CO, (6CV), 6DD, (6DP), (6EA), (6EB), (6ED), 6EF C.W., 6EJ C.W. & Spk., (6EN), (6ER), 6EW, 6EX, 6FI, 6FS, 6GE, 6GP, 6GY, 6HK, 6IC, 6IF, 6IG, 6IS, 6IV, 6JY C.W., 6JD, 6JJ, (6JR), (6JT), (6KA), 6KH, 6KM, 6KO, 6KP, 6LC, 6LE, 6LT, (6LW), 6MK C.W., (6NQ), (6OC), (6OH), (6OT), 6OW, 6PO, (6PR), (6QR), 6QS, 6SK, (6TC), (6TV), 6UV C.W., 6VL, 6VM, 6WO, (6WV C.W. & fone), 6WZ, 6XAD C.W., (6XW C.W. & fone), 6XZ, (6XA), (6ZE), 6ZE C.W., (6ZK), (6ZK), (6ZM), (6ZN), (6ZO), (6ZR), 6ZU, 6ZX, 6ZY, 6ZZ, 6ZAA, (6AAG), 6AAT, spk. & C.W., 6AAV, 6AAB, 6ARM, 6ACM, 6AEW, 6AFN, 6AGF, (6AID), (6AJW), 6AJE, 6AJH, (6AJT), 6AJX, 6AOM, (6APH), (7AD), 7BA, (7BC), (7BH), (7BI), 7BK, (7BP), (7BQ), 7BX, (7CE), 7CN, (7CU), (7CW), (7DA), (7DS), 7ED, (7EX), 7FD, 7FL, 7FL, (7FM), 7FO, 7FQ, (7FT), (7FY), 7GA, (7GQ), 7GY, (7HE), (7HI), 7HN, (7HU), 7IM, 7IV, 7IY, (7JD), 7JF, (7JW), 7KA, 7KM C.W., 7KX, (7LE), (7LN), (7LO), 7LS, 7LV, (7LY), 7MB, 7MY, (7NL), (7NN), (7OP), (7OT), (7OK),

(7PS), 7YG, (7LS), (7ZB), (7ZG), (7ZH), (7ZI C.W.), (7ZJ), (7ZK), (7ZM), 7ZO, (7XD), 9BW, 9FG, (9EE), 9HI, (9HT), (9IN), 9KA, 9LR, (9LW), 9NR, (9OE), 9PS, 9QB, 9RG, 9WA, (9WU), 9XI C.W., 9XM C.W. & Spk., 9YL, (9YW), 9YY, 9AEG, 9AEY, 9AGN, 9ALG, 9ASF, 9AWD, 9AYU, 9XAE, 9ZAC, 9ZAB.

7BQ, PULLMAN, WASH., March

5IF, (6AE), (6AJT), (6AT), (6AAT), (6AID), (6AGF), (6DD), (6EA), (6ED), (6EJ), (6FI), (6FH), (6IC), (6JJ), (6JP), (6KA), (6MK), (6OT), 6PR, (6QR), 6ZA, (6ZR), (6ZU), (7AD), (7BH), (7BI), (7BK), (7BP), (7BR), (7CB), (7CE), (7CN), (7CU), (7EX), (7ED), (7GA), (7GQ), (7IN), (7LU), (7NI), (7NN), (7YA), (7YS), (7ZG), (7ZJ), 9AM, 9AEY, 9AFX, (9AGN), 9ATO, 9DKS, 9CC, 9EE, 9IF, 9JN, 9LR, 9LW, 9MC, 9OE, 9RL, 9UT, (9WU), 9YO, 9YW, 9XLL, 9ZC.

8SP, FAIRMONT, W. VA.

(1AW), 1CK, (1CZ), (1DY), 1OE, (1XM), (1GBC), (1HAA), 1JAP, (1MAD), (1RAY), 2BB, 2BG, (2DA), 2DN, 2DR, (2EL), (2JU), (2OA), 2OM, (2OO), (2RM), (2EK), (2UA), (2UK), 2VA, 2ZL, 2ZN, 2AID, 2GBL, (2BZ), (2CC), (2EN), 2FG, (2GO), (2HG), (2HI), 2HX, 2IW, (2KM), (2NB), 2NC, 2OU, (2PU), (2QP), (2UC), (2UQ), (2VV), (2XF), (2XM), 2ZA, 2ZL, (2ACT), (2AHK), 2AWV, (2AG), (2CK), (2YA), (2YK), 2ER, (2KA), (2BC), (2BO), 2CF, (2DI), 2DJ, 2DR, 2FL, (2FK), 2FQ, 2FT, (2GI), (2GB), 2HG, 2HY, (2HR), (2ID), (2IN), 2IV, 2JF, 2JM, 2LV, 2ML, (2MM), (2MT), (2OI), 2PC, (2QE), (2RQ), 2SH, (2WR), (2WY), 2ACF, 2AX, (2ADE), (2AEE), (2AFB), (2AGD), (2AGK), 2AGO, (2AIB), 2AIO, (2AJT), 2AKJ, (2AKV), (2AMM), 2AND, (2ANT), 2ARS, 2AVF, 2AWA, 2AWP, (2AYF), (2XE), 2XM, 2XU, (2YN), (2ZA), 2ZD, 2ZN, 2ZW, (2ZY), (9AP), 9ET, (9FS), (9GP), (9HR), 9KF, 9KO, 9LF, (9IG), (9MC), 9OE, (9OX), 9QH, (9UH), (9UK), (9UU), (9WE), 9ZJ, (9ZN), 9AAF, (9AAW), 9ABJ, 9ABL, 9AEG, 9AGH, 9ANV, 9AWG, (9AWX), W12, XFI, NSF, Canadian (3BP) 3DH.

8ANA, DETROIT, MICHIGAN

1AW, 1XA, 2AWL, 2DN, 2EL, 2FG, 2GO, 2RK, 2UR, 3CC, 3EFX, 2HL, 2EN, 3GO, 3HG, 3NB, 3PU, 3XM, 3ZF, 4FD, 4XC, 4ADG, 4AFS, 4AGK, 4AGO, 4AGW, 4AIO, 4AMW, 4AOG, 4ASP, 4AXC, 4BC, 4BK, 4BDU, 4DG, 4DI, 4FA, 4GL, 4JO, 4HG, 4HL, 4HP, 4HR, 4HY, 4IL, 4IN, 4IRS, 4JN, 4KA, 4KO, 4LD, 4LV, 4MM, 4NC, 4RL, 4RQ, 4RT, 4ST, 4TN, 4XC, 4XE, 4XU, 4ZD, 4ZL, 9AAW, 9ACN, 9ABO, 9AJ, 9DR, 9ANV, 9AP, 9AV, 9AXU, 9CA, 9EL, 9EQ, 9FG, 9GO, 9GL, 9HN, 9JA, 9JN, 9JY, 9KO, 9LL, 9IQ, 9NJ, 9NR, 9NW, 9OE, 9PS, 9QH, 9QN, 9QO, 9SP, 9TW, 9UH, 9UU, 9WV, 9WL, 9XL, 9ZC, 9ZJ, 9ZK, 9ZN.

8AOY, LANCASTER, N. Y.

1AW, 1CK, 1CY, 1CZ, 1DY, 1GAV, 1GBC, 1HAA, 1MAD, 1IE, 1QS, 1TS, 2AR, 2BB, 2BM, 2CT, 2EL, 2JJ, 2JU, 2KM, 2OM, 2RK, 2VA, 2UK, 2XQ, 2ZL, 2ZM, 2AB, 2AAE, 2ACT, 2ALN, 2CC, 2DS, 2HI, 2IW, 2KM, 2MO, 2NR, 2PU, 2SC, 2VA, 2XM, 2YE, 2YK, 2ZA, 2XA, 2AAX, 2ADQ, 2ADR, 2AG, 2AHS, 2AHQ, 2AJR, 2AMB, 2AMJ, 2AMZ, 2ANS, 2ANJ, 2ANT, 2AOF, 2APJ, 2ARS, 2AVE, 2AXS, 2AXQ, 2AYE, 2AYN, 2BC, 2BV, 2CF, 2CG, 2Z, 2BR, 2FE, 2GI, 2HF, 2HR, 2IL, 2IN, 2KR, 2KU, 2KW, 2KZ, 2LA, 2LB, 2MF, 2MH, 2MZ, 2NU, 2NZ, 2OL, 2PI, 2QB, 2KQ, 2SP, 2TN, 2UF, 2XE, 2XE, 2XU, 2YV, 2ZA, 2ZD, 2ZL, 2ZN, 2ZR, 2ZW, 2ZY, 9AAW, 9AMK, 9FG, 9PS, 9HJ, 9IP, 9KF, 9LG, 9UF, 9UT, 9XM, 9YB, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZT, 9ZU, NSF, XFI.

8AXC, MARIETTA OHIO

1AW, 1BZ, 1CZ, 1DR C.W., 1OE, 1QR C.W., 1JAP, 1MAD, 1RAS, (1GBC), 1XM C.W., 2BK, 2DA, 2EL, 2FG, 2JJ, (2OE), 2OW, (2RK), (2SZ), 2UK, 2VA, 2AWL, 2BHG, (2BML C.W.), 2XQ Spk. & fone, 1C.W., 2ZL C.W., 1C.W., 2BZ, 2CC Spk. & C.W., 2EN, (2FM), (2GO), 2HT, 2IW, (2KM), (2NB), 2OU, (2PO), (2QP), (2VV), 2AAE C.W., 2AAG, (2ABC), 2ACM, (2ACT), 2AHK, (2AIN), (2WV), 2XA, (2XP), 2XI fone, (2XM), 2XN, 2YK,

3ZL 3ZN 3ZF 3ZZ 4AG 4AU 4BK 4BY 4CK) 4CX) 4D) 4FD 4GX) 4YA 4YB 5CC 5DA 5JD 5KA 5YH 5ZL 5ZAB 5ZAC 5AL 5BC) 5BO C.W. 5BQ 5DQ) 5DP 5DR 5DZ 5EF) 5FE 5FG 5FL 5FT) 5GD) 5GS 5GX 5HA C.W. 5HG 5HR) 5IB C.W. 5ID 5IK 5IN) 5JE 5JF C.W. 5KK) 5KZ 5ML 5ML 5MM) 5MT 5MZ) 5NZ 5OL 5OJ 5PU 5PW 5QU 5RE 5RQ) 5SP) 5TJ 5TY) 5WY 5AAZ 5AFC 5AGY 5ADE 5AEE 5AFB 5AFD) 5AFO 5AGD) 5AGK 5AGO 5AKH 5AMM 5AMW 5AMZ 5ANJ 5ANK 5AOA 5AOP 5AQQ 5ARD 5ARS 5AVD) 5AVF 5XE 5XK I.C.W. 5YG C.W. 5YN) 5ZA 5ZD 5ZN 5ZR 5ZV 5ZW 5ZX 5ZY 5AP 5AR) 5BP 5CP 5FS 5FU) 5GN 5GP 5HM 5HR 5JA 5JN 5JQ 5KF 5KL 5LQ 5MC 5ME 5NQ 5NW 5OE 5QH 5QR 5JV 5UH 5UK 5UU 5AAC 5AAG 5AAW) 5ABL 5ACN 5AEG 5ABY 5AGH 5ALG 5ALS 5AMK 5ANV 5ANV 5AWW 5AWX 5ASL 5DLX 5YB 5ZB Spk. & C.W. 5ZJ 5ZN 5ZKA fone. (NIFX) (NSF fone) WVV.

8LF. CRAFTON, PA.—AH C.W.

1AE, (1TS), 1XF, 1XK, 1XM, 2(AJF), 2BML, 2ZL 2ZM 3AAE, (3AAO), 3BM, (3CC), (3WS), 3XM, 4AAE, 4XB, 5BO, 5DP, 5IB, (5IV), 5KM, 5OZ, 5QY, 5VS, 5YG, 5YZ, (5ZG), 9AJA, 9LC, 9XI, 9XM, 9YA, 9ZB.

8ZA, NEW PHILADELPHIA, OHIO

(1AW), (1BZ), 1BBL, 1CK, 1MAD, 1HAA, 1XM C.W., (2BML C.W. & fone), 2CC, 2DN, 2BGH, 2EL (2FG), 2JU, 2RK Spk. & C.W., 2SZ, 2VA, 2XQ fone, 2ZL C.W., (2ZM C.W.), 3AAO C.W., 3ACM, 3ALN, (3AHK), 3BZ, 3CC C.W., 3EH, (3EN), 3AWW, (3GO), 3HG, 3HJ, 3HX, 3KM, 3KO, (3NB), 3MME C.W., 3OU, 3PU, 3XF, (3XM), 3YK, 3YV, 4AG, 4AL, 4AU, 4CK, 4XB C.D., 5DA, 5HL, 5YE, 5YH, 5AL, 5AA, 5AAV, 5ABZ, (5ACF), 5AEE, 5AC, 5AFD, (5AGD), (5AGK), (5AGO), 5AHR, 5AKH, 5ALY C.W., (5ANJ, 5AMP C.W., 5ANT, 5AOA, 5AQQ, 5ARK, 5ARW, 5ADC, 5BC, 5BGO, 5BK, 5BQ, 5RO, 5OD, 5CH, 5CP, 5DC, (5DJ), 5DR, 5DV, 5FA, 5FQ, 5FE, 5FK, 5FL, 5FT, 5GE, (5GH), 5GI, (5GW), 5HA, 5HG, 5HR, 5HS, 5IB C.W., 5ID, 5IN, 5JL, 5JM C.W., (5JF C.W. & fone) (5KM C.W. & fone), 5KP, 5LF C.W., (5LQ), (5LV, 5LW, 5ML, (5MM), 5NI C.W., 5NZ, (5OT), (5OP), 5OM, 5OW, 5OZ C.W., 5PE, 5PN, 5PU, 5QM, 5QY C.W., 5RQ, 5RW, 5SH, 5SP, 5TN, 5TT, 5UR, 5VS C.W., 5WY, 5WZ, (5XE), 5XK, 5XU, 5YG C.W., 5YN, 5YV, 5ZD, 5ZG C.W., 5ZL (5ZN), 5ZP, (5ZR), 5ZT, (5ZV), 5ZW (5ZX), 5ZY, 9AAV, (9AAW), 9ACJ, (9AP), (9AWX), 9AWV, 9AXJ, 9AMC 9AMV, 9ABL 9ANV, 9AV, 9CC, 9DV, 9EQ, 9ET, 9EZ, (9FG), 9FN, (9FS), 9DLX, (9GP), 9HJ, (9HN), (9HR), (9KP), 9L, (9LQ), 9JA, 9JQ, (9JT), 9LW, 9MC, 9MS, 9NQ, (9PC), 9PV, 9QO, (9UT), 9QH, 9XI, 9XM, 9XAE, 9YAC, 9YAD, (9ZC), 9ZJ, (9ZN), (9ZV), (NSP), (NIFX) XFI, XKI.

9NQ, GALESBURG, ILL., Every District.

1AW, 1XM mod C.W., 2RK Spk. & mod C.W., 2ZM, 3CC, 3EN, (3GD), 3NB, 3QF, 3XM, 3YK, 4AG, 4BY, 4XB, 4XC, (5EK), (5HL), 5IB, 5NK, 5XA, 5XB (5YH), (5ZA), (5ZL), 5ZU, 5IAA, 5ZAB, (6VW), 6ZZ, 7EX, 7YA, 7ZM, 7ZO, (8AL), 8CF mod C.W., (8D), (8MM), 8ZN, 8ZY, 8ACF, 8ACY, (8ADE), 8ASM C.W., 8BBO, (9AR), (9CP), (9EL), (9HM), (9KO), (9LC), (9LQ), (9LW), (9OE), (9PV), (9TD), (9UD), (9XI), 9XM Spk. C.W., mod & fone, 9YM, (9YAD), 9ZB C.W., 9ZJ, 9ZN, (9ZT), (9ZV), 9ZY C.W., 9ZAC, NSF, WVV.

9AIF, SIOUX FALLS, S. D.

2RK I.C.W., 2BU, 5HL, 5HV, 5IF, 5JD, 5YH, 5XB C.W. & Spk., 5ZA C.W. & Spk., 5ZE, 5ZL, 5ZR, 5ZU, 7YA, 7ZG, 7ZO, (8AFS), 8AIB, 8KP 8LF C.W., 8LQ, 8PJ C.W., 8QJ, 8QY I.C.W., 8XK fone & I.C.W., 8YN, 8ZR, 8ZW, 9Y, 9AAC, 9AAW, 9ACB, 9ACN, 9ABG, 9AEH, 9AEN, 9AEY, (9AGN), 9AIZ, 9ALG, 9ALK, 9ALS, 9AMX, 9ANF, 9ANP, 9ANQ, 9ANV, 9AOK, 9AOK, 9AON, 9AOU, 9ARP, 9ASF, 9ATN, 9ATO, 9AUO, 9AUU, 9AWX, (9AYW), (9DAT), 9DIW, 9DJJ, 9DJX, 9DKT, 9DLX, 9NRK, 9AP, 9BQ, 9CA, 9CP, (9DE), 9DO, 9DV, 9EE, (9EI), 9EL, 9EQ, 9FG, 9FU, 9GP,

9HI, 9HN, 9HR, 9IY, 9JA, 9JN, 9JQ, 9KF, 9KL, 9LF, 9LQ, (9LW), 9MC, 9MS, 9NQ, 9OA, 9OE, 9OO, 9PL, 9PN, 9PS, 9QO, 9RG, 9SC, 9SZ, (9TI), 9TW, 9TZ I.C.W., 9UF, 9UK, 9UU, 9VE, 9WI, 9XAE, 9XI C.W. & Spk., 9XM C.W. & fone, (9YAE), 9YAF, 9YB, 9YO, 9YT, 9YW, 9ZAG, 9ZB, C.W. & Spk., 9ZC, 9ZJ, 9ZU, 9ZY C.W., 9ZV.

9FS. GOSHEN, IND.

1AW, 1JA, 1XM C.W., 2EL, 2RK, 2SZ, 2ZL, (3AAO C.W.), (3AHK), (3CC), 3DH, 3DS, 3EN, 3GO, 3KM, (3XF), 3XM, 3YK, 4AG, 4CG, 4GI, (5XA), 5XB, 5YE, (5YH), 5ZD, 5ZF, 5ZL, 5ZW, 5ZX, 5ACF, (5AFB), 5AFS, 5AGD, (5AXC), 5OD, (5CP), (5DZ Spk. C.W.), (5FI), (5HG), 5HR, 5IN, 5JE, 5JL, 5JN, (5MM), (5NZ), (5OM), (5PN), (5PU), (5RQ), (5SF), (5TK), (5TN), (5YN), (5ZA), 5ZD, (5ZY), (5ZL), (5ZN), (5ZR), 5ZV, 5ZW, 9AAG, (9AAW), 9ABC, 9AEG, 9AFX, (9AGH), (9AGN), 9AGX, (9AKC), (9AKH), 9AKZ, (9ANV), (9AON), 9ARG, 9AXU, (9AZX C.W.), (9DAX), (9DLX), (9DKT), 9YAC, 9YAD, 9ZAC, (9DV), 9FI, 9FN, (9FQ), 9GP, 9GX, 9HM, (9JI), 9JN, 9KF, 9LG, (9LQ), (9LW), (9ME), 9NQ, 9BP C.W., (9FC), 9ZJ, 9PS, (9UK), 9WE, (9WO), (9WZ), (9VZ), 9QH, (9QO), (9TO), 9XI C.W., 9XM C.W. Spk and fone, 9YA, (9YB), (9YC), (9YM), (9YQ), (9ZC), (9ZN).

9AE, BOONE, IA, C.W. Stations.

2ZL, 2ZM, 5XB, 5ZA, 5ALY, 5AMZ, 5IK, 5JM, 5OH, 5VS, 5XK, 5XY, 5YG, 5ZL, 5ZN, 5ZG, 5ZR, 5ZW, 5ZY, 9AG, 9AK, 9AL, 9AMU, 9LC, 9RQ, 9XI, 9XM, 9ZB, 9ZC, 9ZY, 9AZX, NMW, NSF, XFI.

9ACJ, CHICAGO

1HAA, (2CS), 2DK, (2DN), (2RK Spk. & I.C.W. Can 3RP, 3CC, 3GO, 3HG, (3HJ), 3KM, 3NB, (3XF), 3XM, 4AG, 4FD, 4XC, 4YA, (5HL), 5IF, (5YH), 5XA, 5ZA, (5ZAB), 5ZL, 5ZX, 6KA, 7ZG, 8ACF, (8ACY), (8ADE), 8AEE, 8AFS, (8AGK), (9AGO), 8AIB, (8AKV), 8AXC, (8AL), 8BBW, 8BO, 8BI, 8CD, (8EB), 8FF, 8FK, (8FQ), 8GX, (8HG), (8ID), (8IN), 8JE, (8JL), 8ML, 8MM, 8NL, 8OL, (8OJ), (8RQ), (8RU), 8SP, 8TN, (8TY), 8WY, 8XE, 8XK C.W. & fone, 8ZL, 8ZN, (8ZW), 8ZY, (9AAC), (9ABI), 9ACB, 9AEG, 9AEY, 9AKA, 9ALG, 9ALO, 9ANK, (9ANP), (9AOK), 9AOL, 9AOG, (9ARG), 9ARJ, 9ATO, 9AXU, (9AYE), 9DV, (9EE), 9EK, 9EL, 9EZ, (9FU), 9HK, (9HN), 9HT, 9IY, 9JA, (9JL), (9JN), 9JQ, (9KO), 9LQ, (9MS), (9NQ), 9OE, (9OO), 9PS, 9QO, (9TI), 9UH, 9UG, 9UT, 9WE, (9XI), 9ZAC, 9ZB, 9ZT, (CW3).

9AHC, ELLENDALE, N. DAK.

5CE, 5EK, 5HK, 5HL, 5HV, 5IB, 5IF, 5JL, 5JR, 5LB, 5LC, 5MM, 5NK, 5YH, 5ZA, 5ZB, 6LC, 6WV, I.C.W., 6ZA, 6ZH, 6ZZ, 7DH, 7EX, 7HS, 7IM, 7IU, 7IV, 7MO, 7ZG, 7ZM, 7ZO, 8BO, 8BP, 8CP, I.C.W., 8U, 8PT, 8ML, 8JM C.W., 8OZ C.W., 8SF, 8XK C.W., 8ZR, 8ZY, 8AEE, 8AGK, 8AIO, 8ANW, 8AOU, 8AXC C.W., 8AV, 8ABH, 8ACD, 8ACJ, 8ACL, 8AGN, 8AEG, 8AEJ, 8AEY, 8AFK, 8APX, 8AG C.W., 8AGN, 8AHE, 8AHO, 8AHZ, 8AIF, 8AIS, 8AJH, 8AJP C.W., 8AKC, 8AKM, 8AKX, 9ALG, 9ALH, 9ALK, 9ALO, 9ALU, 9AMH, 9AMK, 9AMV, 9ANF, 9ANP, 9ANV, 9AOA, 9AOK, 9AOK, 9AON, 9AOU, 9AP, 9AQA, 9AR, 9ARJ, 9ARP, 9ARS, 9ASF, 9ASL, 9ASN, 9ATG, 9ATN, 9ATO, 9ATV, 9AUH, 9AUO, 9AUS, 9AUU, 9AV, 9AVP, 9AWX, 9AWZ, 9AXU, 9AYE, 9AYS, 9AYW, 9BM, 9BP, 9BQ, 9CP, 9DAE, 9DAT, 9DHO, 9DD, 9DE, 9DIW, 9DJX, 9DKS, 9DLS, 9DLX, 9DMB, 9DML, 9DNN, 9DO, 9DV, 9EK, 9EL, 9EQ, 9EW, 9FF, 9FS, 9FX, 9GC, 9GP, 9HI, 9HM, 9HT, 9IF, 9IL, 9IY, 9JA, 9JE C.W., 9JN, 9JQ, 9JV, 9KD, 9KL, 9KO, 9LF, 9LQ, 9LW, 9MC, 9ME, 9MS, 9NQ, 9NR, 9NW, 9OA, 9OE, 9OO, 9PC, 9PI, 9PL, 9PN, 9PS, 9QH, 9QO, 9RY, 9SZ, 9TI, 9TO, 9TW, 9UF, 9UG, 9UH, 9UK, 9UU, 9VR, 9VC, 9VE, 9WE, 9WI, 9WO, 9WS, 9XAE, 9XI, 9YAC, 9ZAA, 9ZAC, 9ZB, 9ZC, 9ZJ, 9ZN, 9ZY C.W., NSF.

# April Station Reports

## 1NAQ, Hartford, Conn.

Steadiest	Loudest
1HAA-1RAY-1MBS	1RAY-1HAA-1MBS
2RK-2BML-2ZL	2RK-2EL-2ZL
3XM-3GO-3KM	3XM-3ABC-3GO
	4FD-4AL
8RQ-8BC-8ZR	8KP-8BC-8RQ
9ZJ-9ZL-9ZN	9ZJ-9ZL-9ZN

## 1DY, Lynn, Mass.

Steadiest	Loudest
1HAA-1SBZ-1YB	1HAA-1YB-1MAD
2EL-2RK-2JU	2EL-2RK-2JJ
3XM-3NB-3GO	3XM-3NB-3HX
8SP-8XE-8ZA	8XE-8DR-8BC

## 1CK, Braintree, Mass.

Steadiest	Loudest
10E-1HAA-1SBZ	1SBZ-1HAA-10E
2RK-2EL-2JU	2RK-2EL-2OM
3XM-3CC-3GO	3XM-3CC-3GO
None consistent	4YA-4EY-4CK
8XE-8XU-8BC	8XE-8XU-8VQ
9ZJ-9LQ-9ZN	9ZJ-9ZN-9LQ

## 4XC, Atlanta, Ga.

Steadiest	Loudest
1AW	1AW
2RK-2EL-2BK	2EL-2RK-2BK
3GO-3HJ-3NB	3GO-3HJ-3NB
4GN-4FD-4BY	4GN-4BY-4FD
5XA-5YH-4ZAB	5YH-5XA-5YE
8ID-8DC-8RQ	8DC-8AKC-8HG
8ZY-8ZW-8XE	8XE-8ZW-8ZR
9MC-9LQ-9UU	9XQ-9EL-9MC
9ZJ-9XM-9YI	9YI-9XM-9ZJ

## 4AM, De Land, Fla.

Steadiest	Loudest
2RK-2JU-2EL	2RK-2JU
3GO-3BZ-3GO	3BZ-3GO-3EN
4DL-4XC-4FD	4DL-4XC-4YA
5XA-5YA	5XA-5YA-5ER
8SP	8HG-8XE-8SP
9ZJ-9MC	9ZJ-9MC

## 5XA, Auburn, Ala.

Steadiest	Loudest
1XB-1XF-1AW	1XB-1UBC-1RW
2RK-2ZL-2EL	2RK-2EN-2EL
3GO-3BZ-3W	3GO-3EN-3HG
4BY-4YB-4YA	4BY-4GL-4YA
5ZAB-5YH-5HL	5HL-5YH-5ZL
8ZL-8KP-8RQ	8KP-8YH-8RQ
9AAC-9ZN-9FU	9ZN-9YC-9CA

## 5ZL, Little Rock, Ark.

Steadiest	Loudest
2RK-2ZL-2PL	2RK-2ZL-2PL
3GO-3AAG-3DH	3GO-3AAG-3DH
4XC-4YA-4AG	4YA-4XC-4AG
5HV-5EW-5NK	5HV-5EW-5NK
6WV	6WV
8MR-8ZY-8BA	8ZY-8MR-8BA
9AEG-9ZAC-9OE	9OE-9ZV-9AEG

## 8SP, Fairmont, W. Va.

Steadiest	Loudest
1MAD-1AW-1DY	1MAD-1AW-1DY
2EL-2RK-2JU	2JU-2EL-2RK
3XF-3CC-3EN	3XF-3XM-3NB
4CP-4YK-4YA	4YK-4YA-4CP
5ER-5XA	5ER-5XA
8AXC-8AGK-8RQ	8OI-8YN-8AK
9LQ-9UU-9MC	9LQ-9MC-9ZN

## 8ZA, New Philadelphia, O.

Steadiest	Loudest
1BBL-1AW-1HAA	1AW-1RAY-1BBL
(C.W.) 1XM-1RZ	(C.W.) 1XM-1RZ
2ZM-2RK-2SZ	2RK-2SZ-2DN
2ZM-2ZL-2BML	2RK-2BML-2ZM
(C.W.)	(C.W.)
3XM-3GO-3XF	3XU-3GO-3EN

## 8AOA-8CC-8MME

(C.W.)	(C.W.)
4AG-4XC-4AU	4XC-4AG-4AU
(C.W.) 4XB only	(C.W.) 4XB only
5YE-5YH-5DA	5YH-5DA-5YE
8ANJ-8AGK-8ZW	8BO-8LV-8ZW
8ZV-8JU-8KM	8ZV-8ZG-8LF
(C.W.)	(C.W.)
9UU-9ZN-9LQ	9JT-9ZN-9PC
(C.W.) 9XI only	(C.W.) 9XI only

## 9ME, Ft. Wayne, Ind.

Steadiest	Loudest
1AW-1BBL	1BBL-1AW
2RK-2EL	2RK-2EL
3XM-3EN-3AWV	3XM-3EN-3AWV
4AG-4BK	4AG-4BK-4XM
5ZAB-5JD-5DA	5ZAB-5JD-5DA
8ZY-8DX-8ZL	8ZY-8DX-8ZL

## 9FS, Goshen, Ind.

Steadiest	Loudest
1AW-1HAA-1XM	1XM-1AW-1HAA
2ZL-2RK-2SZ	2ZL-2RK-2SZ
3DH-3EN-3AHK	3EN-3GO-3DH
4XC-4AG	4XC-4AG
5XA-5YH-5YE	5YE-5XA-5ZL
8ZA-8XE-8RQ	8ZR-8XE-8RQ
9ZN-9AEG-9ZN	9EQ-9HN-9ZN

## 9YB, Purdue University, Lafayette, Ind.

Steadiest	Loudest
1AW	1AW
2RK	2RK
3XM-3EN-3KM	3XM-3EN-3YK
4GN	4XC-4AU-4GN
5YH-5XA-5DA	5DA-5YH-5XA
8XE-8ZR-8ZA	8XE-8DI-8ZA
9ZJ-9LQ-9OE	9ZJ-9QO-9OE

### Remarks:

First District. 1AW comes in well at times on fading tests but not heard often otherwise.  
 Second District. Usual lack of good signals from Second District.  
 Third District. 3XM, following in the footsteps of 3DH, has been best although gap used lately changes tone and does not come through so well. 3EN seems to be going well.  
 Fourth District. Not much doing; few stations heard occasionally.  
 Fifth District. No change except that 5XA is coming through more often.  
 Sixth and Seventh District. No stations heard.  
 Eighth District. Based on steadiness of signals and the number of times heard 8XE takes the lead this month with 8ZR next and 8ZA following. 8DI comes in very loud at times.  
 Ninth District. 9ZL still holding the lead. 9LQ next best, although 9QO and 9OE come in more loudly at times.

## SUMMER ARRIVES.

(Continued from page 29)

force. Make schedules with the fellows you hear and watch how the gang grows. Summer operation in the early morning is so incomparably better than at night that we would be wise to change our bed-time hour so we could join Mr. Hebert's "Early Birds" of bygone years. As announced elsewhere in this issue, we're going to have a contest, right in the middle of summer with all its static, and see who can do the best receiving. Reading thru QRN is an art in itself but with only a little practice musical tone signals can be read as long as

(Concluded on page 53)



### Central Illinois Get-Together

The Central Illinois Amateur Banquet will be held in Peoria at the Jefferson Hotel in June. This meeting will not be a Convention but will be a regular get-together and ham-fest with a banquet in the evening. This affair will be held under the auspices of the Peoria Radio Club and it is hoped that a good attendance of Illinois men will be present.

### New Club Papers

QST is in receipt of copies of several new club organs, among which are "The Hamville Star", published by the Central Michigan Wireless Assn., of Lansing; "The Radio Digest", of the Springfield (Mass.) Radio Assn.; and "The Radio Radiator", published by the Jefferson City (Mo.) Radio Club; all affiliated with the A.R.R.L.

As we have said before, we think the idea of local sheets is a fine one, and every amateur will find that the pleasure of having a home radio paper makes it worth his most enthusiastic support.

### M. V. R. A.

The Monongahela Valley Radio Association with headquarters at Fairmont, W. Va., has recently affiliated with the A.R.R.L. Its present officers are:

President: A. G. Heck, 8EF

Vice-Pres.: Edw. C. Jones, Jr., 8JE

Sec'y-Treas.: Albert G. Kisner, 8SP

The membership is now about twenty, composed of station-owners within forty miles of Fairmont, although mostly confined to Marion County. The membership include several former Signal Corps men, and other eligible amateurs are expected to join.

One purpose of the organization is to combat the QRM evil, which is not only from local spark coils, but from hams on high power poorly tuned sets in a city 25 miles away, who use full power to work a few city blocks, and have no regard for hours, QSS tests or other amateurs.

The meetings of the M.V.R.A. are not limited to the usual gab, but often experiments are made. Recently, in order to tell how much the human element enters into making the QSS charts, artificial fading was made with a buzzer and a loose coupler, with every member's phones con-

nected in. Results showed that everyone interpreted the general characteristics the same.

Lectures on practical and theoretical subjects are regular features. Meetings are held semi-monthly.

An inter-city checker tournament is being arranged, and will take place as soon as the champions can be located at hours that will cause the least interference.

All communications to the club should be addressed to Edward C. Jones, Jr., 8JE, 522 Fairmont Ave., Fairmont, W. Va.

### Northwestern Radio Assn.

The Northwestern Radio Association of Portland, Oregon, has recently purchased a General Radio wavemeter to be used in tuning the members' stations. The meter was found to be unsuitable for use in tuning a transmitter to 200 meters, so is being rebuilt for this purpose.

The organization is growing rapidly, and now includes over sixty active members from several counties in two states. Meetings are held every Friday night at 8 P.M. in the Journal Bldg., Portland. It has been found advisable to devote certain meetings each month exclusively to discussions on radio subjects, all business being set aside. This has met with marked approval.

### Lowell's Radio Dance

Another successful radio exhibit and dancing party was held on March 29th by the Lowell (Mass.) Radio Club, with a huge attendance. The music was transmitted by radio from the club rooms to the dance floor at Associate Hall. In addition to the dancing another novelty was presented in the form of a miniature railroad system completely controlled by wireless.

### Columbus Radio Club

Columbus, Ohio, has a live radio club of about 65 members. On April 1st the club held its annual election of officers, resulting in the choice for president of M. Fay McDowell, A.R.R.L. City Manager; vice pres., John Martin; secretary, F. S. Harmer, 74 N. Monroe Ave., and treasurer, Leo Hirsch.

The club recently entertained the convention of Ohio amateurs as mentioned in

last QST. A club room is being sought atop a high office building, where it is planned to maintain a good DX relay station.

#### Dallas Radio Club

Citizen radio in the vicinity of Dallas is booming, and is showing its value to the community.

The Dallas Daily Times Herald recently had a full page story of the achievements of the local men, illustrated with photographs of the operators and equipment of stations 5ZC, 5ML, 5ZG, and the club's able secretary, Brother Porter T. Bennett. This article has done much to open the eyes of the general public to the fact that we amateurs are more than a bunch of kids.

The big news from Dallas, however, is the story of the reporting of recent municipal elections by radio, in co-operation with the Dallas Dispatch. Election returns were phoned by the Dispatch to Ben Emerson, 5ZG, who broadcasted them by radiophone, and were picked up at a half dozen points over the city where the club members had installed temporary sets equipped with Magnavoxes. Large crowds in auditoriums and before bulletin boards, as well as hundreds in outlying districts, were accordingly kept instantly posted on the progress of the count. The new mayor's first message to his people was likewise sent out by radiophone and was conveyed to a dozen large gatherings, two-score private radio parties, and the election watchers in downtown streets.

Dallas now has a time schedule calling for free air 8 a.m. to 7 p.m., with blanks for time signals and daylight QRK tests; 7 to 7:30 p.m. reserved for broadcasts; 7:30 to 8:30 p.m. free air but no testing; 8:30 to 9:30 p.m. short relays and collection of local traffic; 9:30 p.m. to 8 a.m. long distance relaying.

#### Phila. A. R. A.

The Philadelphia Amateur Radio Assn. announces a contest for the best reception accomplished with loops, closing Sept. 19th, with suitable prizes for the winners. Particulars can be obtained from the president, J. E. Delp, Jr., 1526 No. Hollywood St.

During the past month some very interesting and valuable papers were presented before the association. Meetings are held on the first and third Monday nights of each month and all amateurs of the Third District are cordially invited to attend and partake in the discussions.

#### West Allis Radio Club

The West Allis (Wisc.) Radio Club was organized about May 1st, 1920, and after going thru some rather strenuous times became a recognized organization in West Allis. The club now numbers 20 members

and is steadily on the increase. Just recently the club joined the Milwaukee Radio Executive Council to co-operate with the other clubs in Milwaukee County in the reduction of QRM which hinders traffic.

Address all communications to West Allis Radio Club, 602 64th Ave., West Allis, Wisc.

#### Lehigh Valley Radio Association

A very enthusiastic meeting of the wireless men in Bethlehem, Allentown, Easton, and vicinity was held March 10th, at Bethlehem, Pa. This was the largest and most interesting meeting of wireless men ever held in this vicinity. Mr. F. Clifford Estey, President of the Essex County (Mass.) Radio Association, gave a talk on club organization and the experiences of his recent trip throughout the west and south in the interest of wireless.

After Mr. Estey's talk a business meeting was held at which it was voted to form a new association to be known as the Lehigh Valley Radio Association, with a section or club in each of the cities and towns in the valley, all running as separate clubs yet bonded together in the larger association and meeting in one of the cities once each month and the separate sections holding meetings once each week or as often as desirable. Each section will elect its own officers and the president of each section will be a vice president of the Lehigh Valley Radio Association. Besides these vice presidents the association will have a president and chairman of the Advisory Board and these officers will be the governing body of the entire association.

Mr. K. F. Gray of Easton was elected president of the Association and Mr. Arthur F. Breisch of Bethlehem was chosen chairman of the Advisory Board. A committee of three was appointed by the president from each city to call the wireless men together in their towns and conduct the local elections.

#### TUBES WITHOUT FILAMENTS

*(Concluded from page 26)*

to the thickness of a sheet of paper and enclosed in a cylindrical glass tube containing Neon or Helium gas. The field of a powerful permanent magnet is directed across the gaseous space between the two electrodes and apparently causes the liberation of electrons thru ionization due to atomic bombardment. Just how the action is controlled to produce oscillations we do not know and chief interest in the Amrad company is now centering on the use of the new device as a rectifier.

Tubes without filaments would certainly be a blessing and we will await developments with interest.

# Radio Communications by the Amateurs

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



## GENIUS, OR THE P.O.D. RADIO ENGINEERS

Omaha, Nebr.

Editor, QST—

Since the beginning of time man has been bothered with genius. Some geniuses do something and others undo something. This is a story of geniuses that undid something. Just how they accomplished this undoing is narrated below.

As is the case with every burg, city or village, Omaha has its representative body of radio men. If you think I'm kidding just mooch the phones off the the operator at 9HT some evening about eight o'clock. Here you will find Genius in the form of mother's little lambkins permeating the air with ungodly squeaks and groans. But I'm getting slightly off the subject for it's a higher type of genius I wish to tell about, the type who wishes to place before the eyes of the layman, Wireless; Wireless in the form of some mysterious super-natural phenomena.

Coming from lunch Thursday noon, March 10th last, Mr. E. M. Ruede, chief engineer for the Nebraska Power Co., met Mr. Fred Swain of the C & S Radio-Electric Co. of Omaha. Mr. Swain, clothed in a pair of overalls and ready for radio work of any kind, asked Ruede just how to get on top of the power company building.

"We're planning a little radiophone demonstration from the Auto Show in the Auditorium to the Fontenelle Hotel", explained Swain.

"What are you going to use, a telephone line or a Victrola?" asked the interested Mr. Ruede.

Swain promptly found the top of the building and Ruede returned to his work.

Monday noon saw Ruede and some of his friends inspecting a newly stretched P.O.D. on the top of the building and, funny, but that darned P.O.D. ran the six blocks from the auditorium to the Fontenelle and jumped five trolley lines to do it. Gosh but wireless means a lot of work, doesn't it? Tuesday afternoon leads were run from the P.O.D. to a back room in the power company building and when a telephone receiver was shunted around these leads the darned diaphragm just naturally jingled and stuck tighter than ever.

And in the lobby of the Hotel Fontenelle sat a brand new coupe. Above this coupe ran a small flat top aerial while out of the hotel balcony ran a lampcord lead straight into the car. The contents of that car were doubtful. Was that some new fangled coffee grinder setting in the back seat or was it really one of the famous short wave regenerative receivers? At any rate two Magnavox horns adorned the top of this bus and that surely was all that was necessary, for from one of those wonderful horns spouted forth sweet, beautiful music, "wireless music from the municipal auditorium". Oh, what a wonderful age to live in—wireless music from the Auto Show six blocks away!

Wednesday morning a reporter from the Omaha World Herald traced the P.O.D. line for his own satisfaction and then with a sore neck adorned a chair in the lobby of the Fontenelle. He couldn't sleep so he gave the "Wireless Auto" the once over. What was all the funny noise coming from that crazy horn? Sounded like the tuning of some musical instrument combined with the scraping of feet and the low murmur of voices. Mr. Reporter lines out for the power company and hunts up Mr. Ruede.

"Say there, fella, that darned horn up at the hotel's gone crazy" he explained.

"They're playing now," remarked Ruede, as he shunted a phone receiver and a condenser across his leads running from the P.O.D.

"Listen," pleaded Ruede, "you and I know this darn wireless business is a fake, but you shove over to the Herald and dig up another reporter and let him go over to the auditorium and yell into the transmitter over there and I'll bet you a quart of white mule to a quarter kilowatt power tube we'll hear him accompanying that two by four orchestra that's busy festering up a reputation for those two wizards. You sure got to give it to that guy when it comes to concocting a scheme like this. And another thing,—tell the reporter you send over to snoop around ham-like and cut their lead-in to that mistake of an aerial they've hoisted on the roof of the auditorium for a decoy. In the meantime, I'm going to connect up a phone magneto to this P.O.D. and about five minutes after your reporter makes his debut I'll kick one of those Magnavoxes off the top of the

coupe in the hotel or know the reason why. Now mozey along, Oswald, and let's climax this deal. No wonder that ham with the three tube set not three blocks from their aerial isn't hearing a peep out of them. They've got this P.O.D. loaded to the limit."

A news reporter of the Omaha World Herald walked briskly into the auditorium and yelled into the transmitter of the radiophone: "Hello Pat, do you get me? The next number will be 'Bright Eyes', played by Oleson's Orchestra?"

Having yelled into the transmitter as ordered and having accomplished his mission of separating that lead-in from its better half he made tracks for the hotel to find the music in full swing. Say gang, that's what I call efficiency,—a busted lead-in and sigs as loud as ever. Any one wishing to accomplish the same will please write the C & S Radio-Electric Company of Omaha. It's the chance of a lifetime fellows, grab it.

Forty minutes after the pot was opened every Omaha paper was represented in the form of a storm of reporters but the Herald had the dope, Ruede has accomplished his mission and the fight was over. But wait,—next day we had a come back something like this:

"The first two days we used real wireless but our bulbs all blew out at once and we had to resort to the P.O.D. It would take a long time to get new bulbs (they run a radio company) and we had to see it through."

That's about all, gang, but there's just one thing more,—that comeback was a wonderful show of genius in itself, fellows, for they seemed to know those bulbs were all going to "blow" out together. Why, say, they stretched that P.O.D. a week ahead of time!

Yours truly,

An Outraged Amateur.

#### Newspaper Clippings Re Above

"If Old Broadbrim could have peeped over the top of a downtown office building last night he would have looked upon his favorite dessert. Wiretappers were at work! Using a condenser in series with a telephone receiver, the whole clamped onto a wire with clips, E. M. Ruede, Kenneth Ross and a newspaper man heard over it sweet music coming from the Auditorium.

"Ruede and his friends are interested in radio work, and they have been particularly interested in the demonstration of Wilbur R. Cramer and Fred W. Swain of Omaha who, according to the Literary Digest, can catch wireless phone messages on apparatus which they have attached to their automobile.

"This week being auto week, guests at the Fontenelle have been marvelling at an

auto in the lobby equipped with the young men's apparatus, for over it they maintain that music from the auditorium is transported by ether to the Fontenelle where it is caught and released by the wireless phone to those who care to hear.

"Last night visitors at the auto show were surprised, so were members of the band, when a young fellow marched up on the stage and called into the apparatus "Hello Pat, do you get me?", then went away. The wiretappers on the roof nearby hear him call also, and heard the band play.....

"In leaving the auditorium the young man who had called into the receiving apparatus accidentally shut the door on the aerial of the wireless apparatus. But, according to another secret agent the music still wafted from the wireless phone on the auto in the Hotel Fontenelle.

"'It's a blooming fake', cried Ruede, 'I think too much of the work to let anybody put a raw one like that across; that is why we tapped this wire to find out.'

"Ruede yesterday traced a loosely and newly hung wire from the auditorium north over the rooftops to the Rialto theater, thence west to a fire escape at the rear of the Fontenelle, where the wire went in thru a window. Last night the wire-tappers not only listened to the music that they tapped from the Auditorium but they called up several of their friends and by telephone let them hear it too."

—From the *Evening World-Herald*,  
Omaha, March 17th.

"Wilbur Cramer, of Cramer & Swain, who have been giving auto show music by "wireless" at the Fontenelle, admitted today that their apparatus at the hotel is connected by wire with the Auditorium as charged by E. M. Ruede, who Wednesday night "tapped" their wire.

"But they really can transmit the music without the aid of wires and did so the first two days, they said. 'Two of the bulbs on our transmitting instrument at the Auditorium burned out Tuesday night', Cramer said. 'We sent to New York for others to replace them, so to keep the music going we connected the phone up by wire. Up to Tuesday night the music heard at the Fontenelle had been coming as claimed, by wireless..... It was unfortunate that our bulbs, each of which cost \$7.50, should blow out at once. It looks like someone, jealous of us or something, has tampered with them under the orchestra pit at the Auditorium. Someone surely cut the ground wire of the aerial, as it was not broken by having the door slammed on it. That wouldn't break it', Swain said.

"'Mr. Ruede went just a little too far in his insinuations', both young men de-



clared. 'If our bulbs come in time we will yet prove to him and everyone else the music was wireless up to Tuesday night.'

—From the *Evening World-Herald*,  
Omaha, March 18th.

(Of late we have had numerous complaints against the C & S Radio Electric Co. They make no response to our efforts to secure satisfactory treatment for A.R.R.L. members. We cannot recommend them to our readers.—Editor.)

### IS SCOTLAND HEARING US?

130 Second Ave.,  
Long Branch, N. J.

Editor, QST—

Several weeks ago I wrote to Mr. Miller of Aberdeen, Scotland (the man who says he heard 2QR), asking if it would be possible for him to listen for me, as I have a C.W. and get 2 amps. on about 240 meters. Well, the other day I received an answer and will give you a copy of part of it here:

"It must seem strange to you that I have only received 2QR and no other station, but as a matter of fact I've heard a large number of telephone and telegraph stations, but as I've got no directory of the addresses of the senders I can't write them and let them know. So I'm very glad to have had your letter. On looking over the list of the call letters of the ones I've taken, I find I've heard you and the one you work to (2AHL). You were quite strong and clear and when you said you had a low tone I quite clearly remembered you."

Now I'm going to write him and ask for a list of the calls he's heard and will shoot 'em to you as soon as I get an answer.

Hoping this may be of interest to QST readers, I remain,

Yours sincerely,  
Harry J. McCollum, 2AXB.

(We also wrote Mr. Miller on April 8th and offered to swap him a new government call book for a list of the American stations he has heard, but to date we have no reply.—Ed.)

### THE OLD UNANSWERED QUESTION

Stroh, Ind.

Editor, QST—

What is a ground lead? Where does it leave off and the actual ground begin?

For instance, supposing I have my transmitter located 20 feet above ground, and use a 25 foot lead to the ground. This 25 feet would be counted the same as that much lead on my aerial lead-in when I apply for a license. However, if I am using the well for a ground, my lead is only measured from my set to the well pipe. Why not simply extend a piece of 2 inch well pipe 20 feet above ground and then

make my ground lead short? You will probably say that this will not do, as the pipe is the same as the ground lead.

Granting that such is the case, then please explain to me how these fellows located on high buildings, with an aerial over a hundred feet above the ground, can simply place their transmitter close to the city water pipes and have a short ground lead—ON THE THIRD OR FOURTH FLOOR ABOVE GROUND?

Please explain to me how such stations keep their wave below 500 or 600 meters, when they use an aerial 50 or 60 feet long and are perhaps 100 feet above ground. If the ground lead oscillates the same as the aerial, it would seem to me that they would have a very long wave.

Being unable to get a satisfactory explanation I turn to you.

Yours truly,  
F. B. Hanes.

### FROM THE BUREAU OF STANDARDS

#### DEPARTMENT OF COMMERCE

Bureau of Standards  
Washington

May 12, 1921.

Mr. H. P. Maxim, Pres.,  
American Radio Relay League,  
Hartford, Conn.

Subject: Co-operative Fading Tests.

Dear Sir:

1. The series of fading tests, extending over the past year conducted by the American Radio Relay League in co-operation with this Bureau, have been highly satisfactory. We believe that no such extensive and fruitful co-operative radio transmission tests have previously been held. The possibilities of such co-operative research for the future are very great. There is no question that there might be great extensions of similar work in the future. The A.R.R.L. is admirably adapted, through its form of organization and the facilities of its membership for further very valuable work of this kind.

2. We desire to convey through our appreciation of the organization of the tests by your National and District officers, of the excellent work done by the transmitting and recording operators, and, in addition, the fine spirit of co-operation shown by hundreds of stations that stood by patiently during the running of the tests. There has already been partial publication of results of the tests, and we expect to prepare a full account of the work, which will be submitted for publication in "QST".

3. The next project which we should like to take up with the A.R.R.L. is the study of direction of strays. We hope to transmit to you before many days some results of our preliminary experiments.

We appreciate that this project is probably one which will not be suitable for a very wide circle of the A.R.R.L. membership. The International Union of Scientific Radio Telegraphy is, however, making plans for co-operative radio experiments upon a large scale, and we are confident that other opportunities will arise for important contributions by the A.R.R.L.

Respectfully,

E. B. Rosa,  
Acting Director.

#### OUR MOTTO: WE NEVER SLEEP

181 Waverly Place,  
New York City,

Editor, QST—

Just noticed in the May number that I am a regular member of the Boiled Owl Club. I wish to nominate my side partner Mr. Intemann of 2ACX as another member, as he fully deserves that distinction.

On a recent nite abt a week ago we both stuck out the Saturday nite gang as per the O.M. and it sure was great sport art—every hour or so a new bunch got on and the rest went to bed. The sun came up and we still hrd 1XM, 8AIO, and others QSA. We stuck till abt 8 a.m. and then called it a nite and then went upstairs and ate abt a pint of ice cream. You see 2ACX is connected with the ice cream biz.

I wish to recommend a pint or two of ice cream to fellow B.O.'s after an all nite session of outsticking those whose stomachs never go bk on them, as it is very effective in obliterating that taste like a blacksmith's apron. If the ice cream alone is insufficient I wud advise a few pickles and bananas sliced in with it.

Well, on with the good wk, boys. QRU  
nw cul best 73s de

A. Rechert, 2TT, opr. 2ACX.

#### A SPLENDID IDEA

324 Tinkler Street,  
La Fayette, Indiana.

Mon Cher Eddy:

When I reached my room yesterday afternoon I found "QST" waiting for me, so I devoured it in big chunks and let the rest of the world go by. I was particularly interested in 9ZN's article on the "Ideal Spark Transmitter". After having devoured about half of the number, I went over to a friend's station and tried to receive through all the static in the world. (The only thing from out of town that I got all evening was 9XM signing off on straight CW, QSA but still difficult to copy through the QRN.)

Having thus passed (up) an evening I went to bed. Suddenly a brilliant idea came to me. (It might be well to explain that I am a short-connection-fiend.) Why not cut about an inch out of the one-turn

primary (of 1-16" x 2" copper,) and arrange your rotary, of the straight-through type, so that it shall have electrodes of 1-16" x 2" aluminum? In other words, why have leads at all from your condenser to your gap and from your gap to your O.T.? Of course, the cut ends of the primary would be supported on efficient insulators and ground to a thin edge. I think that this must be the limit, so far, in means for the conservation of the amateur's invaluable, priceless inductance—and might be the means of bringing some of the wave-length-law-breakers down to 199% meters in stead of 400.

Truly yours, OM,  
Wm. E. K. Middleton,  
Canadian 4AQ.

#### WE STAND CORRECTED

15 Roseland Ave.,  
Waterbury, Conn.

Editor, QST—

Permit me to call your attention to an error occurring in "Strays" of the April issue of QST.

The editor says, "You radiate energy which is measured in watts." This is not correct. Watts are a measure of *power* which is the *rate* at which energy is used. In order to obtain the energy the watts must therefore be multiplied by a time factor. For instance if energy is put into the primary of a transformer at a *rate* of 1 kilowatt and the transformer is operated for 2 hours there is used 1 x 2 *kilowatt* hours of energy.

The watt is not an electrical term entirely. In the so called C.G.S. (centimeter gram, second) system of measurement it is also the unit of power and represents the delivery of one C.G.S. unit of energy per second.

A clear understanding of the difference between power and energy will help a great deal in the understanding of our various sending and receiving problems.

For instance some of Mr. Wests' "whys" in his answer to Mr. Stones' communication become much easier to answer.

Donald O. Friend.

#### THE A.R.R.L. SPIRIT

Princeton, N. J.

Editor, QST—

April 16.

I am inclosing two dollars as my quota for the April A.R.R.L. Drive. My work keeps me from seeking new subscribers for our little magazine, but I owe it to the A.R.R.L. to help any time I can. Hence the cash. Put it to good use, with the best wishes of

An Amateur.

(Thanks heartily, O.M. But please give us your name so we can extend your own membership a year.—Editor.)

**HERE IS A REAL IDEA!**

1500 So. Ridgeway Ave.,  
Chicago.

Dear Eddy:

After seeing Mr. Vermilya's letter in the March QST I decided to try it out but had too much trouble winding inductances so happened to think of another and better scheme. I brought every ground lead, insulated, up to the O.T. and tuned with ammeter for most radiation on each ground, all to the same wave length. Then I put them all on at once on their respective places and Oh Boy! the radiation jumped just as if u stuck it across your "A" battery. One good thing abt this idea is that the long ground leads could be used and they added to radiation but of course less O.T. was required on long ones than on the short ones.

WI om nil nw, 73 cul.

9AOX.

**WE MUSTABEEN WRONG**

April 16th, 1921.

Dear Eddy:—

I am speaking at you in-re yours of April 1st., via QST, dictated by one Julius G. Aceves, by order of Dr. M. I. Pupin, I regret to advise that I do not agree with Julius.

Having had considerable experience with Bridges I feel qualified to hand you a cue.

Now Julius says that "if F is not known, a standard L is substituted—", while I contend that if F is not known standard Loco is not substituted, for as the Bridge may be down, an Erie Loco will do, in which case the capacity will be about 2QTS (homebrewed). On the other hand, if the power factory is closed, more than 70% of the Henrys will be in use, by which token one will know that the vacuum can be determined only by the formula,

PHOTO-OTA2PLpg" QST 4-1921 = MUD

2 I\*

Moral: Don't sit on the table. use the Bridge.

Your for Beer & Light Wines,  
Inocram.

I/me

**CALLS HEARD**

(Concluded from page 49)

WUBC, CAMP KNOX, KY., All C.W.

1DT, 1HB, 2XB, 2XX, 2CC, 2XK, 2DH, 2HTS?, 2AR, 2ZL, 3AC, 3AA, 3AB Canadian, 4AL, (4XB), 5XB, 5XA, 5VS, 8XB, 8XK, 8ZB, 8VS, 8OY, 8IB, 8IV, 8ZY, 8ZW, 8PJ, 8JM, 8OZ, (8AGZ), (8KM), (8ZG), (8YG), (8ZV), (9XD), (9XM), 9BY, 9YY, 9YK, 9YG?, 9ZN, XF1, XB1, VF1, WL2, NSF.

**CLIFFORD J. GOETTE**

(Concluded from page 43)

can border. To his surprise he found that about ninety percent of the M.I.B. men were amateurs, many of whom he had heard or worked before the war, which only proves once more what a factor we "hams" were in the war. Six months after the signing of the armistice he was discharged and was one of the first to open up after Uncle Sam lifted the ban on amateur operation, and from that day on he has done his share in burning up the air.

2JU was recently described in QST and it will be recalled has a "coffin" transformer and a Grebe synchronous gap. Goette is known for his very excellent fist and his courteous and diplomatic manner on the air, qualities all the more needful because of the range of his booming spark.

Recently Goette was chosen by Division Manager Chas. H. Stewart to become his assistant in charge of the Northern Section of the Atlantic Division, and under his management new life has been put into amateur affairs in that locality. The Northern Section is one of our most important territories, since it embraces New York City and all the traffic lanes leading into that center; it abounds with good stations and good operators; and with Mr. Goette as its able leader we expect to see it speedily gain that place in A.R.R.L. affairs which rightfully should be its own.

**S. KRUSE**

(Concluded from page 43)

hung up a 1320 mile record on a half kilowatt.

Kruse helped form the Lawrence Radio Club and the Central Radio Assn. ("From the Rockies to the Ohio"—Remember it, you old-time Valley men?), and from Kansas U. went to the Western Electric engineering department at New York on circuit analysis work and the development of sub-chaser radiophones. Whence, to the Bureau of Standards Radio Laboratory at Washington, where he is now an assistant engineer. To the Bureau he carried a keen appreciation of practical operating conditions on short waves that has stood him in good stead and makes him a connecting link between the amateur world and the activities of the Bureau relating to short wave radio. He was one of the originators of the idea of the B.S.-A.R.R.L. co-operative fading tests and to him is largely due the credit for the successful inauguration and performance of the tests. The collating and analyzing of the data gathered has been and is in his hands, and when the results from this vast effort are achieved, as they surely will be, the job will have been Kruse's, and to him belongs the credit.

At the convention in Philadelphia in March when the Third District Amateur Radio Council was organized, Kruse was elected president and there are very few men who could have been so wisely chosen. He was also recently elected a Director of our A.R.R.L.

With a sound technical training Kruse combines a hard-headed practical amateur's knowledge of practical operation, a noodle chock full of vital truths regarding 200 meters and thereabouts, and a gift for conveying ideas in a clear and clean-cut style all his own, and besides all this he can write funny stories. All of which makes him a good fellow to know.

**SUMMER ARRIVES**

*(Concluded from page 50)*

they are one-quarter the audibility of the strays. So it's far from hopeless! This contest, too, will show how the spark and

the C.W. compare in "static-puncturing"—we think we'd like to put it: "will show just how much better a static-puncturer the C.W. is than the spark."

Another thing, men: we mustn't forget our advertisers. They have to get results from their advertising or they can't afford to continue it, and that's the only thing that keeps QST going, for the printer alone gets more than you pay for your copy. We want to suggest that summer is a good time to do your over-hauling, assemble the results of the past winter's work into panels, build up new stuff for next winter, etc. You'll get prompter shipments at this time of the year and you'll have the knowledge that you're helping the game along by boosting business thru the hot months. One thing more: whatever you do, don't forget to mention QST when writing advertisers. It helps you and us—we both know why.

Now for that hash-house.



Made Right

**Mr. Manufacturer. Mr. Amateur**

**Stop! Look! Read!**

and let's settle



Stay Tight

**YOUR BINDING POST TROUBLES**



Corporal



Sergeant

The accompanying cuts illustrate two sizes of our Current Posts and the medium size of our slotted style Potential Posts.

The bases of our Current Posts are tapped to take a #6. 8 or 10-32 machine screw and are knurled to prevent turning.

The non-removable insulated cap and base of the Potential Post is made from a high grade indestructible material.

We can supply the current post in any finish desired but unless otherwise ordered they will be furnished in a plain brass finish.



Commander  
Opened

**NINE REASONS WHY THESE UNIQUE POSTS SHOULD APPEAL TO YOU:**

- 1—There are no parts to become lost
- 2—They will not mar the finest of wires.
- 3—They are built for a 24-hour service.
- 4—They are easily mounted on standard equipment.
- 5—They permit a smaller sized post to be used.
- 6—Extreme vibration will not loosen their lock grip.
- 7—They are surprisingly low in price.
- 8—They harmonize with other moving parts.
- 9—THEIR PARALLEL CONTACT SURFACES EXTEND THE FULL WIDTH OF THE POST.

**IMPORTANT NOTICE TO DEALERS:** Here is a real money making proposition for you. We want responsible dealers in every city to carry these unique posts. The boys like them and will soon demand them on all their sets. Put your order in today. They are selling fast.

**IMPORTANT NOTICE TO AMATEURS:** If you want a real Binding Post that you can easily mount on your set—one that DON'T come apart and will easily clamp your wires—Demand "THE LEADER." Specify it in your next set or go to any leading radio dealer and ask for them. Do NOT order from us. Your dealer can supply them if you insist.

PAMPHLETS DESCRIBING THESE UNIQUE POSTS SENT UPON REQUEST

**THE H. H. EBY MANUFACTURING CO.**

1302 WALLACE STREET,

PHILADELPHIA, PA.

**"EVERYTHING IN RADIO"**

**WESTERN RADIO ELECTRIC COMPANY**

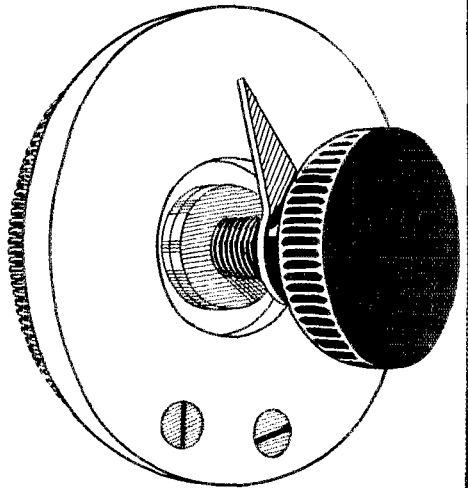
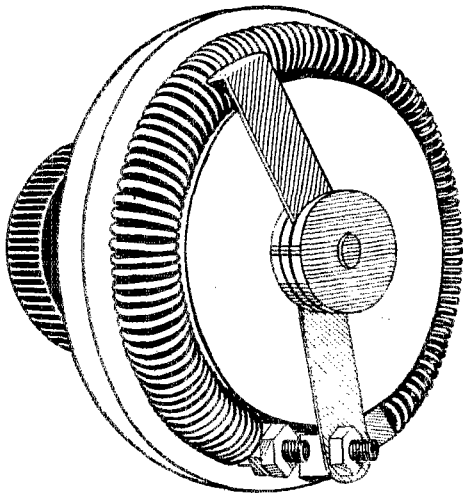
SEND FOR OUR MARCH

STOCK BULLETIN AND PRICE LIST

550 South Flower Street,

Los Angeles, Cal.

# SHRAMCO - R E O -



## for your power tube--

*New type Shramco Reo, No. 90P.*

*1.5 ohm Nichrome resistance.*

*Current capacity 6 amperes*

*Price \$2.00, 1 lb. postage.*

**A** BACK MOUNTED panel rheostat, specially designed for the Radio U.V. 202 and other transmitting tubes. Resistance element (1.5 ohm) is "Nichrome" wire, mounted on a solid block of asbestos. Allows unusually accurate and delicate variation of the filament current. All metal parts brass. Spring

phosphor bronze blade. Base 3". Overall height 2½". Handsomely finished and accompanied by an unconditional guarantee of complete satisfaction. Get the most out of your expensive power tube by using a *good* rheostat. Order a Shramco Reo to-day! Now ready for immediate shipment.

### for your VT detector

*and amplifier, use the original Shramco Reo, type 90. Similar to the power tube type, but with a "Nichrome" resistance of 6 ohms. Price, \$2.00, plus postage for 1 lb. We also make the "Midget" Shramco Reo, .5 ohm resistance, 2½" base.*

**SHOTTON RADIO MFG. COMPANY**  
**P. O. BOX 3, SCRANTON, PA.**

*Catalogue "K", listing a complete line of high grade parts at reasonable prices, sent to any reader of QST for five cents in stamps.*

On the Job--  
**QUALITY  
 SERVICE  
 PRICE**

*For this month only.*

- 22½ Volt B-Battery small size..\$1.25  
 22½ Volt B-Battery large size.. 2.40  
 45 Volt Variable B-Batteries..... 4.00

**CONDENSERS**

- Chelsea #1 Mounted..... 5.00  
 Chelsea #2 Mounted..... 4.50  
 Chelsea #3 Unmounted with dial  
 .0012 Mfd..... 4.75  
 Chelsea #4 Unmounted with dial  
 .0006 Mfd..... 4.25

**VACUUM TUBES**

- Genuine 2 Filament Audiotron.... 6.00  
 UV200 Radiotron Detector Tube.. 5.00  
 UV201 Radiotron Amplifier Tube 6.50  
 UV202 Radiotron 5 Watt Power  
 Tube ..... 8.00  
 Electron Relay Detector Tube.... 6.00  
 Moorhead Amplifier Tubes..... 7.00

**TELEPHONES**

- Western Electric Telephones..... 14.75  
 Baldwin Type C..... 16.50  
 Baldwin Type E..... 20.00  
 Murdock 2000 Ohm..... 4.50  
 Murdock 3000 Ohm..... 5.50

**AMPLIFYING TRANSFORMERS**

- #226 Federal Mounted..... 7.50  
 A-2 Acme Mounted..... 7.00  
 A-2 Acme Semi Mounted..... 5.00  
 A-2 Acme Unmounted..... 4.50  
 We have a limited supply of the  
 new Radio Magnavox..... 45.00  
 Radisco Variable Couplers..... 7.50  
 Murdock Variable Coupler..... 8.50  
 Murdock Moulded Variometer.... 7.50  
 Chelsea Moulded Dials..... 1.00  
 A. H. Corwin Dials 3"..... 1.25

**KELLY & PHILLIPS**

*Radisco Agency*

312 Flatbush Ave., Brooklyn, New York

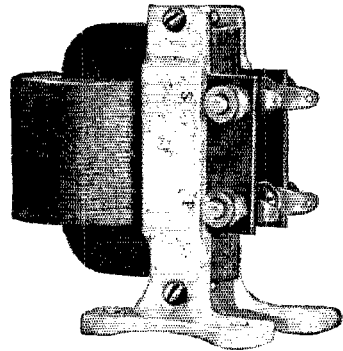
**-A-A-**

AUDIO

FREQUENCY

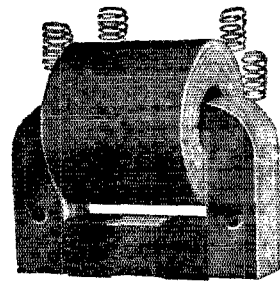
**Amplifying  
 Transformers**

**HIGHEST QUALITY  
 MOST EFFICIENT**



**\$5.00**

**NOTE THE NEW (ONE PIECE)  
 PUNCHED LAMINATIONS**



**UNMOUNTED**

**\$4.00**

**SEMI-MOUNTED .....\$4.50**

**—DEALERS WANTED—**

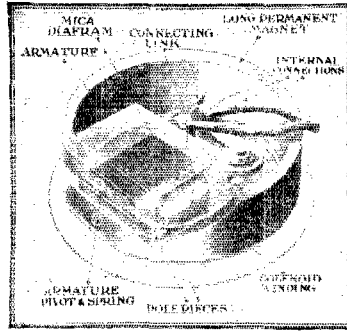
Shipments Made From Stock Prepaid.

Note Change of Address

**All American Elecl. Mfrs.**

**1516 NORTH LOREL AVE.,  
 CHICAGO, ILL.**

This illustration shows the amplifying mechanism in a Baldwin unit. Note that four pole pieces of single solenoid act on the armature, which in turn connects with the super-sensitive mica diaphragm.



Type "C" Navy standard . . . . \$16.50  
 Type "E" Super-sensitive . . . . 20.00  
 Type "F" light weight . . . . 21.00  
**Units for loud speakers.**  
 Type "C" . . . . \$8.50  
 Type "E" . . . . 10.00

# Equal to two stages of radio amplification

THE experience of leading radio operators,—who have found Baldy Phones "equal to two stages of radio amplification" clearly indicates the outstanding advantages of using *good* phones. From a standpoint of radio efficiency, you will get "more value per dollar" from your investment in Baldwin Amplifying Phones than from any other item of your equipment.

Here are the actual (un-asked-for) letters from experienced radio men, telling of their results with Baldys. They're worth careful reading:

"Have used a pair of Type "C" Baldys for some time, in naval communication and commercial service. Consider them the most sensitive telephone on the market." (Name on request.)  
 "I faithfully believe the use of Baldwin Phones will improve any receiving set at least 50%." (Name on request.)

"Have found your Baldwin Telephones equal to one and two stages of radio amplification." (Name on request.)  
 "In our station it is a common occurrence to place the receivers (Baldys) on the table and copy in daylight the long undamp wave stations with but one V.T." (Name on request.)

"Equal to one and two stages of radio amplification": Of course Baldys cost more,—but where can you get better value? Where else can you buy amplification equal to the super-sensitive Baldwin mechanism, for so little?

And, the more limited your investment in radio must be, that much more important becomes the use of a super-sensitive and selective Baldwin head set!

The best radio dealer in your town, undoubtedly has a supply of booklets explaining the superior construction of Baldwin, Eldredge Meters, and other Firth Specialties. If he does lack a supply, write, mentioning his name and address, direct to

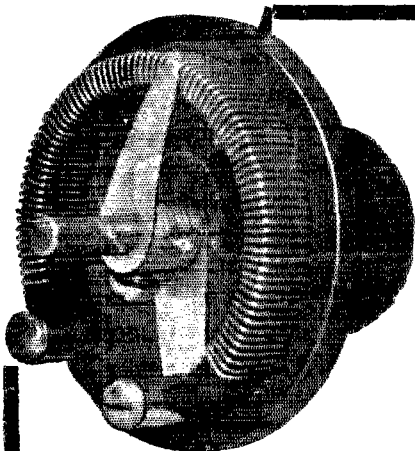
**John Firth & Co., Inc., 18 Broadway, New York**

Distributors for

Baldwin Phones	U. S. Bureau of Standards
Eldredge Meters	Wavemeter
Kolster Decremeter	Brownlie Adjustable Phones.

Dealers: Write for advance information on new popular-priced loud-speaker.

# BALDY FOR LAND SEA AND IN THE AIR PHONES



## your success

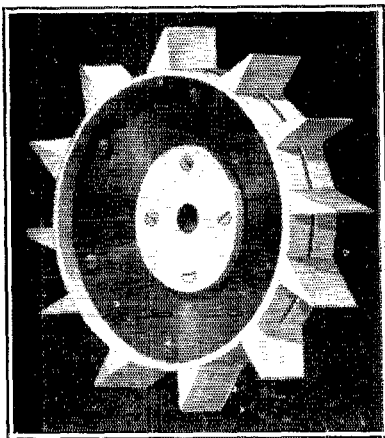
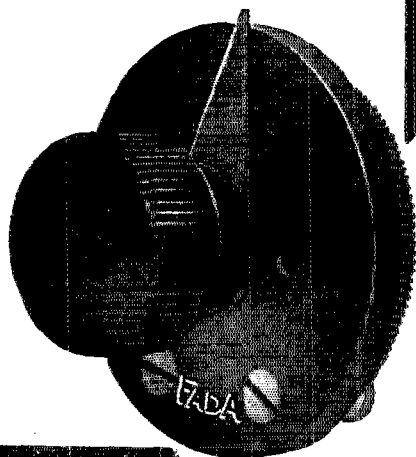
is complete if you use this FADA rheostat to adjust the filament current of your gas-content detector and amplifier tubes. Such tubes require a delicate "A battery" adjustment for best results. And the FADA rheostat does the trick.

**\$1.25**

EACH  
BY MAIL  
POSTPAID

Made with a base of THERMOPLAX, an Asbestos-Bakelite sheet, (2 1/8" in diameter) and furnished with a Bakelite knob and polished nickel plated pointer. Two nickel plated screws are also furnished for mounting to any panel up to 1/2" in thickness. Ample heat radiation to safely carry 1 1/2 amperes. Resistance 6 ohms. There is only one rheostat as good and that's another FADA.

**FRANK A. ANDREA**  
1882-B JEROME AVE., NEW YORK



### IMPROVED SPARK GAP

Built for business. All machine construction. Teeth interchangeable and renewable. 1" wide. 1/4" sparking surface. Special aluminum alloy. Rotor made to fit any size shaft. Bakelite insulation.

## "SAG-RE-CO" PRODUCTS

### Back Panel Mounted Rotary Switch.

Recommended for master switching, low to high wave, switching from det. to one or more stage of amplification, etc. Contact fingers making positive connection at all times. Furnished two or more circuits. Small and compact with bakelite insulation.

Our mail order dept. is prepared to make immediate shipment on all radio apparatus of the following and many other makes:

CLAPP-EASTHAM  
ELECTROSE MFG.  
CHELSEA  
FEDERAL  
REMLER  
MURDOCK

ACME  
BRANDES  
THORDARSON  
GENERAL RADIO  
DE FOREST  
SOMERVILLE LAB.

## Saginaw Radio & Electric Co.

118 So. Water Street,

Saginaw, Michigan



# Ready, CORWIN'S 1921 CATALOGUE

32 pages of up-to-the-minute radio. All Radisco apparatus. Instruments for every part of your station at moderate prices. Tables of codes, abbreviations, etc. Much larger, better illustrated than last year's. And you

can always rely on the Corwin Mail Order Service to ship every instrument listed in the catalogue or in this advertisement quickly, in perfect condition, and with an unconditional guarantee of satisfaction.

*Send us a dime today. We'll mail the catalogue the instant we hear from you!*

## Universal-Coil Mounting Plugs.

Anyone can easily make smooth-running mountings with these plugs. No bending, no filing, they are made to fit exactly, in the first place. Suitable for Radisco and all hand wound coils. A few minutes work with these plugs will save you dollars that can be put into better apparatus!

*Price 80 cents, postpaid.*

### VARIABLE CONDENSERS

A.R.CO. .001 .....	\$6.25
A.R.CO. .0005 .....	5.00
With No. 67 Dial add. ....	1.00
Murdock 366 .....	4.75
Murdock 367 .....	4.75
Murdock 368 .....	3.75
Clapp-Eastham 800 .....	7.50
Clapp-Eastham 800A .....	9.50
Clapp-Eastham 800B .....	11.50
Complete with dial	
Shipping Weight One Pound.	

### GRID CONDENSERS

Radisco, postage 3c .....	.35c
---------------------------	------

### ANTENNA SWITCHES

Murdock, 3 pounds .....	\$4.50
Clapp-Eastham, 10 pounds .....	12.50

### OSCILLATION TRANSFORMERS

Murdock No. 424 .....	\$5.00
5 lbs.	

### RADIO CRAFT PRODUCTS

Detector .....	\$15.00
Two step Amplifier .....	50.00
Detector and one step .....	45.00
Detector and two step .....	70.00
Postage paid.	

### "B" BATTERIES

Radisco No. 1 (2 lbs.) .....	\$1.50
Radisco No. 5 (5 lbs.) .....	2.65

Eveready Storage Battery  
prices on application.

### TUSKA C.W. APPARATUS

181 Coil (2 lbs.) .....	\$7.50
182 Coil (2 lbs.) .....	10.00
183 Coil (3 lbs.) .....	12.50
170 Filt. (8 lbs.) .....	16.00

### AERIAL WIRE

7x22 tinned copper	
100 feet 2 lbs. ....	\$1.25
200 feet 4 lbs. ....	2.40
500 feet 8 lbs. ....	6.00

### AMPLIFYING TRANSFORMERS

A.R.Co. (1 lb.) .....	\$5.00
Federal (1 lb.) .....	7.50

### JACKS AND PLUGS

Federal Closed Circuit .....	\$0.85
Federal Open Circuit .....	.70
Federal Double Circuit .....	1.00
Federal Plug .....	2.00
Postpaid	

ALL RADISCO COILS and  
Wireless Press Books.

*All orders for apparatus not listed as postpaid  
must be accompanied by postage charges.*

## A. H. CORWIN & COMPANY

Dept. D.4.,

4 West Park Street,

Newark, New Jersey

### NEW RADISCO VARIO-COUPLER.

Moulded Base, Formica Tube, Brass for all metal parts. "Accurate to a fraction of a hair's breadth: (PRICE \$7.50 Postpaid).

### VACUUM TUBES

Electron Relays .....	\$6.00
VT Amplifier (1 lb.) .....	7.00
VT Extra hard for transmitting .....	7.50

### ROTARY SWITCHES

Clapp-Eastham No. 19 .....	\$1.00
Clapp-Eastham No. 19A .....	.35
Our Own No. 1 .....	.40
Our Own No. 2 .....	.55
Postage .....	.05

### CORWIN DIALS

No. 66, 3" .....	\$0.75
No. 67, 3" with knob .....	1.39
No. 68, 3 3/8" .....	1.00
No. 69, 3 3/8" with knob .....	1.70
Postpaid	

### RECEIVERS

Murdock No. 55, 2000 ohm .....	\$4.50
Murdock No. 55, 3000 ohm .....	5.50
Brandes Superior .....	7.00
Baldwin C. ....	16.50
Baldwin E. improved .....	20.00
Brownlie new .....	12.00
Shipping weight, 2 pounds.	

### CONTACT POINTS

CP No. 1, Brass, dozen .....	.25c
P No. 4, Brass, dozen .....	.35c
CP No. 5, Nickel Plated .....	.45c
Postpaid.	

### VARIOMETERS

Radisco No. 1 .....	\$7.00
Radisco No. 1D .....	8.50
3 pounds.	

### LOOSE COUPLERS

Clapp-Eastham Radion .....	\$14.00
Murdock 344 .....	9.00
6 pounds.	

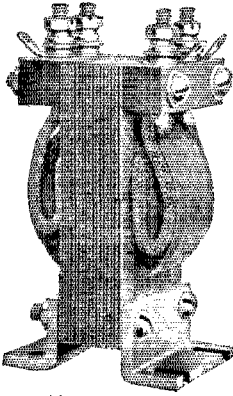
### GROUND OUTFIT

Consists of SPDT 500 Amp. Switch,  
25 feet No. 4 wire, clamp and  
cleats, prepaid .....

### VT. SOCKETS

Murdock .....	\$1.00
Radio Service, Double .....	2.50
Radio Service, Triple .....	3.50
Shipping Weight, 1 pound.	

**Federal Standard Radio Accessories**  
 Are Recommended and Endorsed by the Leading Radio  
 Engineers and Amateur Experimenters of the Country.

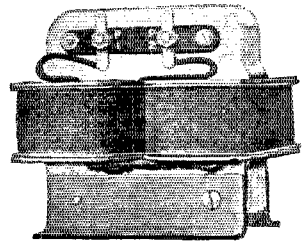


No. 226-W  
 Audio-Frequency  
 Transformer

Federal No. 226-W Audio Frequency Transformer gives the **Maximum Amplification** with all types of Standard Tubes now on the market.

Federal No. 300-W Filter coil for smoothing out the Pulsations in the D.C. Plate Voltage Supply in Radiophone Circuits.

It is unquestionably the most effective filter coil on the market.



No. 300-W  
 300 M. A. Filter Coil

Ask your dealer for Federal products. If he does not have them, tell us his name.

**Federal Telephone and Telegraph Co.**

Buffalo, N. Y.

Manufacturers of Standard Radio Accessories. Send for Bulletin 102-W.B. & C. Circular.

**SALVAGE THAT BURNT OUT "VT"**

**MARCONI  
 MOORHEAD**

Angola, Ind.  
 April 1, 1921.  
 Eastern Vacuum Tube Lab.,  
 178 Washington St.,  
 Boston, 9, Mass.  
 Dear Sirs:

The amplifier tube has been received, and I find same to be in first class condition, and I am fully satisfied with same. I wish to thank you for your kind consideration of this matter, and hope to send you my orders in the future.

Yours truly

(name on request)

**\$3.50**

**CASH MUST  
 ACCOMPANY  
 ALL ORDERS**

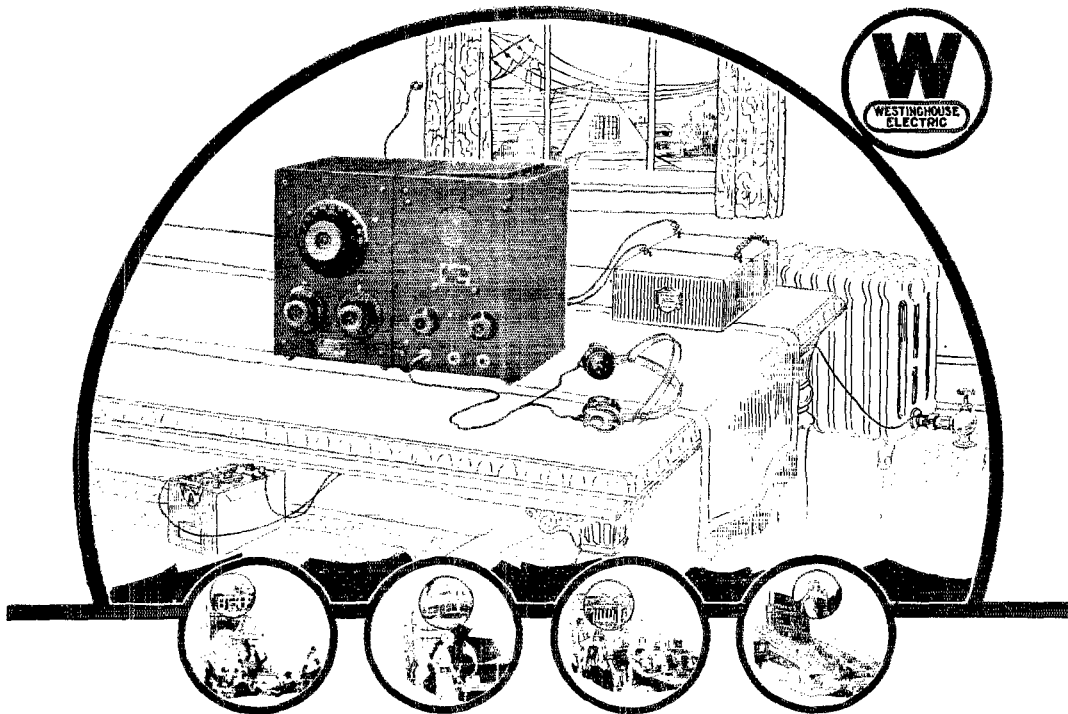
**AUDIOTRONS  
 ELEC. RELAY**

Temple, Pa.  
 Feb. 17, 1921  
 Eastern Vacuum Tube Lab.,  
 178 Washington St.,  
 Boston, Mass.

Gentlemen:  
 Just received the Electron Relay tube and it works O.K. Thanking you very much for your courtesy, I remain  
 Yours very truly

(name on request)

**EASTERN VACUUM TUBE LABORATORIES**  
 178 WASHINGTON ST., BOSTON, 9, MASS.



## Dependable Radio Apparatus

The real radio enthusiast appreciates the dependability and efficiency of Westinghouse Radio Receiving Apparatus embodying the Regenerative Tuner and the Tube Detector Amplifier, the latest achievements of the noted radio engineers Edwin H. Armstrong and Frank Conrad.

*Ask our nearest office for Folder 4446, it gives interesting particulars.*

Our New England radio specialist writes us as follows:

"The Type RA Tuner has been favorably spoken of by all who have seen and used it, the consensus of opinion being that it is the sharpest and most selective tuning device on the market."

### Have You Heard KDKA?

Westinghouse Electric & Manufacturing Company  
East Pittsburgh, Pa.

Atlanta, Ga., Candler Bldg., 127 Peachtree St.  
Boston, Mass., Rice Building, 10 High St.  
Buffalo, N. Y., Ellicott Square Bldg., Ellicott Square.  
Chicago, Ill., Conway Bldg., 111 Washington Street.  
Cincinnati, O., Third and Elm Streets.  
Dallas, Tex., Exchange Bldg., Akard and Wood Street.  
Denver, Colo., Gas and Electric Bldg., 910 Fifteenth St.  
Detroit, Mich., Dime Savings Bank Bldg., Fort and Griswold Street.  
Kansas City, Mo., Orear-Leslie Bldg., 1012 Baltimore Ave.  
Los Angeles, Cal., I. N. Van Nuys Bldg., Seventh and Spring Streets.

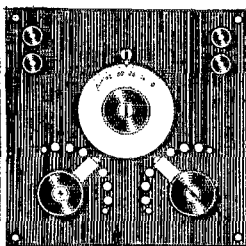
New Orleans, La., Maison Blanche Bldg., 921 Canal St.  
New York, N. Y., City Investing Bldg., 165 Broadway.  
Philadelphia, Pa., Widener Bldg., 1329 Chestnut St.  
Pittsburgh, Pa., Union Bank Bldg., 306 Wood St.  
St. Louis, Mo., 300 N. Broadway.  
Salt Lake City, Utah, Walker Bank Bldg., Second St., South and Main Sts.  
San Francisco, Cal., First National Bank Bldg., 1 Montgomery St.  
Seattle, Wash., Alaska Bldg., Second and Cherry Sts.  
Syracuse, N. Y., University Bldg.  
Washington, D. C., \*Hibbs Bldg., 723 Fifteenth St., N. W.

\*Government business exclusively.

# Westinghouse

# NEW! WILCOX Standardized Unit Panels

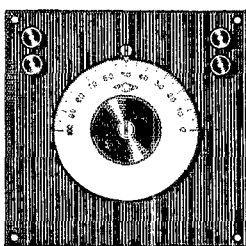
Efficient, Economical, Versatile,  
Accurate, Convenient



**Type 1C Variocoupler**

This instrument is carefully assembled from standard WILCOX parts on a five inch square panel of grained Bakelite. It is designed to be combined with the variometers shown to make an efficient short wave regenerative receiver.

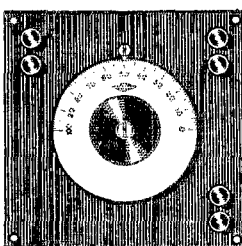
Price \$8.00 Postpaid



**Type 5B Variometer**

This variometer is designed for use in the grid circuit and when used with Type 1C Variocoupler will cover a wave length range of 175 to 450 meters. We have taken much care to so design these standardized units that they may work efficiently together.

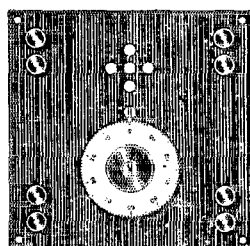
Price \$8.00 Postpaid



**Type 5C Variometer**

This is the plate variometer and is designed to operate with the other instruments shown. The binding posts are so arranged on these instruments that it is only necessary to connect from one to the other with brass strips, which are furnished free if requested with order.

Price \$8.00 Postpaid



**Type 3D V.T. Control**

This panel includes a tube socket, rheostat, grid condenser and grid leak. It is arranged for connection in any circuit but is especially desirable for use with other instruments illustrated on this page because of its standardized construction.

Price \$7.00 Postpaid

**Type 4B-C Condensers**

In appearance these condenser units resemble the 5B Variometer and they may be conveniently used wherever a variable capacity is required.

#4B Capacity .001 \$7.50 Postpaid

#4C Capacity .0005 6.75 Postpaid



Your local dealer probably has WILCOX products in stock. If not order by mail from us and your order will be shipped postpaid.

The Wilcox Laboratories  
LANSING, MICHIGAN

**Type 6A Amplifier**

This amplifier panel has the same appearance as the V.T. Control shown above and may be conveniently connected to it or to additional stages by means of connecting strips.

Price \$12.00 Postpaid

# AT LAST

**An Audibility Meter at a Reasonable Price**  
**EVERY UP-TO-DATE AMATEUR STATION NEEDS ONE.**

This scientifically designed meter enables you:

- (1.) To determine accurately the audibility of "DX" Stations.
- (2.) To obtain absolute results on the government

## FADING TESTS—NO GUESS WORK.

- (3.) To compare the sensitivity of various Vacuum Tubes, Phones, Circuits, etc.
- (4.) To let that "DX" station know you are up-to-date on the postal card you send.

When you receive that "QRK?" don't answer "QRZ," or "QSA" etc. but say "Audibility 750"—think how much more satisfactory such a definite reply is.

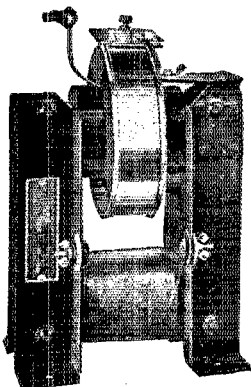
Special introductory price during June only - - \$12.50

**The Radio Specialty Company,**

NEW BRITAIN, CONN.

Watch for Future Specialties

# Important Reductions in Prices of Thordarson Apparatus



TYPE "RS"  
TRANSFORMER

## *Type "RS"* *Transformers*

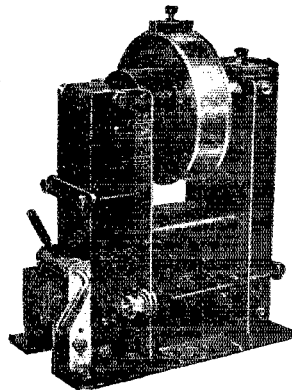
A non-resonant transformer with a lower secondary potential designed to give you the highest possible power factor.

1 KVA 15000 VOLTS.....	\$30.00
1/2 KVA 10000 VOLTS.....	20.00
1/4 KVA 8000 VOLTS.....	15.00

## *Type "R"* *Transformers*

The famous resonant transformer affording the highest practical voltages.

1 KVA 25000 VOLTS.....	\$40.00
3/4 KVA 10000 VOLTS.....	28.00
1/2 KVA 10000 VOLTS.....	22.00



TYPE "R"  
TRANSFORMER

## *Other Thordarson Equipment*

POWER CONDENSER (.0018-.009 MF).....	\$25.00
OSCILLATION TRANSFORMER .....	10.00
R8 ROTOR (8 TOOTH).....	5.00
R16 ROTOR (16 TOOTH).....	5.00
R12 ROTOR (12 TOOTH).....	3.00

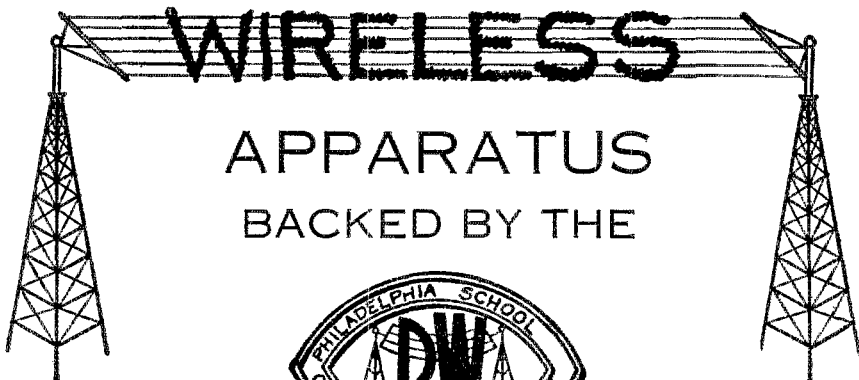
(Specify diameter of motor shaft when ordering rotors.)

A POSTAL BRINGS OUR CIRCULAR TO YOU.

## Thordarson Electric Manufacturing Co.

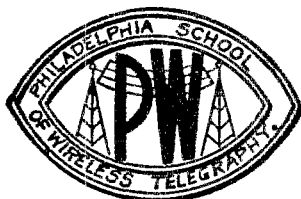
517 S. JEFFERSON ST.,

CHICAGO, ILL.



"3PW"

"3YG"



Reg. U. S. Trade Mark

In addition to the manufacturer's guarantee every piece of apparatus bearing our trade mark has passed our own laboratory inspection, and must operate satisfactorily under **normal** amateur conditions.

### *No Order Is Too Small*

Special attention is invited to the fact that while no order is too small to merit our most careful consideration neither is any order too large for us to fill promptly and efficiently.

PW has recently furnished the apparatus for THE largest amateur station in the U. S. for an important business house and are now working on two other installations for business houses which appreciate the advantages of Radio over ordinary means of communication.

In order to accommodate our increasing business we have taken an entire building with improved facilities for our customers.

---

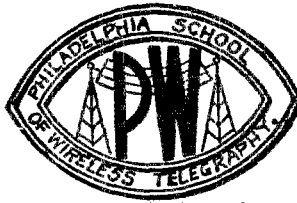
## Philadelphia School of Wireless Telegraphy

NOTE NEW ADDRESS

1533 Pine Street,

Phila. Penna.

**MAIL ORDER  
"SERVICE"**



**WE SHIP SAME  
DAY ORDER IS  
RECEIVED**

Reg. U.S. Trade Mark.

Our large stock of all reliable makes of Radio apparatus enables us to make immediate Shipment of your orders.

<b>ANTENNA SWITCHES</b>	
Murdock, 3 pounds.....	\$4.50
Clapp-Eastham, 10 pounds.....	12.50
<b>AERIAL WIRE</b>	
7x22 tinned copper	
100 feet 2 lbs.....	\$1.25
200 feet 4 lbs.....	2.40
500 feet 8 lbs.....	6.00
<b>AMPLIFYING TRANSFORMERS</b>	
A.R. Co. (1 lb.).....	\$5.00
Federal (1lb).....	7.50
<b>"B" BATTERIES</b>	
Radisco No. 1 (2 lbs.).....	\$1.50
Radisco No. 5 (5 lbs.).....	2.65
Eveready Storage Battery prices on application	
<b>CONDENSERS TRANSMITTING. (Dubilier)</b>	
No. D-100 250 W. 10,000 V. .007 MF....	\$19.00
No. D-101 500 W. 14,000 V. .007 MF....	30.00
No. D-102 1000 W. 21,000 V. .007 MF....	45.00
<b>CONDENSERS (Low voltage)</b>	
Western Electric 1MF 500 Volts.....	\$1.50
Western Electric 2MF 500 Volts.....	2.25
No. 21AA Western Elec. 1000 Volts A.C.	2.50
No. 577 Dubiliers .002 1000 V.....	2.00
<b>CONTACT POINTS</b>	
CP No. 1, Brass, dozen.....	25c
CP No. 4, Brass, dozen.....	35c
CP No. 5, Nickel Plated.....	45c
Postpaid	
<b>CORWIN DIALS</b>	
No. 66, 3".....	\$0.75
No. 67, 3" with knob.....	1.30
No. 68, 3 7/8".....	1.00
No. 69, 3 7/8" with knob.....	1.70
Postpaid	
<b>GRID CONDENSERS</b>	
Radisco, Postage 3c.....	35c
<b>GROUND OUTFIT</b>	
Consists of SPDT 500 AMP Switch, 25 feet No. 4 wire, clamp and cleats prepaid.....	
\$7.00	
<b>JACKS AND PLUGS</b>	
Federal Closed Circuit.....	\$0.85
Federal Open Circuit.....	.70
Federal Double Circuit.....	1.00
Federal Plug.....	2.00
Postpaid	
<b>LOOSE COUPLERS</b>	
Clapp-Eastham Radion.....	\$14.00
Murdock 344.....	9.00
6 pounds.	
<b>OSCILLATION TRANSFORMERS</b>	
Radisco No. 5.....	\$15.00
Via. Express collect only	
<b>ROTARY SWITCHES</b>	
Clapp-Eastham No. 19.....	\$1.00
Clapp-Eastham No. 19A.....	.35
Corwin No. 1.....	.40
Corwin No. 2.....	.55
Postage.....	.05

<b>REGENERATIVE RECEIVERS</b>	
No. CR-1 Grebe 175-680 Meters.....	\$90.00
No. CR-2 Grebe 175-680 Meters.....	45.00
No. CR-3 Grebe "Relay Special" 175-680 Meters.....	65.00
No. CR-3A Grebe With tube control, 175-375 Meters.....	45.50
No. CR-5 Grebe's "Super-Special" 175- 3,000 meters, tube control, self-con- tained. Complete receiving set. Just out.....	80.00

<b>RECEIVERS</b>	
Murdock No. 55, 2000 ohm.....	\$4.50
Murdock No. 55, 3000 ohm.....	5.50
Brandes Superior.....	7.00
Baldwin C.....	16.50
Baldwin E, improved.....	20.00
Brownlie new.....	12.00
Shipping weight, 2 pounds	

<b>RADIO CRAFTS PRODUCTS</b>	
Detector.....	\$15.00
Two step Amplifier.....	50.00
Detector and one step.....	45.00
Detector and two step.....	70.00
Postage Paid	
Regen. Receiver, 150-600 M.....	\$60.00
Regen. Receiver, long wave type.....	145.00

<b>TUSKA C.W. APPARATUS</b>	
181 Coil (2 lbs).....	\$7.50
182 Coil (2 lbs).....	10.00
183 Coil (3 lbs).....	12.50
170 Filt. (8 lbs).....	16.00

<b>VACUUM TUBES</b>	
No. UV-200 Radiotron, detector.....	\$5.00
NO. UV-201 Radiotron, amplifier.....	6.50
UV 202 Radiotron, 5W. power.....	8.00
UV 203 Radiotron, 50W. power.....	30.00
UV 204 Radiotron 250W. power.....	110.00

<b>VARIABLE CONDENSERS</b>	
A.R.CO. .001.....	\$6.25
A.R.CO. .0005.....	5.00
With No. 67 Dial add.....	
Murdock 366.....	4.75
Murdock 367.....	4.75
Murdock 368.....	3.75
Clapp-Eastham 800.....	7.50
Clapp-Eastham 800A.....	9.50
Clapp-Eastham 800B.....	11.50
Complete with dial Shipping Weight One Pound	

<b>VARIOMETERS</b>	
Radisco No. 1.....	\$7.00
Radisco No. 1D.....	8.50
3 pounds	

<b>VARIO-COUPLER</b>	
Radisco No. 3.....	\$7.50
Radisco No. 3D.....	8.50
3 pounds	

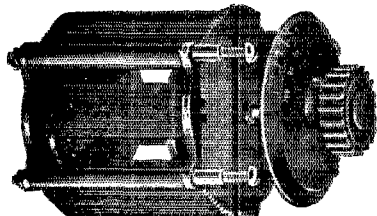
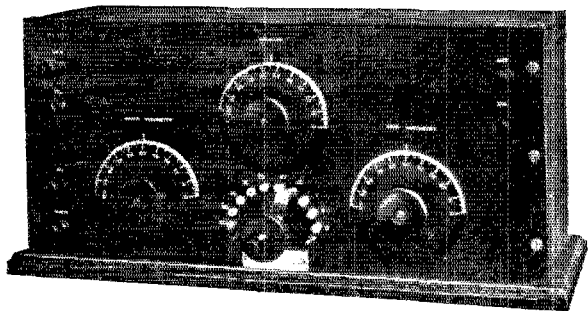
**Philadelphia School of Wireless Telegraphy**

*Note New Address*

**1533 Pine St., Philadelphia**

## The ESCO Regenerative Receiver— Improved

The original ESCO REGENERATIVE RECEIVER as described in previous issues of this magazine has been improved upon. The new set as illustrated above is contained in a smaller cabinet than originally so that now the set is easily portable. All of its former excellent operating features are but enhanced in the new outfit. The wave length range is 150 to 600 meters so that all amateurs and the majority of the commercial stations may be heard. Our new circular describes the set in full. Write for it. Price F.O.B. Columbus, Ohio or Philadelphia, Pa. is \$50.00. Shipping weight 11 lbs.



ESCO variometers and vario-couplers as shown alongside are sold separately for the convenience of those amateurs who prefer to build their own equipment. The instruments are absolutely guaranteed to be satisfactory. Prices are as follows:

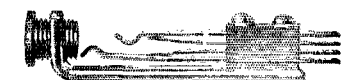
ESCO variometer with dial . \$9.50    ESCO vario-coupler with dial . 10.00  
 ESCO variometer without dial 8.50    ESCO vario-coupler without dial 9.00

### PLUGS AND JACKS

The cut illustrates a plug and jack which have been on the market for only a short time but in that time have acquired a wonderful reputation. With their use many practical connections can be effected. Phone and amplifier connections are quickly made in multi-stage circuit. The upper and lower contacts complete a single circuit thru the phones when the removal of the plug automatically connects the amplifying transformer. Jack and plug are nickel-plated and very attractive in appearance.

Plug only, \$0.75;    Jack only, \$0.85;    Plug and Jack complete, \$1.50.  
 Shipping weight 4 ounces.

Send 15c for our complete literature of Radio supplies. This amount will be refunded on your first purchase of \$1.50 or over. High printing costs make free distribution impossible.



**The Electrical Specialty Co.**

Dept. L., 48-50 So. Front St., Columbus, Ohio.  
 Dept. L., 20 N. 9th St., Philadelphia, Pa.

# Western Electric Head Sets

We have a big stock on hand at \$12.00 per pair **ORDER NOW**. All new, in original boxes.

**D-L COILS—UNMOUNTED 1/2 PRICE—ORDER NOW**

Western Electric, 21AA Condensers capacity 1 MFD, stands 1000 volts \$2.00

**Special for CW Work—VT Receptacles**

Empire \$1.00.    General Radio \$1.75,    DeForest, all moulded \$1.25.  
 Radio Service \$1.10.

Order anything in Radio Parts. We have a complete stock and ship Prompt.

**AMERICAN ELECTRO TECHNICAL APPLIANCE COMPANY**

Dept. Q,    235 Fulton Street    New York City



# Radio Telephone and Telegraph Apparatus of Merit

## JUNE AND JULY BARGAINS

Unmounted Amplifying Trans- formers .....	\$3.45
Panel Mount Rheostats .....	1.35
Honeycomb or Duolateral Coils 20% Discount	
Moulded Gooseneck VT Sockets	1.75
D-101 Dustproof Galena De- tectors .....	\$2.15
Variable Grid Leaks—G-100..	.55
Hard Rubber 180° Dials with- out Knob .....	.45
Hand Key—1K.W. Silver Con- tacts .....	2.95
Amrad Panel Rheostats .....	1.45

## FAMOUS "K" INSTRUMENTS

K20—Enclosed Rotary Gaps	
20a—With Motor .....	\$25.00
20b—Pulley Drive .....	20.00
K1—Open Rotary Gap with motor .....	16.00
K2—16 pt. Sawtooth rotor .....	4.50
K3—10pt. Wide tooth rotor .....	4.50
K6—"Cootie" Double Action Key .....	4.50
K8—"Big Midget" Audion Cab- inet .....	12.50
K7b—Honeycomb Tuner and two condensers .....	29.50
K4e—Audion Detector Cabi- net .....	25.00

## CONDENSERS

DeForest Condensers—All Styles for immediate Shipment	
#366 Murdock .001 in case .....	\$4.75
#366 Murdock .001 interior .....	4.25
#368 Murdock .0005 in case .....	4.00
#368 Murdock .0005 interior .....	3.50
#3662 Murdock .001 Panel Mount .....	5.00
#K10 Chelsea Panel Mount with Dial .....	4.75
Perfection Knock Down Condensers	
11 Plate \$1.80, 21 Plate \$2.25, 41 Plate	\$3.20

## TELEPHONES

Baldwin Type E .....	\$20.00
Baldwin Type F .....	21.00
Baldwin Type C .....	16.50
Brandes Navy Type .....	14.00
Brownlie Adjustable .....	12.50
Liberty 2200 Ohms .....	12.50
Trans-Atlantic Brandes .....	12.00
Brandes Superior .....	8.00
Murdock #55—3000 Ohms .....	5.50
Murdock #55—2000 Ohms .....	4.50
Brown adjustable .....	17.00

## VACUUM VALVES

UV 200 Radiotron Detector .....	\$5.00
UV 201 Radiotron Amplifier .....	6.50
UV 202 5 Watt Transmitter .....	8.00
UV 203 50 Watt Transmitter .....	30.00
C300 Audiotron Detector .....	5.00
ER Detector Tube .....	6.00
APVT Amplifier .....	7.00
APTT 5 Watt Transmitter .....	7.50

## TRANSFORMERS

Acme 250 Watt semi mounted .....	\$13.00
Acme 250 Watt fully mounted .....	16.00
Acme 500 Watt semi mounted .....	18.00
Acme 500 Watt fully mounted .....	22.00
Acme 1000 Watt semi mounted .....	28.00
Acme 1000 Watt fully mounted .....	33.00
Thordarson Type R-1/2 KVA .....	22.00
1500 Volt Acme Power Transformer .....	25.00
Thordarson Type RS-1/4 KVA .....	15.00
200 Watt C.W. Power Transformer .....	20.00
Same semi mounted .....	16.00
50 Watt C.W. Power Transformer .....	15.00
Same semi mounted .....	12.00
Unmounted Modulation Transformers .....	4.50
Mounted Amplifying Transformers .....	5.00

## REGENERATIVE RECEIVERS

Clapp-Eastham Variometers .....	\$5.75
Clapp-Eastham Variocouplers .....	7.50
Amrad Variometers .....	14.50
Amrad Variocouplers .....	17.50
Murdock Variometers .....	7.50
Murdock Variocouplers .....	8.50
Grebe Regenerative CR-3 .....	55.00
De Luxe Regenerative DX-1 .....	35.00
(All Bakelite Variometers)	

## METERS

Model H Flush Mount Radio Frequency Meters	
0-1, 0-3, 0-5, 0-10 .....	\$7.00
Midget Flush Mount Milli-ammeters 0-100, ... 0-200 .....	8.00
#471 0-5 Ammeters .....	5.50
#471 0-200 Milliammeters .....	5.50

*All In Stock for Immediate Delivery.*

Our laboratory and workshops are adequately equipped to satisfy your most exacting requirements in the construction or assembly of special receivers, spark and C.W. Transmitters, or radio telephone sets. Specifications and estimates will be furnished without charge

For 55 Page Illustrated Catalog—Send 4c in Stamps to

## KARLOWA RADIO COMPANY

Office—611 Best Bldg.

ROCK ISLAND, ILL.

Distributors for

DeForest Radio Tel. & Tel. Co.  
Wm. J. Murdock Co.  
Amrad Products

Acme Apparatus Co.  
Radio Corporation of America  
Chelsea Radio Co.

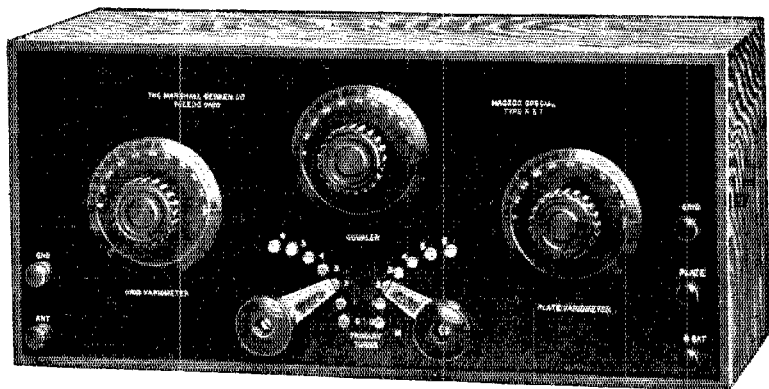
# A *MAGICO* Masterpiece

Short Wave  
Regenerative  
Receiver

Type R. S. 7

Price \$50.00

F.O.B. FACTORY



150 to 750 Meters

This regenerative receiver is constructed of the best material throughout. The panel is of grained Formica and beautifully engraved, the whole being enclosed in a Birch-mahogany cabinet. To say the least it is the last word in beauty and simplicity of operation. Each instrument is tested for C. W. before it leaves the factory. **ACTIVE DEALERS**, write for proposition.

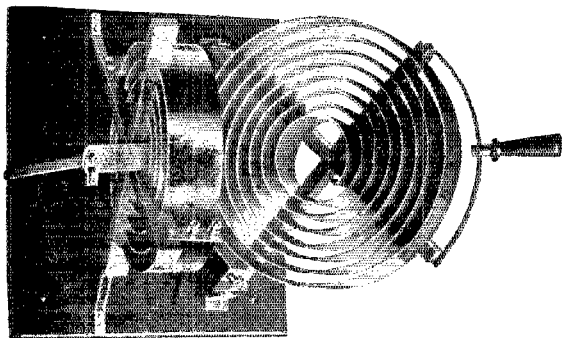
LET US ENGRAVE YOUR PANELS  
6 CENTS A LETTER

VARIOMETER PARTS COMPLETE  
With wire and Blue Prints \$4.00

Send 10c. for Loose-leaf Catalogue.

**THE MARSHALL-GERKEN CO., 126 Radio Bldg., Toledo, Ohio**

## The Answer to Transcontinental Transmission



DX-52 PRICE \$25.00

After months of experimenting 8ZR has developed the oscillation transformer that made possible transmission to 6EJ, 6AK, and 7ZJ.

1. If you want a beautiful instrument at a reasonable price—
2. If you want to increase your antenna current 25 per cent.
3. If you want to become a dependable relay station—
4. If you want reports from every state that your sigs are QSA—
5. If you want to Transmit across The Continent—
6. If you want to tear such a ragged hole in the ether that they will all think . . . — . . . broke loose—

Then you will use DX-52.

*Dealers write for discounts.*

Any kind of radio goods shipped immediately from stock.  
Largest Mail Order Service in Ohio

**THE AMERICAN RADIO SALES & SERVICE CO.**  
GREAT AMERICAN BUILDING MANSFIELD, OHIO

Testing Station 8ZR

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

3 \$1  
for 1



front

# PROTECT YOUR VACUUM TUBES INDEFINITELY!

## Multiplies the Life of your Set

Destructive excessive amperage cannot reach the delicate filaments of any vacuum tube if protected by a

### Carrying Capacity

1. 1 1/4, 1 1/2, 2, 2 1/2 and 3 amp.  
Size 1/4 inch over all.

Radeco

## SAFETY FUSE

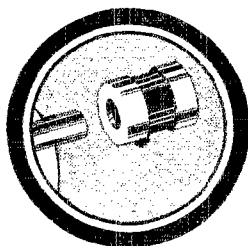
Slips directly on filament terminals of any standard socket without distorting springs or lowering efficiency. RADECO Safety Fuses positively protect your tubes indefinitely.

RADECO Safety Fuses are equally valuable in all C. W. work preventing injury to meters resulting from shorts. Send today cash, money order or certified check.

3 for

\$1

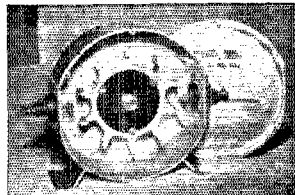
35c. each



# ORDER BY MAIL

## Rotary Quenched Spark Gap \$20.00 Postpaid

With Universal 110 V. Motor Attached, \$25.



The advantages of a noiseless, super-efficient rotary gap are now within the reach of all.

The casing is of cast aluminum with the cover machined to make an airtight enclosure for the extremely light weight aluminum rotor, with bakelite insulation. Stationary electrodes

are of copper with bakelite insulation. The smallest gap motor may be used, but is not supplied with gap. GET YOURS SET UP AT ONCE, and INCREASE YOUR RADIATION AND RANGE!

## 44 V. Variable "B" Battery \$3.60

Include postage on 4 lbs.

Complete in handy wooden case and adjustable phosphor bronze "jiffy" connectors. Better than block batteries—if one 4.4 V. unit weakens prematurely, it can be removed and replaced—thereby not impairing total voltage, which makes this the best battery value to be had at any price. Set of 10 Renewal Units, 44 volt, \$3.10 postpaid. Just the thing for C.W. work.

## GROUND WIRE 8c. Per Foot

\$7.00 PER 100 FEET.

No. 4 solid copper—rubber covered—triple braid—include postage on 20 lbs., per 100 ft. 100 amp. 600 volt lightning switches, \$4.00

## AERIAL WIRE 1c. Per Foot

7 strands No. 22 copper—tin plated to prevent oxidation. Maximum radiation and strength. Include postage on 15 lbs. per 1000 ft.

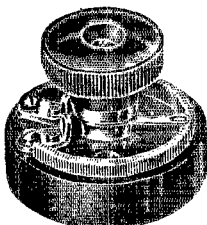
## FILAMENT RHEOSTAT

For Back or Front of Panel Mounting. 6 ohms. 1 1/2 amps., 1 1/4" dia.

\$1.75 Post Paid  
Immediate Shipment.

Standard VT Socket  
Improved Contact Type  
\$1.00 Postpaid

Copper foil condenser  
35c P. P.



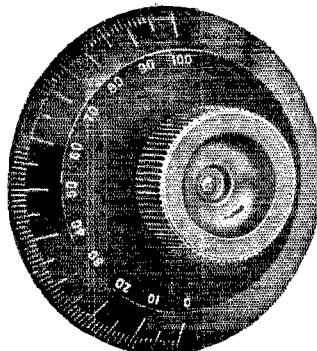
## CHELSEA DIAL and KNOB

Made of best grade bakelite runs absolutely true and will not warp. Dial 3 1/4" in diameter. 1/4" thick. Genuine dial at a genuine price.

Dial ..... \$0.75

Dial and Knob ... 1.00

Send Today

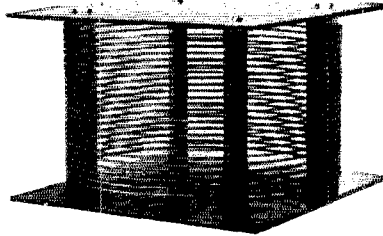


Radio Equipment Co., 630 Washington St. Boston, Mass.  
4th FLOOR

# C-W C-W C-W C-W C-W C-W C-W C-W

Prepare for the bad radio season by installing your CW outfit now. It will carry thru summer static and is ideal for relay work.

OUR C-W CATALOG  
WILL BE READY  
ABOUT MARCH 15th,  
SEND FOR YOUR  
COPY NOW.



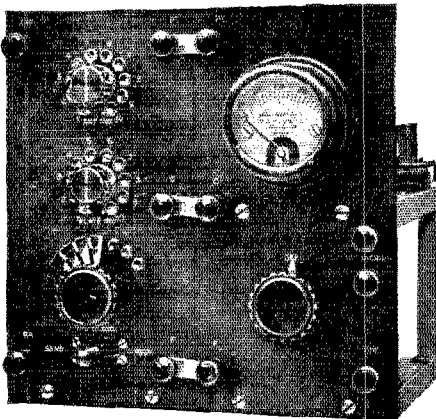
OUR NEW C-W  
CATALOG WILL  
BE THE MOST  
COMPLETE AND  
BIGGEST — CW  
ONLY.

CW Inductance No. CW-100 shown above, mounted on Formica exclusively—25 turns edgewise copper strip 3/16 x .050" complete with connection clips, \$10.00.

Send 15 cents for catalog, which amount may be deducted from first order of One Dollar or more.

**"8ZV" WIRELESS MANUFACTURING CO. "8ZV"**  
CANTON, OHIO

## Headquarters For All Standard Radio Apparatus



**AERIAL OSCILLATING CIRCUIT PANEL.** Contains all necessary controls, and transfer switch. Price this Panel—\$55.00

**POWER TUBE PANEL.** Contains tubes, Ammeter and filament rheostat. Can be clamped to other Panel to form single unit. Price this Panel—\$45.00

Sole Distributors  
in Philadelphia

for

**DE FOREST  
Radio Apparatus**

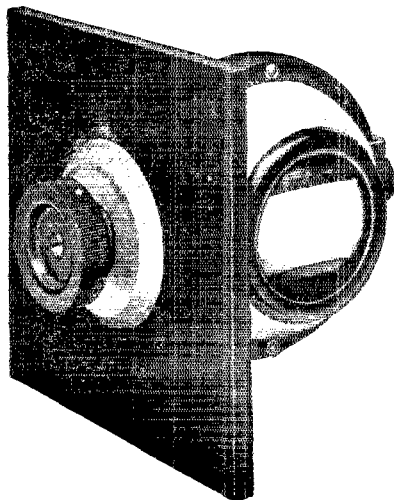
The very newest DeForest Apparatus is now in stock ready for immediate delivery. We have practically everything in dependable Radio equipment. You'll get absolute satisfaction here, besides which our wireless specialists will gladly give you any advice or assistance you need. Come in and have our experts give you demonstrations without in any way obligating you to buy.

**Central Electric and Lock Company**

1309 ARCH STREET,  
PHILADELPHIA, PA.

# THE LATEST "MURDOCK" VARIOMETER

NO.  
345  
"MURDOCK"  
VARIOMETER  
\$7.50



THE PRICE  
IS  
UNUSUALLY  
LOW

THE QUALITY  
IS  
REMARKABLY  
HIGH

WINDING FORMS ARE "MURDOCK" MOULDED

## OTHER "MURDOCK" RADIO INSTRUMENTS

### REAL RADIO RECEIVERS

No. 55 Double head receivers,  
complete with head band and  
cord:—

2000 ohm ..... \$4.50  
3000 ohm ..... 5.50

### VARIABLE CONDENSERS

No. 366, 43 Plates, .001 MFD..... \$4.75  
No. 367, 43 Plates, .001 MFD..... 4.50

### VARIABLE CONDENSERS

Panel Type

No. 3661, 43 Plate, .001 MFD  
with knob and extension handle \$4.25  
No. 3662, 43 Plate, .001 MFD  
with knob, dial and extension  
handle ..... 5.00  
No. 3681, 23 Plate, .0005 MFD  
with knob and extension handle 3.50  
No. 3682, 23 Plate, .005 MFD  
with knob, dial and extension  
handle ..... 4.25

BUY THEM FROM YOUR DEALER

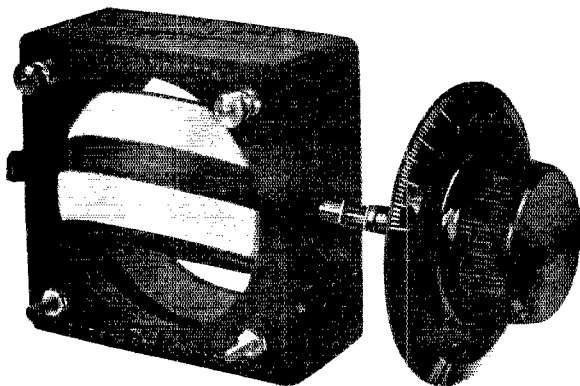
Bulletin No. 20 Sent Anywhere on Request

# WM. J. MURDOCK CO.

65 CARTER ST., CHELSEA, 50, MASS.

509 Mission St.,

San Francisco, Cal.



# TUSKA Moulded Variometer

MECHANICALLY AND  
ELECTRICALLY PEERLESS

TYPE 200.

PRICE \$7.25

SEE THEM AT YOUR DEALER'S

OTHERS	INDUCTANCE		DISTRIBUTIVE CAPACITY	
	MINIMUM	MAXIMUM	MINIMUM	MAXIMUM
No. 1.	70.3 m.h.	940 m.h.	8.4 mmf.	44.1 mmf
No. 2*	75 "	440 "	22.8 "	60. "
<b>TUSKA°</b>	<b>70.0 "</b>	<b>1560 "</b>	<b>14.0 "</b>	<b>55. "</b>

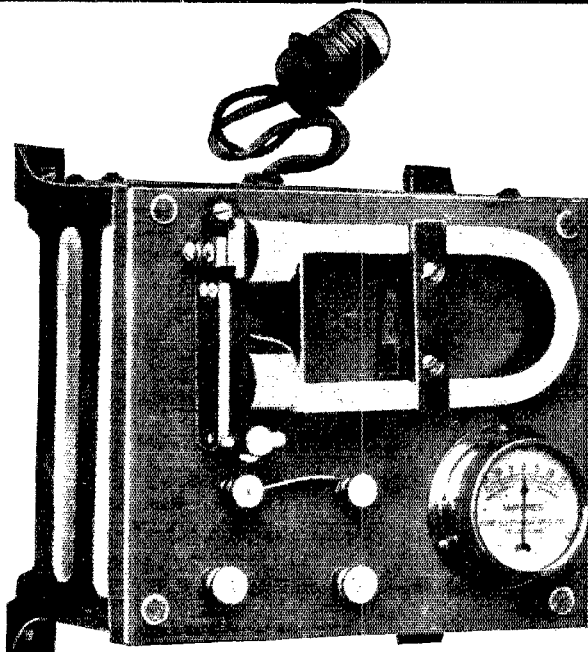
\*Coil wound on OUTSIDE of moulded form. Notice the large distributive capacity for range.

°Think how EXTREMELY low the DISTRIBUTIVE CAPACITY is in the TUSKA VARIOMETER compared with the EXCEPTIONALLY WIDE range.

Send 5c for C.W. and Variometer Booklets

THE C. D. TUSKA CO.,

HARTFORD, CONN.



## Charge your own Battery With a Benwood rectifier

Charges a six or twelve volt battery in several hours

Attaches to nearest lamp socket. Charges any storage battery from 110 volt alternating current source. Average cost per charge is only seven cents.

As indispensable as the receiving set for the satisfactory reception of signals. Excellent for the heavy drain imposed upon your battery by CW work.

**PRICE \$23.00**

Complete with instructions and extension cord. See it at your dealers' or order direct.

**Immediate Deliveries Can Be Made**

## The Benwood Company, Inc.

13th and Olive Streets,

St. Louis, Mo.

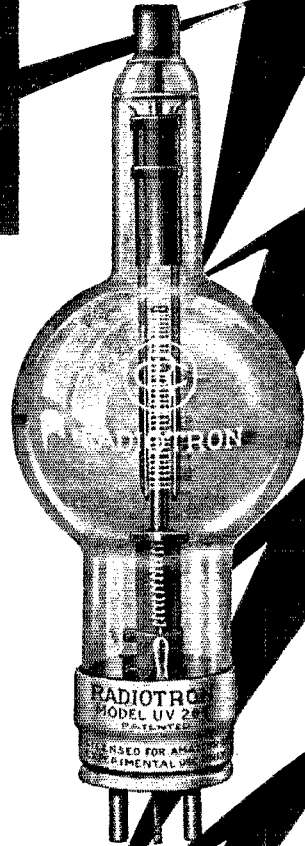
# RADIOTRON TRANSMISSION

## Two high-power transmitter tubes

The era of C. W. transmission is here. Colleges, laboratories, relay stations and experimenters can use these new tubes to help establish long distance records.

Radiotron U. V. 203 is rated at 50 watts. Its filament requires 10 volts at 6.5 amperes while the normal plate voltage is 1000, at .15 ampere. The tube is 2" x 7½" and is fitted with a special 4-prong porcelain base.

Radiotron U. V. 204 is a 250 watt tube of exceptionally long life. Filament requires 12 volts at 15 amperes and 2000 volts on its plate at .25 ampere. Overall dimensions 5" x 14½". Tube is supported by special end mountings. Especially recommended for laboratory and other experimental work.



End  
Mountings  
for this  
Tube  
\$2.00  
Per Pair



Special  
Socket  
for this  
Tube  
\$4.25  
Each

**Radiotron  
U. V. 203  
50 Watts**

**Price \$30.00**

The Radio Corporation's tubes are covered by patents dated November 7th, 1905, January 15th, 1907, and February 18th, 1908, as well as by other patents issued and pending. Tubes licensed for amateur and experimental use only. Any other use will constitute an infringement.

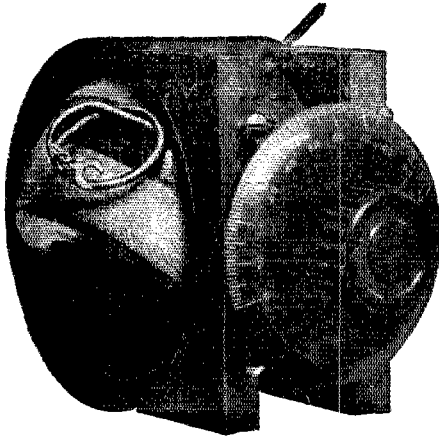
**Radiotron  
U. V. 204  
250 Watts**

**Price \$110.00**

For detailed data see your nearest dealer or write direct to  
SALES DIVISION, COMMERCIAL DEPARTMENT, Suite 1803

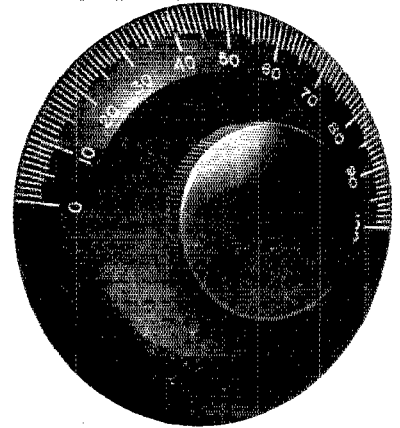
**Radio**  **Corporation**  
of America

235 BROADWAY ~ NEW YORK CITY



**THE VARIOMETER**

The now famous Z. R. V. Variometer has met with a tremendous sale, thousands being in use, by those who know the quality of Clapp-Eastham products.  
 Complete with knob and dial.....\$6.50  
 Without knob and dial..... 5.75  
 Variocoupler to match with knob and dial 7.50



**THE DIAL**

This 3" knob and dial is our own product heavy brass dial black oxidized finish, composition knob 1 3/4" diameter. Supplied for 1/2" shaft only. This dial cannot chip or warp and will run true. Its beauty is in keeping with the best products of the instrument maker.  
 Price dial and knob #FS00H complete..\$0.75

Complete catalogs sent for 6c stamps

Patronize your local dealer: If he won't supply our material your order will receive immediate Factory attention.

**CLAPP-EASTHAM CO., 114 Main St., Cambridge, Mass.**

*Headquarters for Radiotron Tubes. All types in stock.*

**Did You Hear About  
 the 18 Men from  
 18 Boylston Street ?**

Up to April 28, 1921, the last 18 graduates from 18 Boylston Street averaged 81.5% out of a possible 90% on their GOVERNMENT EXAMINATIONS.

The unusually high average obtained by these 18 graduates, whose instruction averaged the short period of 5 months previous to their examination, shows conclusively the high merits of this school. Results count.

*Send for free literature*

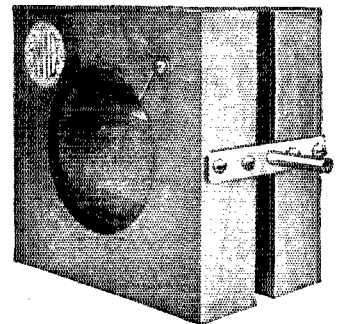
**MASSACHUSETTS RADIO AND  
 TELEGRAPH SCHOOL, INC.,**

18 Boylston Street, Boston, Mass.

Tel Beach 7168

R. F. Trow

G. R. Entwistle



**Something New in Variometers**

Just the thing for your new Regenerative Set. The "Simplex" has a specially designed bearing, with heavy cotton covered wire, on forms made of thoroughly seasoned hard wood, treated with insulating varnish.

These features combined with neatness and ruggedness, make a very efficient and reliable instrument.  
 Simplex Variometer, Price.....\$6.00  
 Simplex Vario Coupler, Price.....\$6.00

**The Quaker Light Supply Co.**

728 Arch St., Philadelphia, Pa.

Attention of Mr. H. J. Dunbar.



# RADIO APPARATUS

*Distributors of Reliable Radio Apparatus to Schools, Colleges,  
Radio Clubs and Experimenters All Over the World!*

**"PITTSO"**

Service Fills Orders on  
Every Continent! Why  
Not Let Us Serve You?



**"PITTSO"**

Service Reaches All  
Over the World! Why  
Not Let It Reach You?

## AMRAD APPARATUS

Type A VT Detector in cabinet.....	\$15.00
Type A One step amplifier.....	21.00
Type A VT Detector and one step.....	34.50
Type A Two step amplifier.....	39.50
Type D Variometer in cabinet.....	14.50
Type D Vario-coupler in cabinet.....	17.50
Type E Crystal Receiving set.....	23.50

## BRANDES PHONES

"Superior" with new headband.....	\$ 8.00
"Trans-Atlantic" with new headband....	12.00
"Navy Type" with new headband.....	14.00

## CHELSEA APPARATUS

No. 1 Variable condenser, .0012 mf., in case, splendid value.....	\$ 5.00
No. 2 Variable condenser, .0006 mf., in case.....	4.50
No. 3 Variable condenser, .0012 mf., un- mounted, with new dial.....	4.75
No. 4 Variable condenser, .0006 mf., un- mounted, with new dial.....	4.25
No. 5 Chelsea knob and dial, 3-16 in. or 1/4 in. shaft, complete.....	1.00
No. 21 Variable grid, 1/2 to 5 megohms, 10 values.....	3.50

## BALDWIN PHONES

Type C "Navy Standard".....	\$16.50
Type E "Super-Sensitive".....	20.00
Type F "Latest," small and light.....	21.00
Type C Loud speaker unit, single receiver only.....	8.50

## GREBE APPARATUS

No. CR-3 170-680 meters "Relay-special" ..	\$65.00
No. CR-3A 170-375 meters, with tube con- trol, self contained.....	45.50
No. CR-5 170-3000 "Super-special." Just out! With tube control, a complete set.....	80.00

## GENERAL RADIO APPARATUS

No. 214A Rheostat, 2.5 Amps. Just right for UV-202, 5 watt tubes.....	\$ 2.50
No. 214C "A" Battery Potentiometer, 400 ohms, panel mtg.....	4.00
No. 231A Amplifying trans., new type, just out, fully mounted.....	5.00
No. 127 Hot wire ammeters, .1, .25, 1/2, 1, 2 1/2, 5, or 10 amps.....	7.75

"Let PITTSO Products, Super-service and Prompt Delivery solve your Radio Problems." Send for our catalog, No. 22. Contains over 100 pages, over 150 illustrations, over 600 items.

## MURDOCK APPARATUS

No. 345-P Plate variometer.....	\$ 7.50
No. 345-G Grid variometer.....	7.50
No. 346 Vario-coupler.....	8.50
No. 56 2000 ohm phones with new head- band, just out.....	5.00
No. 56 3000 ohm phones with new head- band, just out.....	6.00
No. 56 Headband only, army type.....	1.50

## RADIOTRON TUBES

No. UV-200 Detector tube.....	\$ 5.00
No. UV-201 Amplifying tube.....	6.50
No. UV-202 5 Watt power tube.....	8.00
No. UV-203 50 Watt power tube.....	30.00

## THORDARSON APPARATUS

Type "R" 1 K. W. Power transformer....	\$40.00
Type "R" 1/2 K. W. Power transformer....	22.00
Type "R" 1/4 K. W. Power transformer..	14.00
No. T-1 Power condenser, .0018 to .009 mf.....	25.00
No. T-2 Oscillation transformer.....	10.00

## TUSKA APPARATUS

### C. W. Inductances

No. 181 Cap. feed back circuit.....	\$ 7.50
No. 181-A Same as above, but knock- down.....	5.00
No. 182 Split filament type.....	10.00
No. 183 Tickler feed back.....	12.50
No. 170 Tuska filter.....	16.00
No. 201 Tuska variometer, without dial..	6.25
No. 200 Tuska variometer, with dial....	7.25

## BOOKS

Practical Wireless, by Bucher.....	\$ 2.25
Experimenter's Manual, by Bucher.....	2.25
Vacuum Tubes, by Bucher.....	2.25
How to Pass U. S. Exams., by Bucher....	.75
How to Conduct a Radio Club, by Bucher.	.75
Practical Amateur Stations, by Bucher...	.75
Radio Telephony, by Goldsmith.....	2.50
Robinson's Manual of Wireless, by Robin- son.....	2.50
Consolidated Radio Call Book, Just out...	1.50
Federal Arc Text-book.....	2.50

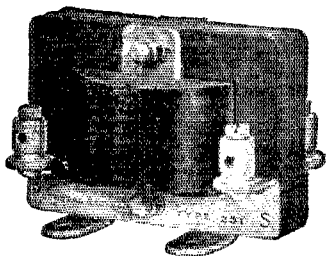
# F. D. PITTS CO., INC.

12 PARK SQUARE

DEPT. A.

BOSTON, MASS., U. S. A.

# OPERATING YOUR TUBES AT 100%



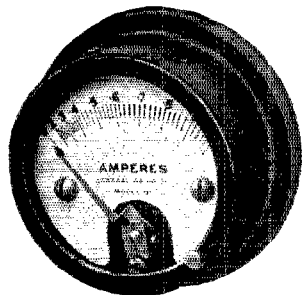
The new Radiotron Vacuum Tubes are accurately designed electrical instruments. To get the maximum results from them, they should be used with apparatus designed specifically to agree with their electrical characteristics. Our new Type 231A Amplifying Transformer is the result of careful engineering design to produce a transformer which will give the maximum amplification of signals using a UV201 tube. The Type 231M Modulation Transformer was designed to give the maximum modulation possible without distortion when used with a UV202 tube.

Send for free Bulletin 907Q on the operation of amplifying and modulation transformers and completely describing the new Type 231 instruments.

**PRICE, Either Transformer, Completely Mounted - - \$5.00**

## Radiation and Filament Ammeter

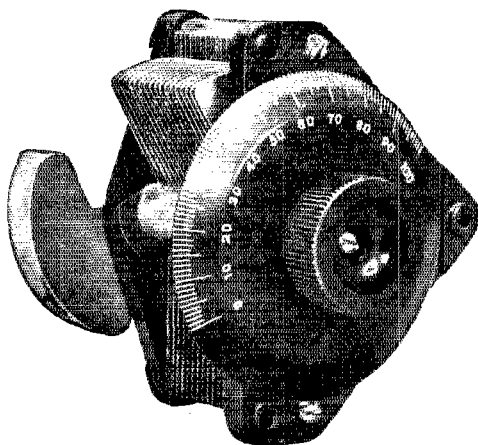
Results are not obtained by guessing. They come from the intelligent application of accurate information. If you desire to get the best results from your CW set it is necessary to make measurements of the various currents. Our Type 127 Hot Wire Ammeters are particularly suited for this service. They are suitable also for measuring the radiation currents of spark stations, and for measuring filament currents, either AC or DC. Supplied in a variety of ranges and for front of board, as illustrated, or flush mounting. Described, and ranges listed in Bulletin 904Q.



**PRICE \$7.75**

## GENERAL RADIO COMPANY

MASSACHUSETTS AVENUE AND WINDSOR STREET, CAMBRIDGE, 39, MASSACHUSETTS



## Chelsea Variable Condensers

(Die Cast Type)

No.	Capacity	Type	Size	Weight	Price
1	.0011m.f.	Mounted	4 5/8 x 4 5/8 x 3 1/4	1 3/4 lbs.	\$5.00
2	.0006m.f.	Mounted	4 3/8 x 4 3/8 x 2 3/8	1 1/4 lbs.	4.50
3	.0011m.f.	With Dial	4 1/2 x 3x4	2 lbs.	4.75
3	.0011m.f.	Without Dial	4 1/2 x 3x4	2 lbs.	4.35
4	.0006m.f.	With Dial	4 1/2 x 3x3 1/2	1 1/2 lbs.	4.25
4	.0006m.f.	Without Dial	4 1/2 x 3x3 1/2	1 1/2 lbs.	3.85

Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

Unmounted types will fit any panel and are equipped with counter-weight.

Purchase from your dealer; if he does not carry it, send to us, Bulletin sent upon request.

## Chelsea Radio Co., 15 Fifth St., Chelsea, Mass.

Manufacturers of Radio Apparatus and Moulders of Bakelite.

**Best of Everything in  
Radio Apparatus and Parts.**

Send Stamp for Catalog "Q"

**J. H. BUNNELL & CO.**

32 Park Place,

New York

## CANADIAN AMATEURS

Deal in Canada and Save \$\$\$\$

The Leading Amateur Supply House for  
**WIRELESS**

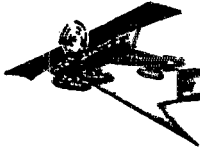
Apparatus and Parts.

Send 5 cents for our list.

**THE VIMY SUPPLY CO.**

567 COLLEGE ST.,

TORONTO



**EASTERN  
RADIO**

TEL.  
BANK BAY  
5 9 6 4

899 BOYLSTON ST.  
BOSTON, MASS.

**INSTITUTE**



# RESULTS !!

If you are interested in studying Commercial Radio under the most advantageous conditions, the RESULTS accomplished by the Eastern Radio Institute should merit your immediate enrollment.

FOR INSTANCE:—

The Eastern Radio Institute was founded in 1913 and is now over six years older than any other Radio and telegraph school in New England.

**WE ARE ESTABLISHED!**

The Eastern Radio Institute moreover has given instruction at this date to over 4000 different students, and has enrolled, graduated and placed more Commercial Radio operators than all other schools in New England combined!

**WE HAVE ACCOMPLISHED SOMETHING!**

Graduates of the Eastern Radio Institute have actually secured 90%, 89.9%, 89.8% etc. out of a possible 90% in their Commercial Radio operators first grade examination.

**WE KNOW HOW TO GIVE THE STUDENT PROPER TRAINING!**

Successful graduates of the Eastern Radio Institute are found in responsible radio positions all over the world. Why not be one? It costs no more!

Our latest, illustrated prospectus is free. If you cannot visit the Institute send for one. Remember our ORGANIZATION with over eight years of continued RESULTS and SUCCESS is behind every student who enrolls!

F. D. PITTS, Director.

KENNEDY  
EQUIPMENT

## Thousands of dollars

have been spent by radio amateurs and experimenters for inferior apparatus. There was a time when they could get nothing else.

To-day it is different. The up-to-date experimenter is no longer content with his former limitations. With the development of the high-grade equipment now available he demands apparatus built according to real professional standards.

In this development the Colin B. Kennedy Company has been a leader. From its very beginning its policy has been to manufacture apparatus which is "built to a standard, not to a price."

Ask your dealer for a demonstration of Kennedy Receiving Equipment. Give it a thorough examination in comparison with the best of other makes on the market. Form your own opinion of its design, workmanship and performance. Our unreserved guarantee on every item bearing the Kennedy trade-mark is your final protection.

*If your dealer has not yet put in a stock, send direct for our catalog and price list.*

**THE COLIN B. KENNEDY COMPANY**  
INCORPORATED

RIALTO BUILDING

SAN FRANCISCO

# SORSINC

22½ VOLT

"B"

BATTERY

4⅞" x 5⅛" x 8"

**"THE LARGEST "B"—KNOWN"**

Behind all this RUGGED CONSTRUCTION—what? The two 16 strand heavy service terminals connect to 15 cells, each 4" long and 1½" in diameter, made up into a 12 pound unit that is "CHOCK FULL" of 6400 milli-ampere hours of energy.

And still behind this—What?

Months of designing and development were spent by us to produce this battery, which is telling a significant story—that the radio public is regarding the SORSINC battery with confidence, and shows that battery values are being scrutinized as never before, on the basis of greater relative values and actually demonstrated worth.

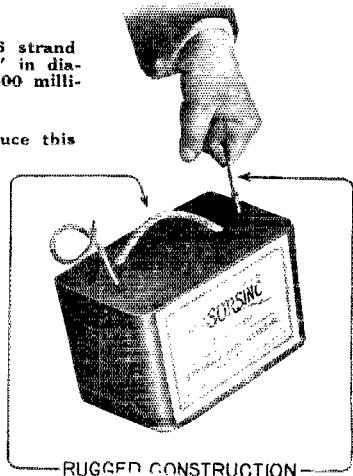
HAVE YOU CONVINCED YOURSELF?

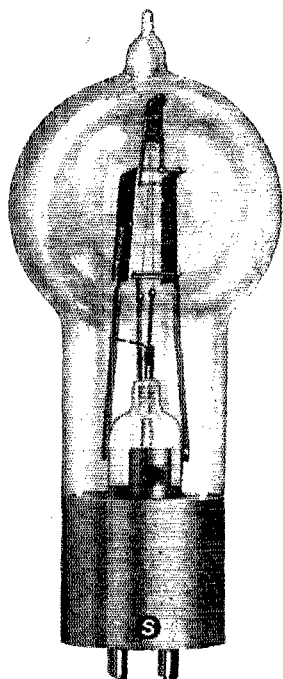
PRICE \$4.00 F.O.B. any Add P. P. Shipping  
Branch Office Charges Weight 14 lbs.  
IF YOUR DEALER CANNOT SUPPLY YOU, ORDER DIRECT FROM  
NEAREST BRANCH OFFICE

**SHIP OWNERS RADIO SERVICE, INC.**  
80 WASHINGTON ST., NEW YORK CITY

Branch Offices: Boston — Philadelphia — Baltimore — Norfolk —  
Savannah — New Orleans — Galveston — San Pedro — San Fran-  
cisco — Portland, Ore. — Seattle — London — Honolulu.

*Attractive Proposition for Dealers.*





# --for experimental C W

---

## NEW A-P RECTIFIER TUBE MAKES EXPENSIVE HIGH VOLTAGE DC GENERATOR UNNECESSARY—

---

A wonder—this newest A-P tube—a rectifier that can be used effectively with *any* transmitter tube of *any* voltage up to 750, and *without* a high voltage DC generator. Step up your 110 V A-C lighting supply to 350, 500, or 750 volts, using a small transformer, and two of the new A-P tubes do everything else, rectifying both halves of the cycle so the plates of your transmitter tubes get all the high potential direct current necessary—*without the use of a high voltage DC generator.*

The A-P Rectifier has a 75 milli-ampere carrying capacity, which is sufficient to operate five A-P Transmitting Tubes in parallel. For high power CW transmission, use additional A-P Rectifier Tubes in parallel.

A-P Rectifiers used in Type 0 A-C DeForest Radiophones, equipped with the SHAW standard condensite four-prong base, and licensed under SHAW patents. Price \$9.75. Order from your dealer or direct from addresses below.

And for the best book on Radio, ask your dealer for "*Elements of Radiotelegraphy*" by Lieut. Ellery W. Stone, U.S.N., or order this book direct from—

ATLANTIC RADIO SUPPLIES CO.	PACIFIC RADIO SUPPLIES CO.
8 KIRK PLACE—	638 MISSION STREET—
NEWARK—NEW JERSEY	SAN FRANCISCO—CAL.

Distributors for Moorhead Laboratories, Inc.

---

*Complete diagram of connections free with each tube*

---

# CUNNINGHAM

## DETECTOR TUBE

Type C-300  
GENERAL ELECTRIC QUALITY PLUS  
CUNNINGHAM SERVICE

TYPE C300 invites comparison. Amateur requirements decided its design. Many years' research of vacuum tube properties have made Type C300 the Ideal Amateur Receiving Tube. Detector sensitiveness at low plate voltages requires that gas action be combined with the electron emission and by a wonderful new process of manufacture this gas action is so controlled that the plate voltage for maximum signal audibility is always within the limits 18—22½ volts. This tube is one of the latest products of the great Research Laboratory of the General Electric Company. Only a single block cell is needed in the plate circuit—a big saving in battery investment. Type C300 is completely silent in operation—a decided advantage in receiving weak signals.

Any three member vacuum tube is necessarily an amplifier, but the results obtained from Type C300 as a tone frequency amplifier with only 22½ volt plate battery proved a surprise. Again Type C300 invites comparison. Competitive tests show this tube to excel any tone frequency amplifier previously developed. For power amplification in operating loud speaking telephones and in complex and multi-stage circuits use the special Plotron amplifier Type C301 for freedom from distortion. Write for special Bulletin C301.

Type C300 is a free and persistent oscillator for regenerative amplification and C. W. reception.

The pleasure and satisfaction from

DEALERS: Standard Packages F.O.B. Cleveland,  
San Francisco, New York. Broken Packages  
F.O.B. San Francisco.

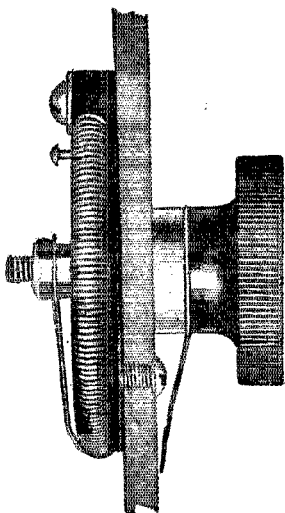
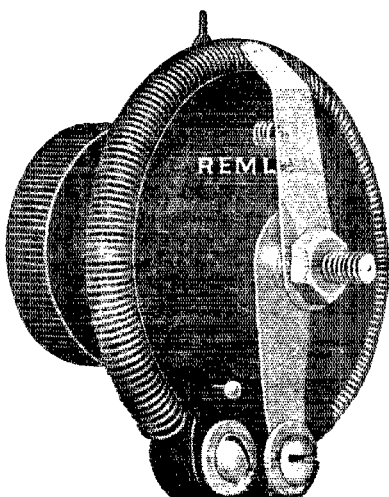
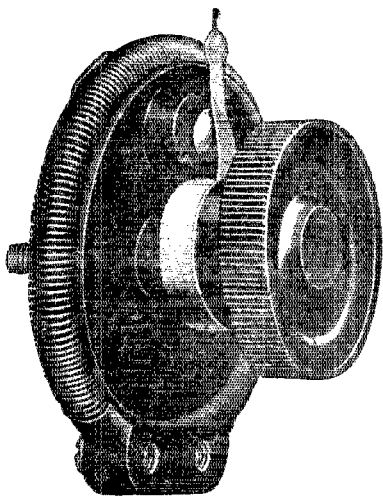
Type  
C-300  
\$5.00

operating Type  
C300 cannot be  
described. See  
your dealer today  
—or write for his  
name and a copy  
of Bulletin C300



*E. J. Cunningham*

Trading as  
**AUDIOTRON MFG. CO.**  
35 Montgomery St., San Francisco



# Remler No. 810

PANEL TYPE

## Jr. Rheostat

PRICE \$1.00

TEN thousand Remler rheostats now in service testify to the value and merit of No. 810. The resistance unit is renewable (an exclusive feature) and is mounted on a bakelite disc. End stop and off position are provided. The knob is of polished bakelite 1 3/8" diameter and all metal parts in front of panel are polished nickel. The contact arm is nickel plated spring brass. This rheostat is as smooth running as a coupler switch and only two holes need be drilled to mount it. Resistance 4 ohms, carrying capacity 1 1/2 amps. Designed especially for vacuum tube filament control.

No. 81 Remler panel type rheostat of similar design and appearance is a larger unit of 3 amp. carrying capacity. For controlling the filaments of a group of amplifier tubes or the filament of a 5 watt power tube. PRICE.....\$1.75

FREE: Remler catalog is now ready. Send for your copy.

DEALERS: Remler Apparatus offers a merchandising opportunity. Send for full particulars.

---

Apparatus that Radiates Quality

---

Mfd. By

# Remler Radio Mfg. Co.

E. T. CUNNINGHAM, Sales Mgr.

163 Sutter St., San Francisco, Calif.

# QUALITY RADIO EQUIPMENT

## RADIO MAGNAVOX TYPE R-3

Latest development in sound amplifiers; constructed on a patent protected electro-dynamic principle. Emits same volume of sound as higher priced Magnavox Telemegafone **\$45.00**

## RADIOTRON VACUUM TUBES

Recognized as the amateur's and experimenter's standard for Radio detection, amplification and power work.

Radiotron U.V. 200 Detector..... \$5.00

Radiotron U.V. 201 Amplifier..... 6.50

Radiotron U.V. 202 Power Tube 5 watt \$8.00

Radiotron U.V. 203 Power Tube 50 watt \$30.00

Special Sockets for U.V. 203 now in stock \$5.00 each

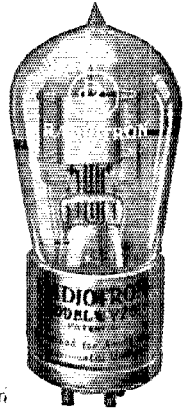
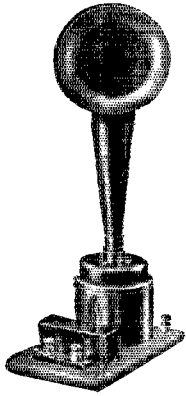
(Postage extra on all prices.)

## RADIO SUPPLIES FOR CAMPERS

Receive N. A. A. Time, U. S. Weather Reports, Baseball Scores, Press News, Stock Reports, etc., while in camp by using the new **GREBE TYPE CR-5 REGENERATIVE RECEIVER**, 150-3000 Meter wave length range. **\$80.00**

In operation the last word in simplicity.

Dealer's Special Proposition—Mail orders promptly filled



# DOUBLEDAY-HILL ELECTRIC CO.

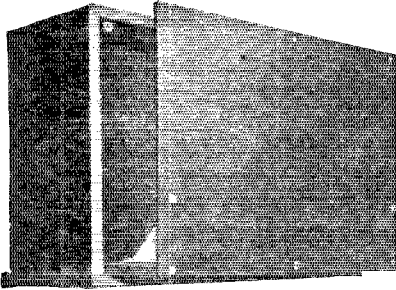
RADIO DEPT.—DESK A

715 12th St., N. W., WASHINGTON, D. C.

719-21 Liberty Ave., PITTSBURGH, PA.

## Back Again

With the original drawer bottom Radio Cabinet.



Did we stop making them? No! the demand for these high grade Cabinets, with our exclusive drawer bottom arrangement, was so far beyond our facilities to manufacture, that we had to stop advertising them, in order to catch up with our orders.

But now, having incorporated and increased our capital and facilities, we are ready to handle some new orders.

We now make these Cabinets in four sizes, our latest size, being designed especially for regenerative sets.

We have prepared a neat little pamphlet, giving sizes, prices and full descriptions of these Cabinets, which we would like to send you. Do not buy a Cabinet until after you have read this little pamphlet—write for it today—it is free.

Remember, these Cabinets were, are now, and always will be—the highest grade Radio Cabinet on the market.

Dealers—we have an attractive offer for you, write us.



**Penn  
Radio Apparatus  
Co., Inc.**

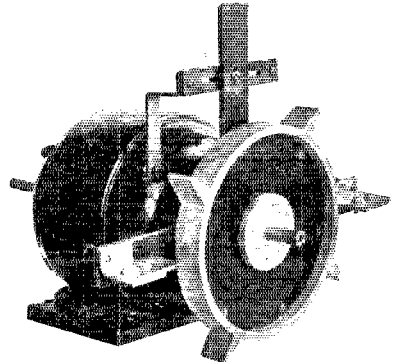
Dept C-4.

Reading, Pa.

— \* SA OM \* —

Would you like to have a  
**SYNCHRONOUS GAP?**

Here is one



At a price you can afford.

4 or 8 tooth disc. Electrodes can be adjusted while gap is in operation. Motor runs on 110 Volt 60 Cycles A.C.

\$65.00 F.O.B. ST. PAUL

**RADIO SUPPLY & MFG. CO.**

H. R. Hall

H. H. Spencer

23 Merriam Place

ST. PAUL,

MINNESOTA

## BUZZERS

for all radio work. External tone adjustments. Satisfaction guaranteed

"RADIO'S BEST BUY"

60c

POSTPAID

60c

**AJAX ELECTRIC CO.**

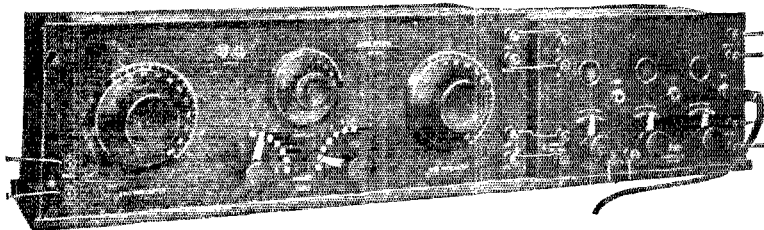
Palmer St.,

Cambridge 38 Mass.



# For Short-Wave Results —

This combination makes phenomenal distance work an every-day occurrence in your station.



CR-3 Relay Receiver—Detector and 2-Stage Amplifier (RORD)

This is the famous combination that proved its merit in the relay tests some months ago. It makes a wonderful team both for ease and flexibility of operation and what is far more important—real results!

See it at your dealer's today. If he hasn't it in stock, write us,—mentioning his name—for catalogue.

*GREBE RADIO apparatus is licensed under the original Armstrong and Marconi patents.*

Central Radio Co., Inc., Kansas City, Mo.  
Continental Radio and Electric Corp., New York  
Detroit Electric Co., Detroit, Mich.  
Doubleday-Hill Electric Co., Pittsburgh, Pa.  
Electrical Specialty Co., Columbus, Ohio  
Holt Electric Utilities Co., Jacksonville, Fla.  
Hurlburt Still Electrical Co., Houston, Texas  
Kelly and Phillips, Brooklyn, N. Y.  
Klaus Radio Company, Eureka, Ill.

Manhattan Electrical Supply Co., New York,  
Chicago, St. Louis.  
Leo J. Meyberg Co., San Francisco, Cal.  
J. H. Bunnell & Co., New York City  
F. D. Pitts Co., Inc., Boston, Mass.  
Philadelphia School of Wireless Telegraphy,  
Philadelphia, Pa.  
The Newman-Stern Co., Cleveland, Ohio  
Western Radio Electric Co., Los Angeles, Cal.

**A. H. GREBE & CO., Inc.**  
**74 Van Wyck Blvd., Richmond Hill, N.Y.**



## RHAMSTINE\*—PLUG AND JACK

Complete **\$1.50** Postage 4c

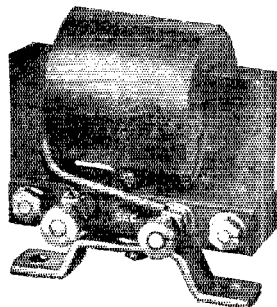
Excellent in quality—Attractively plated—Moderately priced and—Increasingly popular. Eventually everyone will use them. Immediate shipments.



## Rhamstine\* Amplifying Transformer

Mounted **\$3.50** Postage and Packing 10c

Here is shown the Rhamstine\* Amplifying Transformer. Compare it with other makes and buy it with the assurance that it will give satisfaction,—it is guaranteed to do so. And the reasonable price will appeal to you. Now is the time to get the units for that extra stage. Circulars on Rhamstine\* Products upon request. Dealers are desired in all sections—Write for Discounts.



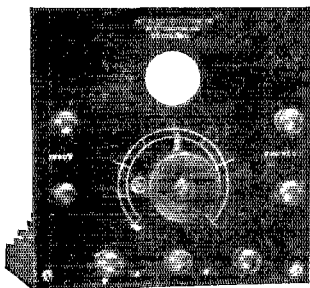
Manufactured By

**J. THOS. RHAMSTINE\***

2152 LARNED ST. E.,

DETROIT, MICH.

\*Plugs and Jacks—Amplifying Transformers



## THE RADIO ELECTRIC COMPANY AUDION CONTROL

Detector Panel ..... \$9.50

Amplifier Panel ..... \$13.50

Send for circular describing our audion apparatus.

## THE RADIO ELECTRIC COMPANY

3807 Fifth Ave., S.

Pittsburgh, Pa.

The Original Tested Crystals



Now 25c

Now 25c

### Be Sure of Results! Insist on Getting N. A. A. TESTED CRYSTALS

These exquisitely sensitive minerals are the best that money can buy for radio detector and wave meter work. Each crystal is individually tested, wrapped in foil and packed in a convenient lithographed tin container.

N. A. A. (Arlington) Tested Minerals are the original tested crystals. To avoid their many imitations, look for the signature of J. S. NEWMAN on each box.

At good Radio Dealers everywhere, or shipped direct post-paid on receipt of price.

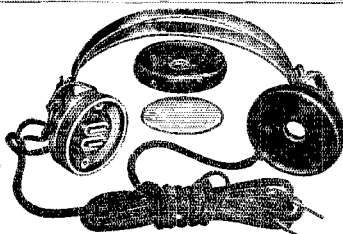
THE NEWMAN-STERN CO.  
Newman-Stern Bldg. Cleveland, O.

NOW

**25c.**

(Galena or Silicon)

3,000 Ohms



**\$8**

Post Paid

### RED-HEAD RADIO PHONES

At this price, Red-Heads are unquestionably the best wireless phone values in the world! Why We Reduced the Price of Red-Heads There are four reasons. First: increased production. Second: Decreased manufacturing costs. Third: A sincere desire to aid in the prevailing movement to bring prices to normal. Fourth: To place RED-HEADS within reach of EVERY experimenter.

Specifications: 3,000 ohms resistance (each receiver 1500 ohms); cast aluminum backs, genuine Bakelite ear caps; reinforced cords with strain loops and posts; braid-covered military type head band; finest workmanship throughout. Rugged and sturdy but exquisitely sensitive. A triumph in radio-phone building. Price Complete, prepaid anywhere, only \$8.00.

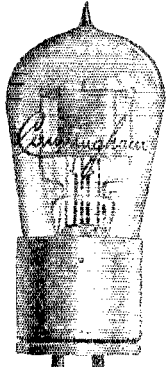
THE NEWMAN-STERN CO.  
Newman-Stern Bldg. Cleveland, Ohio

# AMATEURS SAY "TRY WECO"

Good Goods.

Complete Stock.

Prompt Service.



C-300



UV-201

Cunningham, Radiotron, Moorhead Tubes,  
 Detectors \$5, Amplifiers \$6.50, Power Tubes \$8.  
 Acme Amplifying and Power Transformers  
 Mounted \$7.00 C.W.  
 Semi Mounted \$5.00 Power 200 Watt \$16.00  
 Unmounted \$4.50 Same Mounted \$20.00  
 1 KW Spark Coil Mounted \$33.00  
 Semi Mounted \$28.00

Stranded Copper, Antenna Wire \$0.01 per ft.  
 Ground Wire #4 .08 " "  
 Connecting Up Wire Stranded .01 1/2 " "  
 Consolidated Radio Call Book 3rd  
 Edition 1.50

**Crystal Detectors**  
 Bowman No. 5 \$1.75  
 DeForest D 101, Dust Proof 2.80  
 Jove No. 8854 2.00  
 Murdock No. 324 .70  
 Paragon No. 45 1.75

**Dials**—Remler with knob and bush, 1/4 in. or 3/8 in. shaft. 1.30

**Honeycomb Coils** at low prices, send for our list

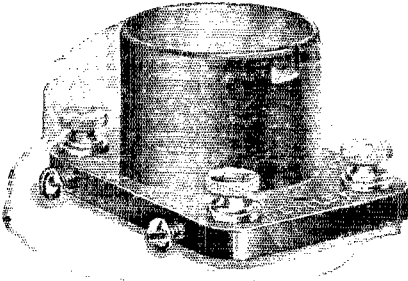
**Honeycomb Mountings**  
 DeForest Single U. L. C. 200 1.90  
 DeForest Double U. L. C. 300 4.00  
 DeForest Triple U. L. C. 400 5.30  
 DeForest Triple U. L. C. 100 10.00  
 Remler Triple 6.00

**INSULATORS—Antenna**  
 Electro—Balt type No. 1 .40  
 Electro 4 in. No. 2 .50  
 Electro 10 in. No. 3 .90

**Instrument Switches**  
 Bowman, No. 114 .50  
 Clapp-Eastham No. 19 1.00  
 Remler No. 94, 1 in. radius .45  
 Remler No. 95 1 1/2 in. knob .60

**RECEPTACLES**  
 DeForest No. R-300 1.50  
 General Radio No. 156 1.75  
 Murdock No. 550 1.00  
 Remler No. 92 1.50  
 Somerville, front and back mounting 1.35

**Rheostats**  
 Beeko No. 453 \$1.40  
 Paragon, front and back mounting 1.75  
 Remler-Junior No. 810 1.00  
 Remler No. 81 1.75



Remler Moulded Receptacle #92—\$1.50

**Switches**  
 Ground, 100 amp. 600 volt. 4.00  
 S. P. T. S. Instrument .25  
 S. P. D. T. Instrument .35  
 D. P. S. T. Instrument .40  
 D. P. D. T. Instrument .50

**Switch Points—Nickle plated**  
 1/4 x 1/2 inch with 7/8 inch screw .04  
 1/2 x 1 1/2 inch with 7/8 inch screw .02

**Telephones**  
 Baldwin, original 16.50  
 Baldwin improved 20.00  
 Baldwin lightweight 21.00  
 Brownie-Adjustable 12.50  
 Holtzer-Cabot (special slightly used) 9.00  
 Murdock No. 55 2,000 ohms 4.50  
 Murdock No. 55 3,000 ohms 5.50

**Telephone plugs and jacks**  
 Federal plug (brass) 2.00  
 2-circuit jack 1.00  
 Closed circuit .85  
 Open circuit .70  
 Weco 2-circuit jack and plug combination 1.50

**Magnet Wire**  
 No. 22 D. C. C. 461 ft. lb. 3.00  
 No. 25 D. C. C. 903 ft. lb. 3.50

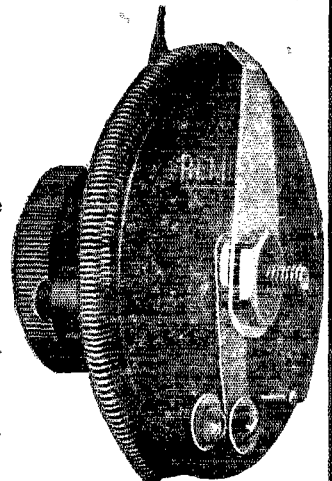
We Carry Complete Line of Remler Apparatus.

Write for Our "Special Tube and Combination Offer" for May to August."

Postage prepaid on any order over \$1.00.

**Whitall Electric Co.**  
 WESTERLY, R. I.

Call letters 1IAP

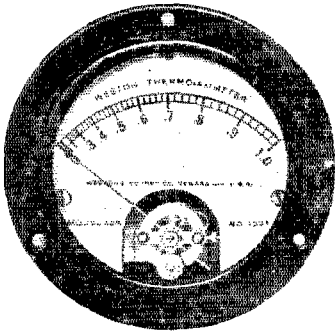


Remler #810 Junior Rheostat \$1.00—Panel Type

# Amateurs--

Do you realize that standard commercial radio instruments are obtainable at a cost very little above that paid for inferior imitations? Only in standard commercial instruments can you procure

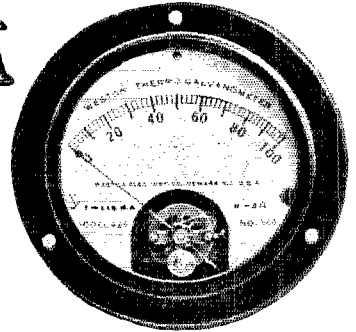
**Accuracy — Large Overload Capacity — Small Power Consumption — Small Sizes —**  
the characteristics sought in Radio Instruments.



# Weston

Model 425

**Thermo-Ammeters  
Milliammeters  
Current-Squared  
Meters**



possess these and other necessary characteristics which make them the most desirable and serviceable instruments for amateur use.

**Eliminate Instrument Troubles! Increase the Efficiency of your Set!**

**Equip NOW with WESTON INSTRUMENTS**

*Complete information will gladly be furnished upon request.*

**WESTON ELECTRICAL INSTRUMENT COMPANY**

158 Weston Ave.,

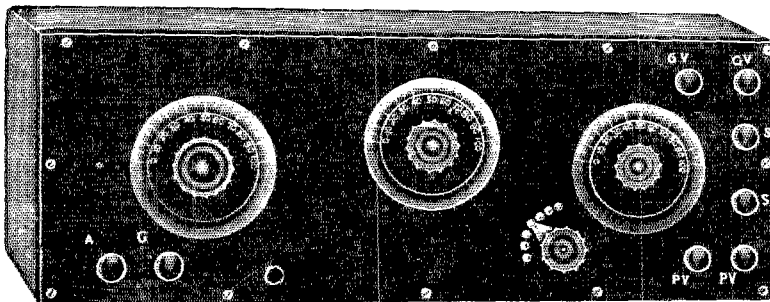
Newark, N. J.

BRANCHES IN ALL PRINCIPAL CITIES.

# Cut Prices Only for a Limited Time

50,000 ft. Aerial Wire just received, 88ft. to the lb. pure copper #14 @ 45c. per lb.  
Brass Rod,  $\frac{1}{4}$ " sq. @ 12c. per ft.  
 $\frac{1}{8}$ " round or square @ 8c. per ft.  
Series—Parallel Panel Switches 83c. ea.  
Hard Rubber Binding Posts @ 10c. ea.  
Buzzer, key and code, mounted on one base, best for code practice \$2.49.  
A real wireless key, mounted \$1.50.  
Pancake Helix (Signal Type) \$2.25  
C.W. Inductance Coils for 250 watt \$8.00.  
Loading Inductance \$3.25.  
3600 Meter Loose Coupler \$10.98  
600 Meter Loose Coupler \$5.90.

VT Receptacles \$1.00 ea.  
Radiotrons: Detector \$4.90  
Amplifier \$6.40  
Variable Grid Leaks.—necessary to use with Radiotrons, 69c.  
Fixed Grid Cond. 33c.  
Porcelain Rheostats for Panel \$1.00; for table, 88c.  
Nickel Binding Posts, good for Phones, large, 11c.; small 9c. ea.  
Small size "B" Batteries, Ace type, \$1.00.  
Nov. date "B" Batteries 50c.  
New Type Eveready "B" Battery, large, tapped each cell \$2.75.



JJN Variometers \$4.35

IJN Variocouplers \$4.75

The Regenerative set illustrated is the best bargain you can get finished with best grade black Bakelite on the Grebe type selling for \$35.00.

**AMERICAN ELECTRIC & WIRELESS SUPPLY COMPANY**

Mail all orders direct to 602 W. 145th St., N. Y. C., Dept. Q.

# Look at 'er Now!

## "The Promised Land"

CREATOR OF OPPORTUNITY  
FOR YOU

Remember the photo in last month's advertisement? Dull-looking concrete blocks and drab piles of dirt. . . . Today—already—the first of the giant steel towers are rising high into the air. The new four-continent station is rapidly becoming a fact.

"The Promised Land" is the name professional operators have given to the New York Radio Central Station, on Long Island. When completed, this station will be the largest and most powerful radio station in the world.

It will be equipped to work simultaneously with five other nations in widely separated and distant parts of the world and will be epoch-making in the field of international communication.

Enrollments are coming in by every mail. Why aren't you one of the wideawake wireless men who have seen the new and greater opportunity opened to them by the Home Study Course, which is specially designed to land them one of the enviable jobs at the world's greatest radio station? NOW—not some later day—is the time to act!

A large number of trained men will be required for its operation and maintenance. A position at this station is the height of every operator's ambition, for it means unlimited opportunity to succeed and progress to higher, more responsible and better paying positions in the radio industry. So far as opportunity goes the successful future of these men is assured.

### HOW ABOUT YOU?

Right now, today, radio offers you big opportunities—if you are properly trained. Radio companies need trained executives, engineers, drafts-men, operators and mechanics. Hundreds of positions in the ever-broadening field—from ship operator to general manager—are open to you, if you have the required training.

The Radio Institute of America has been an established and successful institution for over fifteen years. The year round average attendance in its classrooms is now 298 students per month. It has trained over 6,000 men, 95% of whom have successfully engaged in this new branch of science and industry. You, too, can be successful in this new field if you properly train yourself by means of the Home Study Course of the Institute. Radio offers an unlimited opportunity for future advancement—why not take advantage of it. Write for our booklet and further details.—NOW.

HOME STUDY DIVISION

## Radio Institute of America

(formerly Marconi Institute)

328 Broadway, New York

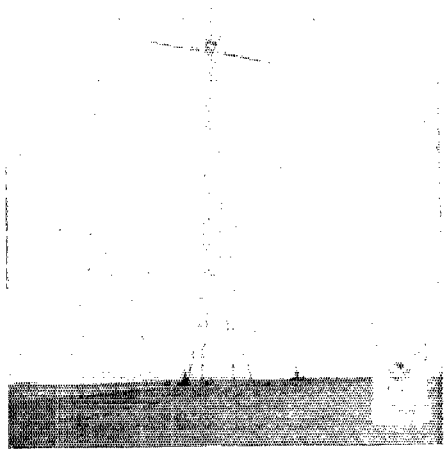


Photo taken April 29th.

The Radio Institute of America will give you this training, as it has to thousands of others. If you cannot come to the Institute, the instruction will come to you—to your home.

This new home course of radio training, which has been developed for the benefit of those who cannot attend the Institute personally, is the same course used at the Institute. It includes everything from basic principles of electricity and magnetism, to actual operation of commercial radio equipment. It also includes the same textbooks used in the Institute classes, as well as a buzzer set of greatly improved design, with a variable automatic transmitter, for code practice.

The graduates of the Radio Institute of America enjoy a great and exclusive advantage in the close connection existing between the institute and the Radio Corporation of America, world's largest radio manufacturing and commercial radio company.

Prominent executives in the radio field are former students of the Institute. The Radio Corporation employs thousands of men, in its executive departments on ships and at shore stations and in factories and laboratories. A large percentage of these men are graduates of the Institute.

**Canadian Radio Experimenters -- Special Radio Storage Batteries**

- 40 Ampere hours.....\$22.00
- 60 Ampere hour..... 25.00
- Baldwin Telephones Type C..... 24.75
- Brandes Telephones Superior..... 12.00
- Transatlantic Telephones..... 18.00
- Navy Telephones..... 21.00
- Murdocks Telephones 2000 ohm.... 6.00
- 3000 ohm.... 7.20

- Lateral Coils to order  
 Inductances for Wireless Telephone  
 Milliammeter and Hot Wire Meters  
 Vario-Couplers & Variometers... \$4.25  
 Transmitters for Radio purposes... 3.50  
**LOOK! LOOK!! LOOK!!!**  
 1/4 H.P. 110 Volt 25 cycle Menominee Motors.....\$30.00  
 1/5 H.P. 110 volt 25 cycle Menominee Motors..... 25.00  
 1/10 H.P. 110 volt 25 cycle Menominee Motors..... 20.00  
 Send 5c for 30 page catalogue

**J. M. PAQUIN**

The Electrical Shop, 787 Queen St., W. Toronto, Ont.



**B A - 2 WIRELESS**

**BATTERIES FOR PLATE CIRCUIT OF VACUUM TUBES.**

**NOVO MANUFACTURING CO.**

424 W. 33d St.      531 So. Dearborn St.  
 NEW YORK                      CHICAGO

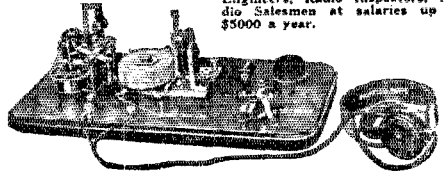
**LEARN WIRELESS AT HOME**

The Demand for Good Wireless Operators Far Exceeds the Supply

The New York Wireless Institute will make you an operator—AT HOME—in your spare time—quickly, easily and thoroughly. No previous training or experience required. Our Home Study Course has been prepared by our Radio Expert, L. B. Krumbo, formerly Chief Technical Inspector, Bureau Navigation, N. Y. Experts able to impart their practical and technical knowledge to YOU in an easy to understand way. The graded lessons mailed you will prove so fascinating that you will be eager for the next one. The instruments furnished free, will make it as easy to learn the Code as it was to learn to talk. All you will have to do is to listen.

**Travel the World Over** A Wireless Operator can visit all parts of the world and receive fine pay and maintenance at the same time. Do you prefer a steady position without travel? There are many opportunities at the numerous land stations or with the Commercial Wireless or Steamship Companies.

**BIG SALARIES** Wireless operators receive salaries from \$125 to \$200 a month and it is only a stepping stone to better positions. There is practically no limit to your earning power. Men who but yesterday were Wireless Operators are now holding positions as Radio Engineers, Radio Inspectors, Radio Salesmen at salaries up to \$5000 a year.



This wonderful Set for learning the code furnished free with our course

**FREE** Instruments and Text Books We furnish free to all students, during the course the wonderful receiving and sending set exactly as reproduced in the illustration. This set is not loaned but GIVEN to all students completing the course.

The Transmitter shown is the celebrated Omnigraph used by several Departments of the U. S. Government and by the leading Universities, Colleges, Technical and Telegraph Schools throughout the U. S. and Canada. Start the Omnigraph, place the phone to your ear and this remarkable invention will send you Wireless Messages the same as though you were receiving them, through the air, from a Wireless Station hundreds of miles away. When you apply for your license, the U. S. Government will test you with the Omnigraph—the same model Omnigraph as we furnish to our students. Ask any U. S. Radio Inspector to verify this.

**FREE Post-Graduate Course**

A one month's Post-Graduate Course, if you desire at one of the largest Wireless Schools in N. Y. City, New York—the Wonder City—the largest port in the World and the Headquarters of every leading Wireless and Steamship Co.

**NEW YORK WIRELESS INSTITUTE**

Dept. 261, 258 Broadway      New York City

**NEW YORK WIRELESS INSTITUTE**

Dept. 261, 258 Broadway      New York City

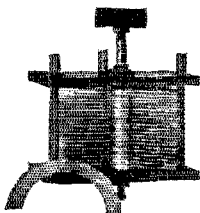
Send me, free of charge, your booklet "How to Become an Expert Wireless Operator" containing full particulars of your Course, including your Free Instrument Offer.

Name.....  
 Address.....  
 City or Town..... State.....

**THE WORLD'S CONDENSER MARKET**

**Knocked-Down Condensers**

Assemble them and save money.



- 11 Plate.....\$1.80
- 21 Plate..... 2.25
- 41 Plate..... 3.20 Add P. P.

If you want us to assemble them for you add \$1.00, plus P. P., to above prices. Shipping weight 2 lbs.

**Glass Plate Condensers—Universal Condensers.**

SEND 10c FOR CATALOG OF 16 PAGES TO

**TRESCO**

**Davenport, Iowa**

# Formally Announcing—

## The First National A.R.R.L. Convention and Radio Show at Chicago

**August 30, 31, September 1, 2 and 3, 1921**

**T**HE most wonderful convention and Radio show that this country has ever beheld and which every live radio man should attend without fail.

It's the first National affair and everybody you have wanted to meet will be on hand. Arrange to spend a week of your vacation at Chicago during convention week. Watch QST for the detailed five-day program and further announcements.

The immense banquet will be held the night of the third of September and you should not miss the spectacular doings. There will be no convention charges outside of your banquet plate, reservations for which should be made on the blank below immediately. Cancellations will be accepted at any time.

**Manufacturers! Write for show space.**

---

**Mr. N. C. Bos, Reservation Manager,  
First National A.R.R.L. Convention,  
118 North LaSalle Street, Chicago, Ill.**

I am enclosing herewith Five Dollars for one banquet plate reservation at the National A.R.R.L. Convention.

Do you desire hotel reservations?.....What priced room do you wish?.....

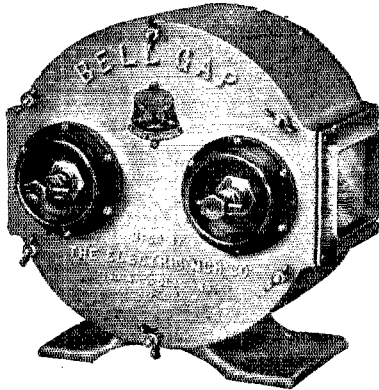
Do you wish to stay at the convention hotel or at a less expensive hostelry in the loop district?.....

Advise when and how you will arrive and how many in your party. Don't forget that there will be arrangements for the ladies.

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



*Clear as a Bell*  
**The New Bell Rotary  
 Quenched Spark Gap**



**PRICE \$55.00**

Place your order through your dealer

**A BELL GAP OR A POWER TUBE?**

The first cost of the new **Bell Rotary Quenched Spark Gap** is the last cost. Count its life in years, not hours. Equal in tone to anything in the air and often superior. Let your pocketbook tell you why you should buy a **Bell**.

**THE GAP THAT SAVED THE SPARK!**

**The Electric Machine Co., - - Indianapolis, Ind.**



*The first of our*  
**New Series of Bulletins**

On Radio Apparatus is now ready. Bulletins describing more complete and advanced equipment will soon follow.

In the meantime, send five cents for the first Bulletin No. 10, which will indicate the beginning of the line which we will offer to discriminating amateurs, experimenters, colleges, etc.

**PACENT ELECTRIC COMPANY**

(Selling Agents)

150 Nassau Street,

OR

New York, N. Y.

**WIRELESS IMPROVEMENT COMPANY**

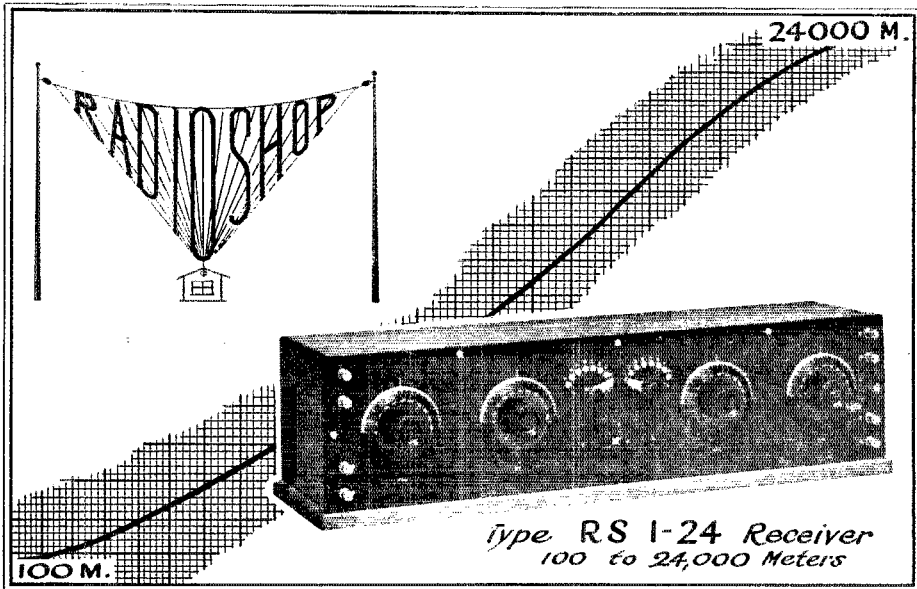
(Manufacturers)

66 York Street,

Jersey City, N. J.



# Something Concise: \_\_\_\_\_



Concentrated essence of efficiency, the new RADIO SHOP type RS 1-24 receiver. The latest application of regenerative tuning to a range spanning every wavelength used in radio communication throughout the World.

Haven't you ever tired of the "QRM" on amateur wave-lengths and wished for a receiver that would bring in the commercial ships and long wave damped and undamped stations, without the trouble of changing wires and plugging in and out of numerous coils?

This is it! 100 to 24,000 meters, without a "dead spot," all in one cabinet! Variometer tuning applied to the entire scale with the resultant ease of control of regeneration and oscillation. Circuits so synchronized that troublesome "combinations" of tuning are entirely eliminated, making definite adjustments and reliable reception an assured thing and the RS 1-24 the ideal receiver for all wavelengths, with absolutely no sacrifice of efficiency on any particular wavelength. A "stand-by" arrangement is also incorporated that will broaden tuning, when so desired, for general "listening in" work.

The very popular RADIO SHOP short wave receiver construction applied to wavelengths below 1,000 meters assures maximum selectivity and efficiency for amateur and short wave commercial spark and C.W. reception. Wavelengths from 1,000 to 24,000 meters are taken care of by an entirely new application of the variometer principle which has already been employed in the RADIO SHOP long wave receiver, described in previous advertisements. The result:—SATISFACTION.

A few mechanical features that will appeal to the most exacting:—Banked windings. Dials that run true. Heavy bus-bar wiring. Non-shorting variable condensers. Grained, engraved, Formica panel. Interior as well as exterior workmanship of the highest possible order. NO SEALS. We are as proud of our interior as of the outward appearance and want the purchaser to know just as much about the apparatus as we do.

The "RS 1-24" carries the same "money back if not satisfied" guarantee that applies to all RADIO SHOP products. So far we have never had to live up to this guarantee, an enviable record to say the least.

## "THE SET THAT YOU WILL EVENTUALLY BUY"

Licensed under Armstrong's Regenerative Patent and applying this unapproachable circuit to its maximum effectiveness.

THE RADIO SHOP type RS 1-24 Receiver is the most efficient and effective radio tuning device ever built.

PRICE, F.O.B. SAN JOSE, \$100.00

In ordering please specify whether Oak or Mahogany cabinet is desired.

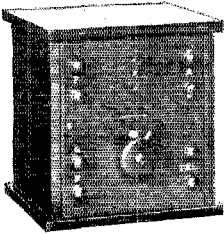
DEALERS: We have an interesting proposition to offer you. Write us.

# THE RADIO SHOP, San Jose, California

Variometers, \$5.75.

Vario-couplers, \$4.75.

A few still are left



## The "Miraco" Vacuum Tube Detector

The new "MIRACO" Detector contains features not found in others at double the price. There is ample space in the hinged covered cabinet for "B" batteries and additional binding posts on the back of panel enable the operator to connect them inside.

**\$7.85**  
Postpaid.

Complete ready to use, only

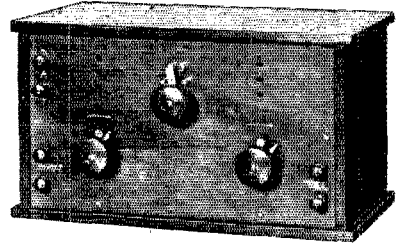
## The "Miraco" Two Stage Amplifier

The "MIRACO" Two Stage Amplifier is distinguished for its unusual amplification and quietness in operation. May be operated from same "A" and "B" battery used for your detector. But cabinet includes a shelf for additional "B" batteries for the amplifier. A switch automatically changes the circuit from one to two stages of amplification.

Complete ready to use, only **\$29.50**

These "MIRACO" units are ideal for radio-telephone and telegraph work during the static season.

Postpaid.



**THE MIDWEST RADIO CO., Dept. E., 3423 Dury Ave., Cincinnati, O.**



The Amplifone Loud Speaker is designed to operate with a two stage Vacuum Tube Amplifier. It does not require a battery for its operation. The Amplifone gives fine results on radio concerts as it does not distort. Finished in dull black. Dimensions 5"x7"x12". The handsomest and most efficient loud speaker at any price. Bulletin 106 R tells why.

PRICE \$20.00.

If your dealer cannot supply you send us his name.

**F. M. DOOLITTLE CO.**  
817 Chapel Street, New Haven, Conn.

## YOU CAN NOW BUY THIS REMARKABLE BOOK THE Alexanderson System FOR Radio Telegraph and Radio Telephone Transmission

By Elmer E. Bucher

10 1/2 x 8 1/4, 56 pages, 38 illustrations and diagrams. Bound in heavy antique paper cover. Originally Intended for Private Distribution—the requests for copies became so insistent that consent was finally given for a public sale. The only complete description of this famous system as installed in the New Brunswick station is in this book.

Here, for the first time, you get the details of the invention that revolutionized trans-Atlantic wireless transmission—the one producing such a wonderfully clear note that foreign governments sent their experts to investigate and who, on the reports of these experts, ordered the alternator for their own stations.

**SPECIAL INTRODUCTORY OFFER**

Price of Book alone, \$1.25, postpaid. With Wireless Age, one year, \$3.25.

Regular Price \$3.75.

(Postage Outside U. S. 50 Cents Extra)

**THIS BOOK**

**Is Now Ready to Mail**

Order from your dealer or direct from us.

**ORDER TODAY**

The first edition is limited  
Orders filled as received.

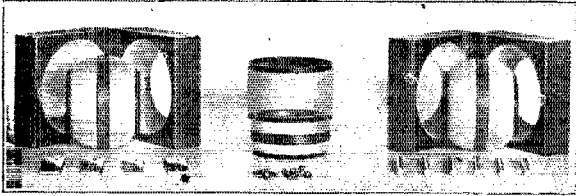
**DEALERS**—Place Your Order at Once

**WIRELESS PRESS**

Incorporated

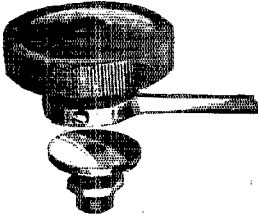
326-28 Broadway, NEW YORK

## NEW "Chi-Rad" APPARATUS



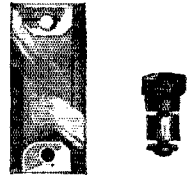
Complete as shown \$10.00  
(include P.P. on 4 lbs.)

C.W. reception; variometer adjustments semi-critical giving great amplification without distortion. **IMMEDIATE DELIVERY**—order your set today!



Universal Pointer for condensers, couplers, variometers, etc. Knob 2 1/4" diam. 2 3/8" radius, shaft hole 3/4". Complete with bushing \$1.25.

Grid Condensers specially designed for Radiotron UV-200. Made of mica and copper foil—no paper. 35c each, 3 for \$1.00.



Hard Rubber Posts, Nickel Bushing, Hard Rubber Top. 12c. each, \$1.25 per doz.

Dealers:—Write for attractive discounts on these items.

We carry a complete stock of all standard makes of apparatus. Read our list each month—Immediate Delivery on every item. Try our "Chi-Rad" Service! *Blue Print of 4 new C.W. Circuits sent anywhere for 15c in stamps.*

### VACUUM TUBES

Radiotron UV-200 Detector.....	\$5.00
Radiotron UV-201 Amplifier.....	6.50
Radiotron UV-202 Transmitter.....	8.00
Radiotron UV-203 Transmitter.....	30.00
Special Socket for above tube.....	4.25
DeForest Rectifier tubes.....	9.75
DeForest 35 Watt "Singer" tubes.....	20.00

### RHEOSTATS

Porcelain Base 10 ohm.....	\$1.00
Paragon Panel.....	1.75
New DeForest Panel.....	1.65
General Radio 7 chms.....	2.50
General Radio, 2 ohms, heavy duty.....	2.50
General Radio, 400 ohms.....	4.00
("A" Bat. Potentiometer)	

### HEADSETS

Murdock, new type, 2,000 ohms.....	\$5.00
Murdock, new type, 3,000 ohms.....	6.00
Brandes, Superior.....	8.00
Brandes, Trans-Atlantic.....	12.00
Brandes, Navy.....	14.00
Baldwin, Type "C".....	16.50
Baldwin, Type "E".....	20.00
Baldwin, Type "F".....	21.00

### FEDERAL APPARATUS

Open Circuit Jack.....	\$0.70
Single Closed Circuit.....	.85
Double Closed Circuit.....	1.00
Single, Filament Control.....	1.20
Double, Filament Control.....	1.50
Anti-Capacity Switch.....	2.80
Hand Transmitter #260-W.....	7.00
Telephone Plug.....	2.00

### METERS (GENERAL RADIO)

100 Milli-Amps.....	\$9.00
250 Milli-Amps.....	7.75
1/2, 1, 2.5, 5 or 10 Amps.....	7.75
Jewell Thermo-Couple Meters. Any scale up to 10 Amps.....	15.00

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

Build your own Regenerative Receiver with these high grade parts. Accurately turned variometer forms with all windings in place—one for grid and one for plate circuit. Wire will not loosen under any conditions. Coupler primary of Bakelite. Bearings and shaft holes perfectly centered—set can be assembled in 30 minutes. Unequaled for Radio Phone and

**CHICAGO AMATEURS:—Come and see our new Radio Phone**

## CHICAGO RADIO APPARATUS CO., Inc.

C. C. Klentz

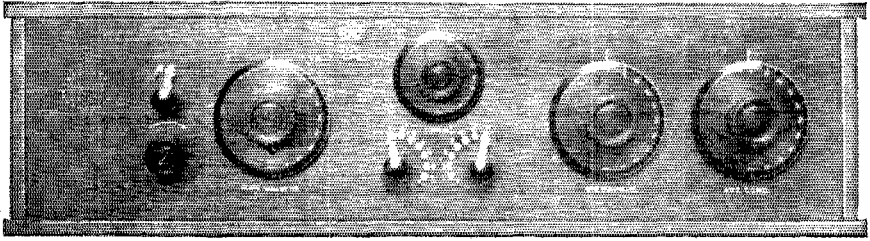
Phone Harrison 1716  
(Room 210)

L. L. Lynn

508 SO. DEARBORN STREET,

CHICAGO, ILLINOIS

# A NEW "CINO" SPECIAL FOR DX MEN!



Have you ever wished that the Manufacturers of Regenerative Tuners would wake up to the fact that you were right-handed?

Now look at the above illustration and start from left to right: First the detector; with the present day tubes it is seldom necessary to readjust a detector after arriving at the point where your tube works best. Allright, get it out of the road, which is to say, at the extreme left!

Next is the plate variometer: Inasmuch as the plate variometer is used solely for regeneration and does not require that you look at it continually keep it also at the left.

Next is the coupling, and last but of most importance the Grid or wavelength tuning variometer, and alongside of it the series, or Antenna Condenser!

Now Traffic Men can this arrangement be improved upon? Everything at your right hand, 'long side of the key!

And finally, will they bring them in? Well, write us for literature and if you wish we will give you a list of satisfied users, distance men and boosters.....Price \$72.00



We also carry a full line of standard apparatus. Cunningham 300-301-302 Tubes, Somerville Meters, G-R Radiation Ammeters, Chelsea, Murdock, Acme, etc. Paragon and G-R Rheostats, Burgess Batteries, Radioelectric Shop smooth-out condensers, 2 1/2 MFD 1500 Volt. Bell Rotary Quenched Gaps.

"CINO" Variometers—Forms \$3.00—Mounted \$8.00 Postpaid.

"CINO" Variocoupler—Parts \$2.50—Mounted \$7.00 Postpaid.

## CINO RADIO MANUFACTURING CO.

218 West 12th Street,

Cincinnati, Ohio

## A Full Line of Radio Apparatus

We have everything you need. Below are a few items from our large stock. Watch this space for a complete stock list.

### POWER TUBES

A-P 5 watt.....	\$7.50
Cunningham C302 5 watt.....	\$8.00
Cunningham C303 50 watt.....	30.00
Cunningham C304 250 watt.....	110.00
DeForest Singer Type 37 watt....	24.00
DeForest Oscillion 250 watt.....	60.00
DeForest Oscillion 500 watt.....	75.00
DeForest Oscillion 1000 watt.....	150.00

We have all the necessary material for CW outfits.

350 volt generators.....	\$20.00
6" diam. 1/8" wall Formica Tubing	
Per ft. ....	2.75

Send for bargain list.

The above prices are F.O.B. St. Paul.

### PIONEER ELECTRIC CO.

137 East Fifth St.,

St. Paul, Minn.

R  
KLAUS  
D  
I  
O

## KLAUS RADIO CO.

Eureka, Ill.

*Authorized Distributors for*

Grebe	DeForest
Acme	Murdock
Moorhead	Radio Corporation
Brandes	Clapp-Eastham
Baldwin	Amrad

We assure prompt deliveries and guarantee safe arrival of all apparatus.

Buy your material from Klaus Radio or associated distributors. The combined facilities mean service.

—Our Bulletins are Free—



# CONNECTICUT

## HIGH GRADE RADIO APPARATUS



### CONNECTICUT Head Receivers

Adopted during the world war as United States Government standard. A high grade set, justly popular among operators. The receivers are durable and of first quality. Steel wire bands bound with webbing, specially light, but equally strong. Readily adjustable to any head.

- 2000 ohms with 6 foot cord.....\$6.00
- 3000 ohms with 6 foot cord..... 6.50

### CONNECTICUT Transmitters

Mechanically and electrically correct. Every transmitter fitted with finest imported mirror carbon electrodes, and subject to micrometer inspection.

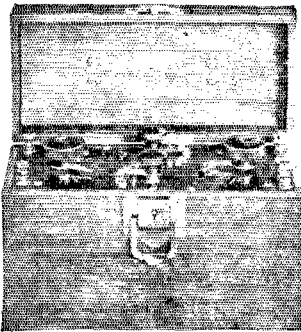
- Transmitter with short adjustable arm.....\$5.00
- Hand Transmitter with cord.....11.00

### CONNECTICUT Variable Condenser

This new condenser has met wonderful success. Send for booklet with full information. Portable or panel type \$6.50.

## CONNECTICUT TELEPHONE & ELECTRIC COMPANY

Meriden Connecticut



## MARVELOUS! - "MIDGET"

The 20th Century Invention of a Wizard-Genius.

Are you a skeptic? You need not be. We are selling apparatus every day. This is not a one-horse company, but a \$50,000.00 corporation. The "MIDGET" is a regenerative receiver, tuning 100 to 3000 meters!! And the price—O, Boy! It's in our new catalogue.

APPARATUS THAT IS WORTH WHILE  
Wake up, gentlemen—We are on the map

**Detroit Radio Laboratories, Inc.**

3661 Gratiot Ave., Detroit, Mich.

### A Brand New Storage Battery. More Capacity for Less Money

A battery with twice as many plates per cell as the standard battery. The most powerful and longest life battery ever built.  
Guaranteed 2 years.

Price, F.O.B. Cleveland:—

- 6 Volt 80 Ampere hour.....\$28.00
- 8 Volt 80 Ampere hour..... 36.00

**Colebrook - Hamilton Battery Co.**  
1940 E 82nd. 1941 E 81st  
CLEVELAND, OHIO.

### BUILD YOUR OWN SET

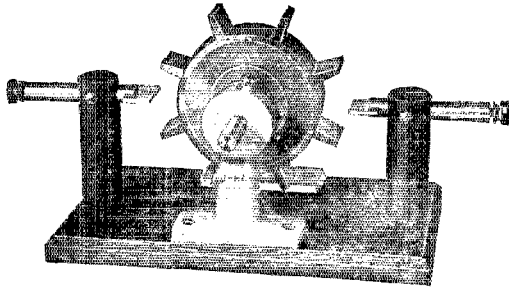
High quality, seamless paper tubing, in just the right sizes for constructing

- Variometer  $3\frac{7}{8}'' \times 2''$   $4\frac{1}{8}'' \times 2\frac{1}{4}''$  25c
- Vario-Coupler  $3\frac{7}{8}'' \times 2''$   $4\frac{1}{8}'' \times 4\frac{1}{2}''$  35c
- 3500 Meter Loose Coupler  $3\frac{1}{4}'' \times 7''$   $3\frac{7}{8}'' \times 7''$  45c
- 6000 Meter Loose Coupler  $3\frac{7}{8}'' \times 7''$   $4\frac{7}{8}'' \times 7''$  65c

Postpaid to you—order to-day.

**THE TAYLOR COMPANY**

Box 1043C Lowell, Mass.



## J-Ray Open Rotary Gap

We are pleased to announce this type of open gap designed for those who desire the J-Ray improvements in Gaps but an open rather than an enclosed gap. Disc turns in **New Depart-**

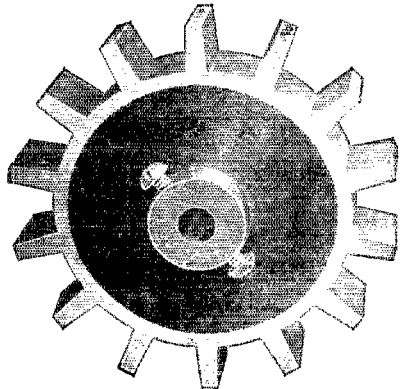
**ure ball bearings** as in our enclosed Gap, and is mounted on a  $\frac{1}{2}$ " steel shaft. Uprights are of bright lacquered bronze which in conjunction with the fibre electrode supports give a beautiful appearance to the gap.

Base is of heavy oak 6x10 inches. Due to the reduced friction in the bearings a very small motor will drive the gap with ease. Our standard  $\frac{1}{2}$ " round lacquered stationery electrodes are used, and disc as described below. Open Gap as described, choice of aluminum or bronze disc \$20.00.

## J-Ray Machine Cut Discs

as used in all our gaps are the **only machine cut rotors on the market today.**

Each and every disc is cut out tooth by tooth on a special gear cutting machine which renders the finished article absolutely accurate to  $\frac{1}{1000}$ " and perfectly balanced. **Indispensable in synchronous gaps where absolute accuracy is essential.** J-Ray discs  $5\frac{1}{2}$ " diameter, perfectly insulated, center hub of aluminum, teeth tapering to sharper edge than shown, are made in the following styles:—



1A—Material	Aluminum	—width of teeth	$1\frac{1}{4}$ "	.....	Each	\$10.00
1B	“ Bronze	“ “ “	“	.....	“	“
2A	“ Aluminum	“ “ “	$\frac{3}{4}$ "	.....	“	9.00
2B	“ Bronze	“ “ “	“	.....	“	”

Bronze discs are of a special slow burning bronze alloy recommended for use in enclosed gaps as they burn with very little oxide. Aluminum discs are exceptionally light for their width, permitting use with small motors.

J-Ray discs as described, choice of 4 to 14 teeth, bushing to fit any motor Shaft,—\$10.00 and \$9.00 respectively.

### BUILDERS OF

**J-RAY MFG. CO.**  
2131 DeKalb St., St. Louis, Mo.

Noiseless Gaps  
Open Gaps  
Synchronous  
Gaps

Write for Special  
Proposition on  
Synchronous  
Motors

## CO-OPERATIVE RADIO PURCHASING

Members of this association participate in the profits which have accrued through their own and fellow amateurs combined purchases. In addition to this dividend our service is unexcelled. You also can secure this service and share

in our profits. Order direct from this ad or send a stamp for full particulars. Remember "We take pride in our service." The items listed below are but a few of the items which are carried in stock

**RADIOTRON TUBES**  
 UV-200 Gas Content Detector \$5.00  
 UV-201 Plotron Amplifier..6.50  
 UV-202 5 Watt Transmitter..8.00  
 (We supply full directions with either detector or amplifier.)

**AMPLIFYING TRANSFORMERS**  
 Clapp-Eastham type QO unmounted ..... 4.00  
 Clapp-Eastham type QO mounted ..... 6.50  
 Acme A2 with binding posts 5.00  
 Acme core & coil assembled 4.50  
 Acme A2 fully mounted.... 7.00  
 U. V. 712 List Price..... 7.00  
 Mfg. by Radio Corp. of America.

**CONDENSERS**  
 Connecticut .001 encased... \$6.50  
 Connecticut .001 panel type 6.50  
 Chelsea No. 1 encased..... 5.00  
 Chelsea No. 2 encased..... 4.50  
 Chelsea No. 3BD with dial for panel..... 4.75  
 Chelsea No. 4BD with dial for panel..... 4.25  
 Murdock No. 366 .001 encased ..... 4.75

Murdock No. 367 .0005 encased ..... 4.50

**TELEPHONES**  
 Brandes Superior with Navy band ..... \$8.00  
 Brandes Trans-Atlantic with Navy band..... 12.00  
 Brandes Navy type with Navy band ..... 14.00  
 Western Electric type 1002A 15.00  
 Murdock No. 55, 2000 ohms 4.50  
 Murdock No. 55 3000 ohms 5.50

**AUDION CONTROLS**  
 Clapp-Eastham ZRD detector panel ..... \$12.00  
 Acme Y-1 detector ..... 10.00  
 Adams Morgan No. 70 control ..... 6.00

**SHORT WAVE SET MATERIAL**  
 Clapp-Eastham ZRV Variometer, without dial..... \$5.75  
 Clapp-Eastham ZRV Variometer with 3-inch dial.... 6.50  
 Clapp-Eastham ZRC Variocoupler, with knob & dial 7.50  
 Clapp-Eastham ZRC Variocoupler, with switch and points ..... 9.00  
 J. J. Nightingale Variometer 4.50

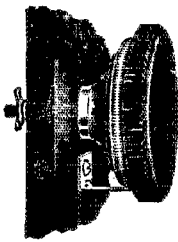
J. J. Nightingale Variocoupler 5.00  
 Murdock G or P Variometer No. 345 ..... 7.50  
 Murdock Variocoupler No. 346 8.50

**STORAGE BATTERIES**  
 Marko 6 volt 20-40 ampere hour ..... \$14.60  
 Marko 6 volt 40-60 ampere hour ..... 18.00  
 Marko 6 v. 60 A. H. Ford type ..... 17.10  
 Marko 6 V. 80 A. H. Ford type ..... 21.60  
 Marko 8 volt 20-40 ampere hour ..... 18.70  
 Marko 8 Volt 40-60 ampere hour ..... 25.40  
 Marko 12 volt 20-40 ampere hour ..... 29.30  
 Marko 12 volt 40-60 ampere hour ..... 36.00  
 (On all storage batteries add Excise Tax of 5%)

**"B" BATTERIES**  
 Standard 22½ volts, small, \$1.50  
 Standard 22½ volts, large... 2.65  
 Standard 22½ volts, large variable ..... 3.50  
 Cyclone 22½ volts, small... 1.25  
 Cyclone 22½ volts, large... 2.40

**MUTUAL PURCHASERS ASSOCIATION**  
 Dept. Q, 2 Stone Street, New York City

## Back To Old Prices



### Parkin Rheostat

5000 Sold Last Year at \$1.00

NOW REDUCED TO

### 75 Cents

Due to the general drop in the prices of raw material and to our large production, we have been able to reduce all our prices to their pre-war level, and in some cases even lower. New catalog No. 4, listing our complete line sent free.

Here are a few of the items:

No.	Postpaid
31 Audion panel with rheostat and B Bat.	
Switch .....	\$8.00
43 45 Volt Large B Battery .....	5.00
50 Parkin .001mf Variable Condenser, unit only 1.50	
51 Parkin .001mf V.C. with knob and pointer 2.00	
52 Parkin .001mf V.C. with knob and 3" dial 2.50	
53 Parkin Molded Bakelite Fixed Condenser... .70	
UV-200 New Radiotron Vacuum Tube.....	5.00

DEALERS—If you are not on our mailing list, write for new catalog and discounts.

**PARKIN MFG. CO.**

San Rafael,

Calif.

## NEW ORLEANS RADIO

APPARATUS AND SUPPLIES

### ROSE RADIO SUPPLY

604 GRAVIER STREET

NEW ORLEANS, LA.

Send 10c for Latest Catalogue

## MINNESOTA RADIO AMATEURS

AND OUR NEIGHBORS

We have a complete line of radio apparatus and represent over thirty radio manufacturers. Write us for prices.

POSTAGE PAID

Duluth's Oldest Electrical Store

**BURGESS ELECTRIC CO.**

310 W. FIRST ST., DULUTH, MINN.



# BLUE PRINTS SHORT WAVE RECEIVER

ARMSTRONG REGENERATIVE AMPLIFYING TYPE

## 160 TO 1000 METERS

This data is not available in any text book or publication, NOT A TWO VARIOMETER RECEIVER.

Design GUARANTEED to be at least equal in efficiency to best receivers on the market covering any part of this wavelength range. Has every advantageous feature known today.

Developed and designed in our laboratory by COMMERCIAL RADIO ENGINEERS, not only to work perfectly but to be built ECONOMICALLY and at a REASONABLE PRICE.

Electrical Data, Mechanical Details, Assembly Views, Wiring Diagram and List of Material shown on four blueprints 21"x28", Price \$4.00 set.

### CONSIDER THIS

#### WHEN YOU BUILD

Raw Materials .....20%

Saving Approximately 80%

#### WHEN YOU BUY

Dealers Discount.....30%

Manufacturers Profit.....20%

Manufacturers Overhead.....20%

Raw Materials.....20%

Other Items.....10%

List Price Instrument.....100%

Also available, blueprints, 150-25000 meter Regenerative Receiver; 10, 20, 50, 100, 200 and 500 Watt CW and Radiophone ICW Sets, Quenched Rotary Spark Gap, 64 volt Storage "B" Battery and others.

## Experimenters Information Service

Suite 551

45 Pinehurst Avenue

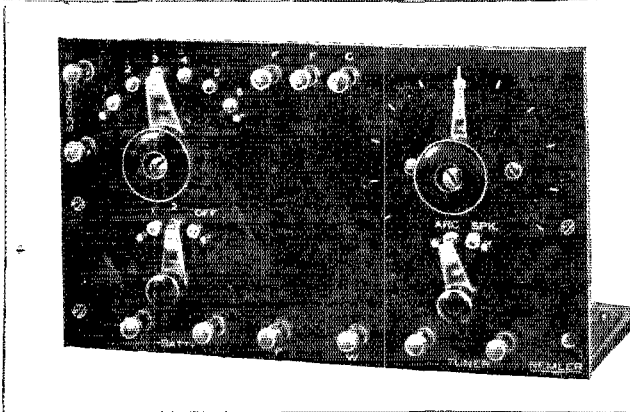
New York City

Charles R. Leutz, Director, Formerly Designing Radio Engineer, Marconi Wireless Tel. Co. of Am. and Liberty Electric Corp. of Mallory Industries, Inc.

# Special price reductions

Control panels with VT Mounting, as illustrated. \$11.00  
 Same as above, but without VT Mounting. . . . . 9.00

CESCO Variometers, each. . \$5.50  
 CESCO Variocouplers. . . . \$4.50  
 Bakelite Base Crystal Detectors . . . . . 1.25



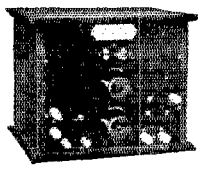
This Audion Control Panel is the greatest panel value ever offered. It will not discolor like hard rubber, nor is it brittle or easily damaged. The panel is cut from solid sheet—not moulded. Surface highly polished. Lettering and scales machine cut—not stamped—and whitened. Metal parts heavily nickered. Filament rheostat back mounted. Wound for 5 ohms, it permits close adjustment of filament temperature.

*These prices are special and temporary only. The apparatus is standard, and the saving to you considerable. Mail your orders at once—*  
 CALIFORNIA ELECTRIC SUPPLY CO. 643 MISSION ST. SAN FRANCISCO, CAL.

# Radio supplies that R right



**"D. X. Signals"**



are getting weaker and, hence, more difficult to copy, now that the hot summer months are coming on. "Step 'em up" with an ACE Amplifier Unit and your problem of how to maintain reliable communication is solved.

Amateurs! If your dealer cannot supply you, forward your order by mail and it will receive our prompt attention.

Dealers! We manufacture a line of equipment which is far above the average quality but selling at a price within the reach of all. We know you will be interested.

ACE 2-stage Amplifier, as illustrated, completely mounted on a Formica panel and enclosed in a solid mahogany cabinet with hinged top. Equipped with an anti-capacity switch for shifting the phones from detector to one stage or two stages, or vice versa. An instrument of sterling quality. Price \$40.00

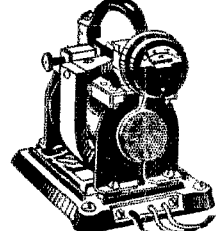
ACE 1-stage Amplifier, construction and quality similar to the ACE 2-stage Amplifier. Price \$20.00.

Send 6c stamps for catalog

**THE PRECISION EQUIPMENT CO.**  
 Dept. D., 2437-2439 Gilbert Ave., Cin., O.  
*"You May Pay More But You Can't Buy Better"*  
 Member A.R.R.L. Radio Call "8XB"

## 10c. Charges Your Battery at Home With An F-F Battery Booster.

and your station will never be closed because of a discharged battery.



is it not gratifying to feel that your filament battery will always be ready when you want it and that you will never have to give up in disgust when working a distant station?

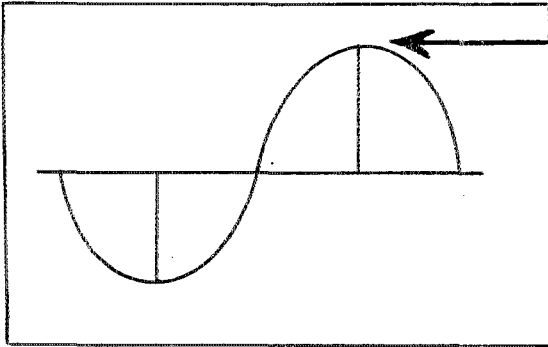
F-F Battery Boosters are automatic and operate unattended. Screw plug in lamp socket, snap clips on battery terminals and see the gravity come up.

The ammeter shows you Service Station Service just the amount of current flowing. The full wave of current is rectified thru adjustable and easily renewable carbon electrodes which maintain a constant efficiency and last for thousands of hours. Everything complete on one compact, self-contained unit.

The F-F Booster is a Magnetic Rectifier for 105-125 Volt 60 Cycle Alternating Current.  
 Bantam Type 6 charges 6 Volt Battery at 6 Amps. \$15  
 Type 16 charges 6 Volt Battery at 8 Amperes \$24  
 Type 166 charges 6 Volt Battery at 12 Amperes \$32  
 Also Boosters for 12 Volt Batteries at same prices

Shipping weights 10, 12 and 15 lbs.  
 Order from your dealer or send check for prompt Express Shipment. If via Parcel Post have remittance include Postage and Insurance Charges. Will also Ship C. O. D. Also F-F Battery Boosters for charging batteries from Farm Lighting Plants, Direct Current Circuits and D.C. Generators. For Group Charging use the Full Wave Automatic F-F Rotary Rectifiers of 100 Volt, 36 cell capacity. Order now or write today for descriptive Bulletin No. 31 or Rotary 31A

**The France Mfg. Co.** CLEVELAND, OHIO  
 Canadian Representative: Battery Service & Sales Co., Hamilton, Ont'



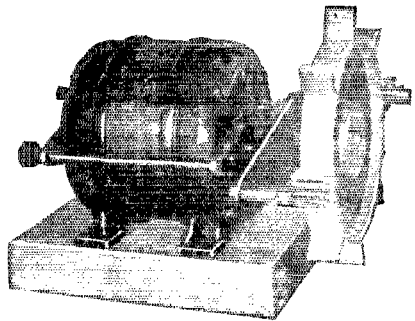
# Get That Peak!

A SYNCHRONOUS GAP IS THE ONLY MEANS OF GETTING THE MAXIMUM DISCHARGE EVERY TIME AND THUS OBTAINING THE MAXIMUM FROM A TRANSMITTER FOR A GIVEN INPUT.

Synchronous gaps must be adjusted carefully and accurately. Friction or clamp adjustment is not sufficient. The Hyrad synchronous has gear adjustment of the rocker arm giving exceptionally fine variation. Motor supplied with the Hyrad synchronous operates directly from 110 or 220 volts 60 cycle alternating current and requires no external excitation.

Equipped with our balanced Hyrad disc. Machine work so accurate that adjustment of stationary electrodes may be made within .003 inch of rotor, and rocker arm rotated without hitting.

Supplied with special Tungsten Electrodes when desired for exceptional quenching.



HYRAD SYNCHRONOUS ROTARY

Hyrad Synchronous Gap, complete with motor, disc, and gear adjusted rocker arm mounted on finished oak base. F. O. B. Chicago.....\$125.00  
Tungsten Electrodes.....\$3.00 each

*All our prices have been reduced.  
Catalog F-21 quotes new prices.*

## Chicago Radio Laboratory

Testing Station--9ZN--5525 Sheridan Road  
*We have moved! Note our new address!*

6433 Ravenswood Ave.,

Chicago, Ill.

# WIRE R T S MARKET

NOW IS YOUR OPPORTUNITY TO BUILD YOUR NEW SET

We can furnish you with the following sizes of magnet wire, neatly spooled. This is the highest grade wire obtainable.

Size	Weight	Double Cotton
No. 20	1/4 lb.	49c
No. 22	1/4 lb.	52c
No. 24	1/4 lb.	58c
No. 26	1/4 lb.	72c
No. 28	1/4 lb.	92c

We charge nothing for Spools. When Ordering include postage.

### AERIAL WIRE

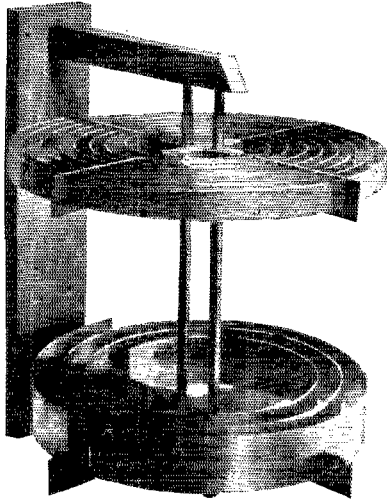
JUST THINK—Nearly 2 ft. of pure solid copper No. 14 Aerial wire for 1c. (Order YOURS Now)  
No. 14 Solid Copper Aerial Wire Per. 100 ft. \$0.58  
No. 14 Solid Copper Aerial Wire Per 100 ft. \$0.58 ft. \$5.50.

DID YOU SEND 10c FOR THE R.T.S. CATALOGUE?

RADIO TESTING STATION

BINGHAMTON, N. Y.

# OSCILLATION TRANSFORMER



Type TH-2

Built to put ALL of your condenser energy into the open circuit. No metal parts near the windings to absorb the energy. Formica insulation throughout. Woodwork natural finished walnut. Heavy brass ribbon. Secondary is 18" diameter and has 8 turns of 1¼" ribbon. Primary is 18" diameter and has 3 turns. TH-1 has 1¼" ribbon on primary. TH-2 has 3". Can be mounted in either vertical or horizontal position. Coupling easily variable.

TH-1 - - \$14.50

TH-2 - - \$18.50

Write for literature.  
Interesting proposition to dealers.

We have in stock at all times a complete line of spark and CW equipment.

**T & H RADIO CO.**

**ANTHONY,  
KANSAS**

## KEYSTONE WIRE

Wire for every Wireless Purpose

### MAGNET WIRE

We are prepared to furnish best grade magnet wire on ¼ and ½ lb. spools at the following prices:

#### PRICE PER ¼ LB. SPOOL

Size B & S Ga.	Single Cotton	Double Cotton	Single Silk	Enameled
No. 22	\$0.56	\$0.68	\$0.62	\$0.45
No. 24	.60	.77	.67	.47
No. 26	.65	.88	.71	.49
No. 28	.75	1.10	.85	.52
No. 30	.85	1.24	.97	.53
No. 32			1.15	.55
No. 34			1.52	.59
No. 36			1.77	.69

Price of ½ lb. spools double above list.

All prices are net and include cost of spool and delivery charges via Parcel Post to any Post Office address in the United States; safe delivery guaranteed.

Send for Circular 21-A giving prices on other sizes, insulations and quantities of Magnet Wire. This circular lists "WIRE FOR EVERY WIRELESS PURPOSE."

**KEYSTONE WIRE COMPANY**

P.O. BOX 120



SCRANTON, PA.

### TeCo RADIO ANNOUNCES

Slashing prices in Honey Comb Coils

For 600 meter work,

set of three . . . . 1.60 unmounted

For short wave work,

set of three . . . . \$1.20 unmounted

Other wave lengths quoted on application. For the information of those discriminating amateurs that want nothing but the best we wish to state that after exhaustive tests we have adopted and are now using on our own aerial THE IDEAL SET, which is as follows: Grebe CR 5, 150-3000 meters, \$50; General Radio Two Stage Amplifier, \$50; Magnavox, \$45 (this instrument works very well without battery; we advise the use of a Paragon Rheostat in series, and Oh, Boy! she does roar—without distortion; no operator should be without this wonderful instrument); Baldwin Type E or Brown Phones; the latter have adjustable reed and are supersensitive. With the above set we are able to copy NSF time (Washington D. C.) with one stage amplification all over the house and in the street. The above set in our estimation comprises the very latest and best circuits in use today. We can make immediate shipment on above articles. The QRM after midnight is as bad from outside districts as it is locally before midnight. Before spending your money on inferior goods write us and let us advise you free of charge, giving you the benefit of our 15 years experience.

#### Some Bargains:

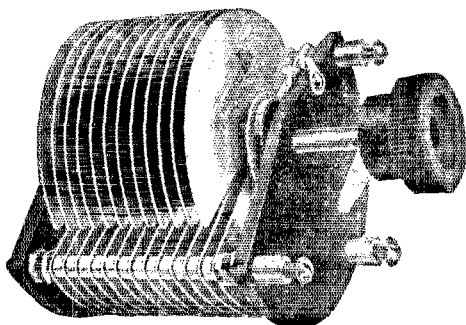
Gen. Radio Detector Panel . . . . .	22.00
Gen. Radio Potentiometer, 400 . . . . .	3.00
U. V. Radiotron 200 . . . . .	4.75
U. V. Radiotron 201 . . . . .	6.25
Chelsea grid leak . . . . .	2.50

We can furnish you anything in CW and phone work. Write us and let us know your wants.

**TeCo RADIO CO.**

P. O. Box 3362

Boston, Mass.



**WANTED--** The Name of  
Every Radio  
Man Who Has  
Had Trouble With His C.W.  
Condenser.

*This One Won't Give  
Trouble.*

**IF YOU ARE NOT ACQUAINTED  
WITH "WIRELESS SHOP" CONDENSERS—LET'S SHAKE.**

We want every amateur who uses a variable condenser to know our product. Our new bulletin showing our entire line of variables will be mailed for the asking. Where shall we send your copy?

We build 14 different sizes of condensers, in three different types, and several special ones to order. The prices range from \$2.00 to \$10.00 for the standard instruments. Can any other manufacturer offer you anything like this in variables?

The NEW WIRELESS SHOP C.W. VARIABLE CONDENSER is designed to be used on CW sets where the plate voltage runs up to from 200 to 1000 or higher. You won't have makeshifts now. Get a condenser which is built especially for your C.W. set. The plates are widely spaced and the construction is rigid. Only the best of materials and workmanship throughout. Fully guaranteed to give satisfaction or your money back.

**PRICES:**

No. 1500 15 plate, approximately 0.0004 mfd. Max. capacity.. \$6.00

No. 2500 25 plate, approximately 0.0006 mfd. max. capacity.. 7.50

No. 3500 35 plate, approximately 0.0008 mfd. max. capacity.. 9.00

Regularly equipped with knob and pointer and mounting screws. A metal dial will be supplied instead of the pointer at 75c extra, or a high grade moulded bakelite knob and dial with graduations filled in white, will be furnished at \$1.00 extra.

Postal charges and insurance must accompany your remittance. Insurance on any CW condenser is only 5c. Isn't it worth it?



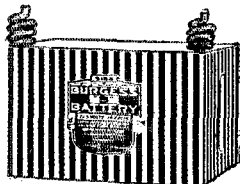
511 West Washington St.,

Los Angeles, Cal.

**LONG LIFE—CLEAR RECEIVING**

are the features of

**BURGESS "B" BATTERIES**



All sizes from the Navy type down to the  
Baby "B." With and without taps

Send for catalogue

**BURGESS BATTERY COMPANY**

Harris Trust Bldg.

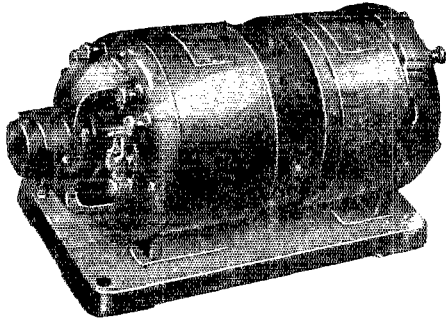
::

::

CHICAGO

# ESCO

**GENERATORS — MOTOR-GENERATORS — DYNAMOTORS**



4 to 32 Volts for Filament.  
350 to 2000 Volts for Plate  
Capacity 20 to 2000 Watts

LIBERAL RATINGS

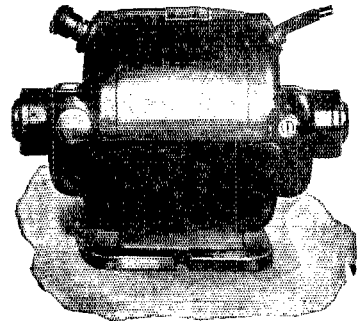
Write for Bulletin #231 Which Lists  
200 Combinations.

Motors and Generators Developed and  
Built for Special Purposes.  
Pioneers in the Manufacture of High  
Voltage Direct Current Radio Generators.

**ELECTRIC SPECIALTY CO.**

215 SOUTH STREET

**STAMFORD, CONN., U. S. A.**



## In Our Large New Store

at 189 Greenwich Street, New York,  
(just below Fulton Street), we hope to  
establish a new kind of radio store, dis-  
tinguished by a friendly spirit of help-  
ful service. We have just moved into  
these new quarters, and as an example  
of this spirit, we have set aside a room  
as a meeting place for amateurs. Visit  
it soon, and enjoy exchanging your  
ideas and experiences with other ama-  
teurs.

Here are a few of our specials:

Back mounted rheostats .....	\$1.20
Front mounted rheostats .....	1.00
Spark gaps .....	1.10
Loose couplers .....	6.00
Unmounted variable condensers:	
43 plate .....	4.10
21 plate .....	3.90
11 plate .....	2.70
Binding posts .....	each, .05
Contact points .....	each, .04

**DREYFUSS SALES CORP.**

189 Greenwich Street,

New York

1/4

H. P. 110 volts,  
A. C. 60 cycle,  
single phase,  
1750 R. P. M.

# MOTORS

**LARGE QUANTITIES NEW WASHING MACHINE MOTORS**

These are of standard manufacture and carry the full factory guarantee  
Shipped in original boxes. Complete as usual. Suitable for operating Coffee  
Grinders, Cream Separators, Bottle Washers, Air Compressors,  
Small Lathes, Etc.

At \$22.00 each or Money order  
We will send C.O.D. sub-  
ject to full examination  
Money Back Guarantee.

**\$22.75**

Each



MANUFACTURERS: DISCOUNTS  
CHAS. H. JOHNSTON - Box 19 W. E. Pittsburgh, Pa.

## BAKELITE PANELS

(BLACK)

Cut the size you want it

1/8" .....	.02	per sq. inch
3/16" .....	.03	" " "
1/4" .....	.04	" " "

Example:—

$$6'' \times 10'' \times \frac{3}{8}'' = 60'' \times .03 = 1.80$$

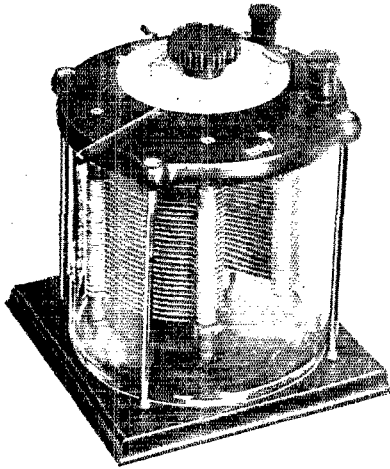
**MICHIGANS LARGEST DEALERS  
IN RADIO SUPPLIES**

**Detroit Electric Co.,** 434 SHELBY ST.  
Detroit, Mich.

# DE FOREST

## Are You Listening to Rome, Lyons, Eiffel Tower, Nauen and Darien on the World's News?

It can be done easily with DeForest Vernier Condensers, because:—  
**FIRST**—Vernier adjustments on tuning condensers are absolutely necessary for receiving maximum continuous wave signals or telephone speech; and DeForest are the only condensers so equipped:  
**SECOND**—High insulation qualities and rugged mechanical construction insure uniformity of plate separation and high dielectric strength, making DeForest condensers especially adaptable for Radiophone and continuous wave transmission; and



**THIRD**—Long life and freedom from "loose play", due to excellence of workmanship and mechanical strength.

DeForest Vernier Condensers, when used in connection with DeForest Duo Lateral Inductance Coils, complete a long wave receiving set which cannot be surpassed for double the money. Made in various sizes; from \$5.25 to \$26.40.

"A Chain is as Strong as its Weakest Link"! Why lower the efficiency of your equipment by using inferior condensers? The slight additional cost of DeForest Vernier Condensers over others of moulded type is insignificant when the gain in efficiency is considered.

**Get Our Catalog at Once**

Contains detailed description of these and many other pieces of DeForest Quality Apparatus.

**DE FOREST RADIO TEL. & TEL. CO.**

*Inventors and Manufacturers  
of High Grade Radio Apparatus.*

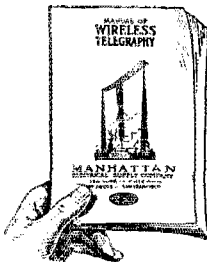
1415 SEDGWICK AVENUE, NEW YORK CITY

Sole Distributors for

Pacific Coast  
Pacific Radio Supplies Co.,  
Henry M. Shaw  
638 Mission St., San Francisco

# DE FOREST

## Get a Copy of Our Wireless Manual H-12



We ask 25 cents for it, give a coupon receipt for the amount which coupon when returned with an order will be credited at 25 cents.

As the edition is limited, if you desire a copy, send the 25 cents and get it now for future reference.

It contains 200 pages, fully illustrating and describing the many instruments used in Radio service. Forty-five pages are devoted to general instructions, diagrams, station calls, tables, codes and other information identified with the art. The book is printed on highly finished paper with a two-color cover; size 9x5 1/4 inches.

With a large and varied supply of wireless instruments and accessories carried in stock, we are in position to fill any order or meet any condition promptly and accurately.

We have experts in charge of our wireless departments, so do not hesitate to consult us about your wireless problems. Proper attention and accurate information is yours for the asking.

**MANHATTAN ELECTRICAL SUPPLY CO., Inc.**

17 Park Place, New York; 114 So. Wells St., Chicago; 1106 Pine St., St. Louis; 604 Mission St., Frisco.

# Puncture Proof Condensers

For C.W. and Radio Telephones.

Few Radio Experimenters realize the importance of a GOOD filter condenser on their C.W. equipment. You know of the QRM caused by the HUM and RIPPLE of your generator or your rectified A.C. A PROPER filter will reduce this QRM to practically nothing. These condensers are designed for this purpose, they will reduce your hum to a minimum, they have a lower power factor loss, they are GUARANTEED not to blow up, they are a decided improvement over the telephone condensers which are commonly used, well worth the additional investment. ENGINEERS designed it, therefore it is the best that can be had. Hundreds in use at the present time, giving results beyond expectations.

Your first cost the only cost; we will replace them or refund your money if they are not satisfactory in every way.

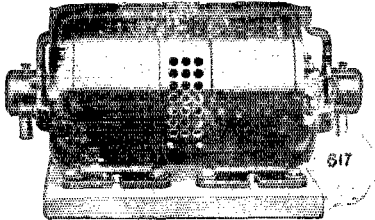
2 MFD. 1000 V. 250 WATTS.....	\$ 5.00
2 MFD. 2500 V. 250 WATTS.....	15.00
2 MFD. 4000 V. 250 WATTS.....	23.00
5 MFD. 1000 V. 500 WATTS.....	10.00
5 MFD. 2500 V. 500 WATTS.....	30.00

Increase the power factor of your SPARK TRANSMITTER by installing a 25 MFD. condenser across your power mains. A new "STUNT" used successfully by a well known "DX" station.

*Write for descriptive circular.*

**RADIOELECTRIC SHOP, Dept. Q. 919 Huron Rd., Cleve., Ohio**

## MOTOR GENERATORS



### ROBBINS AND MYERS CO.

AC or DC—Speed 1750 RPM, 100 Watt, 500 V. Unit 110 V—60 cycle \$67.50. Generator Only \$38.80.

200 Watt 500 V. Unit 110 V.—60 cycle \$81.00

Generator only \$45.00

100 Watt 500 V. Unit 32 V. D.C. supply \$70.00

200 Watt 500 V Unit 32 V. D.C. supply \$84.00

UNIVERSAL SYSTEM  
RECEIVING APPARATUS

Catalog 5c (-stamps)

**NEW ERA RADIO SALES CO.**  
ELMIRA, N. Y.

## Lightning

SWITCHES

100 Amp. 600 V.

S.P.D.T.

**\$3.90**

## AUDIOTRONS

GENUINE

2 FILAMENT

**\$6.00**

PLATE VOLTAGE UNDER 40

*Send for Catalogue "Q 21"*

**DAVID KILLOCH COMPANY**

57 Murray Street

New York City, N. Y.



# Getting Every Word



**T**HAT'S the universal experience of operators who use the Brandes Headsets. The two phones are perfectly matched in tone; they deliver signals so faint that other receivers fail to get them. Stress of weather and other conditions of interference are overcome in a wonderful way by these supremely sensitive and mechanically perfect instruments.

Send 5c for Catalog F.

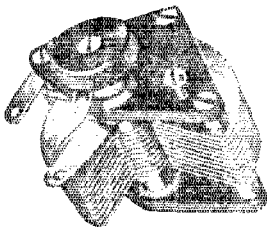
**DEALERS**—Write for Special proposition.

**C. BRANDES, Inc.**

Room 821, 32 Union Square

New York City

## BRANDES Matched Tone HEADSETS



Best results are secured by using correctly designed instruments

### EMPYREAN CONDENSERS

are correct in every detail, mechanically perfect, electrical losses nil. Install them in your set and consistently listen to those long distance stations.

Furnished complete with knob, scale, pointer, mounting screws, stop posts and connecting strips at prices beyond comparison.

43 plate—.001 mf. . . . . \$4.50

21 plate—.0005mf. . . . . \$3.65

Add postage for two pounds.

*Bulletin on request.*

**EMPYREAN RADIO CO.,**

**159 N. State St.,**

**Chicago, Ill.**

# USE 32 VOLT D. C. For Your C. W. PLATE CURRENT HOW ?

A Ray-Di-Co "DYNAMOTOR" makes it possible.

A combination motor and generator within *one frame*. No more *space* required than for a *single unit*. Higher efficiency obtained than from a motor generator of same capacity. Operates on 32 volts, generates 500 volts, compound wound.

TYPE "DY-5" 500 volts 50 watts \$75.00  
 TYPE "DY-7" 500 volts 75 watts 82.50

For greater capacities the Ray-Di-Co "STANDARD" motor generator unit of the following capacities is recommended.

TYPE "SP-10" 500 volts 100 watts \$115.00  
 TYPE "SP-17" 500 volts 175 watts 141.00

MOTOR—32 volts D.C. compound wound.  
 GENERATOR—shunt wound.

All quotations F.O.B. Chicago.

QUOTATIONS FOR SPECIAL MACHINES UPON REQUEST.

## RAY-DI-CO

(Ray-Dee-Ko)

2653D N. Clark St.,

Radio 9AG

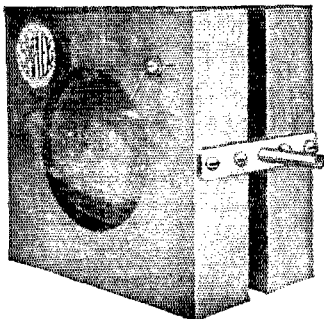
Chicago, Ill.

H. H. BUCKWALTER, 713 LINCOLN ST., DENVER, COLO.

Representative

Colorado, Wyoming, Utah, Nebraska, Western Kansas, Northern New Mexico, Deadwood and Lead, S. Dak.

"Watch for our next announcement—you'll be surprised."



### SIMPLEX VARIOMETER

A high grade instrument within the reach of every Amateur.

Forms are made of thoroughly seasoned wood well finished. Wound with extra heavy cotton covered wire. Bearings are special type with inserted spiral brass springs, making a perfect contact.

Price as illustrated.....\$6.00

Price mounted on formica Panel with 3 inch dial..... 8.50

Simplex Vario-Coupler, Price..... 6.00

Vario-Coupler mounted on formica panel with 3 inch dial and two switches, Price.....10.00

Send for descriptive Bulletin #10.

**SIMPLEX RADIO CO.,**  
 1013-15 Ridge Ave., Phila., Pa.

## Radio Craft Products

Look in the May issue of QST. The instruments advertised are the same stock as those which formerly sold at double the prices we are now asking. There are still a few instruments left and these may be procured at prices that are so low that you must buy if you need an instrument at all. These instruments are of the highest grade material and workmanship.

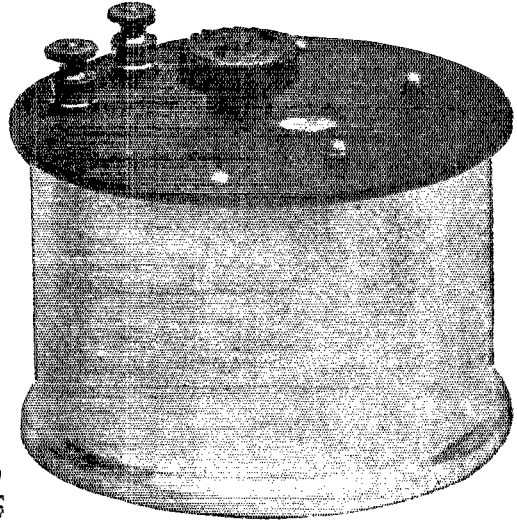
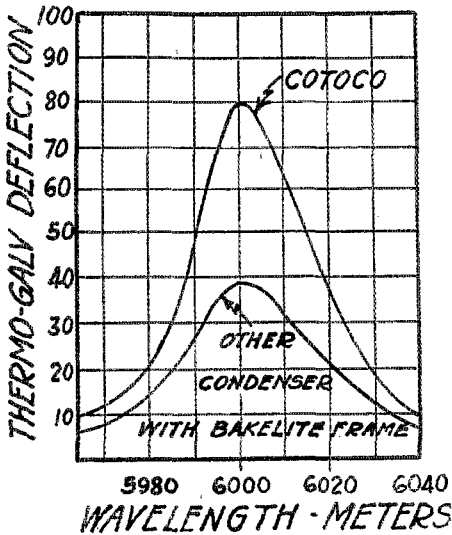
### Price List

Detector Unit .....\$10.00  
 Detector and 2-stage Amplifier...-35.00  
 Detector and 1-stage Amplifier... 22.50  
 Two-stage Amplifier ..... 25.00  
 Short Wave Regenerative Tuner .32.50

## RADIO-CRAFT, Inc.

413 THIRD AVE., BROOKLYN, N. Y.

# WHY?



## WHY

did we start building condensers?  
 should you investigate Cotoco condensers?  
 should you use a Cotoco condenser?

The curves above were made to compare the sharpness of resonance of our condenser with the usual type assembled between bakelite heads. It gives the essential reason WHY this condenser will produce results you want. If this is not sufficient reason, let us send you our descriptive bulletin, which will give you all the details.

Made in three sizes .0005 M.F.—.0007 M.F. and .001 M.F. in case as shown, or unmounted.

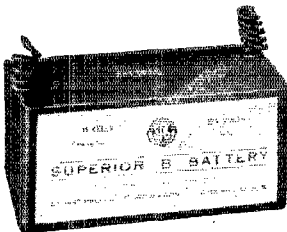
Get on our mailing list NOW

## COTO-COIL CO.

87 WILLARD AVE.,

PROVIDENCE, R. I.

## STUART "77"



Dealers we have an attractive proposition for you.

Business is GOOD on GOOD "B" Batteries—  
 Because GOOD "B" Batteries Make GOOD Business.

Stuart Batteries bring in the signals until the last bit of energy is gone—then you realize that Stuart Batteries give you longer life—more PEP and better service at a reasonable cost.  
 No. 5677.

Small price—Popular size—tremendous PEP.

Size 5" x 3" x 2 1/4". Weight 2 1/4 lbs. Price \$2.25.

Send us the name of your dealer, and receive the latest Bulletin on Radio batteries, postpaid.

## STUART PRODUCTS CORPORATION

663 WEST WASHINGTON BLVD., CHICAGO, ILL.

# BEAT THESE PRICES?

For one month *only* we will deduct 10% off the list price of any piece of CW and Phone Apparatus listed in Catalog CW-2. If you have not a copy of this CW Catalog send 10c for it today. A few of the bargains as follows:

## POWER TUBES

Radiotron 5 Watt.....	\$7.20
Radiotron 50 Watt.....	27.00
Singer 37.5 Watt.....	21.60

## RADIOTRON ACCESSORIES

Bakelite VT Socket.....	1.35
5000 Ohm Variable Leak.....	3.00

## CW CONDENSERS

Wireless Shop .0004 mfd.....	6.00
Wireless Shop .0006 mfd.....	7.50
Wireless Shop .0008 mfd.....	9.00

## ACME CW APPARATUS

50 Watt CW Transformer.....	13.50
200 Watt CW Transformer.....	18.00
50 Watt Filament Heater.....	10.80
150 Watt Filament Heater.....	13.40
Modulation Transformer.....	4.50

## FEDERAL MICROPHONES

260-W Hand Microphone.....	6.30
262-W Panel with bracket.....	4.75
263-W Panel Mounting.....	4.75

## "IDEAL" CW EQUIPMENT

IDEAL 800 Volt Filter.....	\$15.00
IDEAL 1 Henry Double Choke..	7.00
IDEAL 1 Henry Single Choke..	5.00

## MOTOR GENERATORS

500 Volt 100 Watt.....	90.00
500 Volt 200 Watt.....	100.00
1,000 Volt 200 Watt.....	135.00

## Z-NITH EQUIPMENT

Z-Nith Regenerator.....	49.50
Amplifigon Agn-2.....	85.00

## MOORHEAD TUBES

Electron Relay.....	5.40
Amplifier-Oscillator.....	6.30
Rectifier Tube.....	8.00

## EVEREADY B BATTERIES

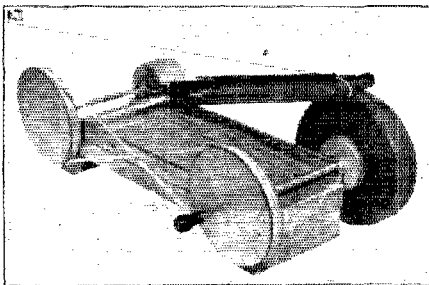
22.5 Volt Small.....	2.00
22.5 Volt Large.....	3.15

## CONDENSERS FIXED

600 Volt 1 Mfd.....	1.15
600 Volt 2 Mfd.....	1.15

**IDEAL APPARATUS CO., 1901 E. Louisiana St., Evansville, Indiana**

## STAND BY



## TEN DOLLARS FOR A REAL COIL WINDER

Guaranteed to wind lattice coils any size up to 2000 turns. Adjustable widths from 1/2 inch to 1 1/2 inch. Order today and wind all the coils you want.

Lambert and Associates, Mfrs.

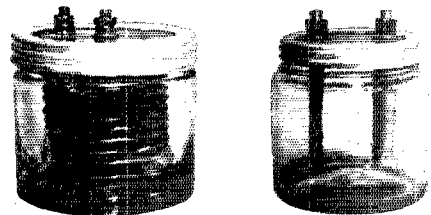
**A. W. HALLBAUER**

DISTRIBUTOR OF

COIL WINDERS AND LATTICE  
VARIOMETERS

1001 N. LOCKWOOD AVE.,  
Chicago, Ill.

## A GOOD Storage "B" Battery



McTighe 22 B-Battery Lead-Aluminum Rectifier  
Patents Pending

The 22 B-Battery is as convenient as a dry battery, does not become open circuited, is small and compact, and is a real storage battery. When run down it can be recharged from the ordinary A.C. lighting circuit with a rectifier and lamp in series. Full directions are included with each battery and rectifier.

Complete set of parts except jars, (which may be replaced by large jelly glasses) with complete instructions for building your own battery and rectifier also furnished.

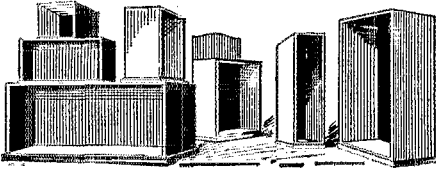
McTIGHE 22 BATTERY, 22 Volts.....	\$5.00
McTIGHE RECTIFIER.....	\$2.00
SET OF PARTS.....	\$3.50

Postpaid

**McTighe Battery Company**

WILKINSBURG, PA.

## Crosley Cabinets



The tendency in the radio field today is to put apparatus in cabinets not only for appearance's sake, but as a protection from dust, dirt, atmospheric conditions, etc. Realizing the demand for attractive stock cabinets of various sizes, we are building them in quantities in our large wood working plant. These cabinets are all uniform in style. The panels are rabbeted in to the front. As the outside dimensions and inside dimensions are either larger or smaller than the panel itself, we show panel size and also inside dimensions. Prices quoted do not include the panels.

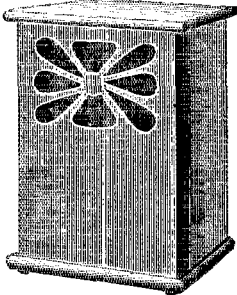
All cabinets are waxed antique mahogany finish. Wood used is either gum, genuine solid mahogany or quartered oak. Lids or tops are hinged. Sizes and prices are shown below:

### CABINETS

For Panel Size	Inside Dimensions			Mahogany or Quartered	
	High	Wide	Deep	Gum	Oak
6x7	5½"	6½"	7"	\$2.50	\$3.85
6x10½	5½"	10"	7"	2.75	4.40
6x14	5½"	13½"	7"	3.30	5.55
6x21	5½"	20½"	7"	3.90	7.30
9x14	8½"	13½"	10"	3.70	6.80
12x14	11½"	13½"	10"	4.40	6.80
12x21	11½"	20½"	10"	5.25	10.60

Cash must accompany order. No C.O.D.'s. We pay transportation charges.

We can furnish genuine formica panels ¼" thick, cut to the following dimensions: 6x7: 6x10½: 7x9: 6x14: 7x12: 6x21: 7x18: 9x14: 12x14: 14x18: 18x21. Price of panels—2½c. per square inch. For odd sizes order the next largest size; we will trim. We pay postage.



### CROSLEY MAGFON

No radio station complete without it. Built in horn; amplifies signals, voice, or music, making head phones unnecessary except on weak signals. Uses one watch case receiver, any make; simply insert it in back of cabinet. Beautiful antique mahogany finish. Price \$10.00.

Dealers wanted. **MANUFACTURERS OF RADIO APPARATUS**—send us samples or drawings of your cabinets for quantities prices.

Get your name on our mailing list to receive latest bulletins of our latest radio specialties.

**CROSLEY MANUFACTURING CO.**  
Dept. "Q" CINCINNATI, OHIO.

### RADIO CONSTRUCTION CO.

Manufacturers of all kinds of Wireless Telephone and Telegraph apparatus. Panel drilling and engraving a specialty. Binding Posts, stops, switch points, nuts and screws of all sizes.

42 Maverick Square  
Winthrop Block East Boston, Mass.

# FORMICA

## Sheets, Rods, Tubes

Made From Anhydrous Redmanol Resins

Insist on getting the best insulating material in your equipment and apparatus.

FORMICA is approved by the Bureau of Engineering, U. S. Navy, and is used by the leading manufacturers of radio apparatus.

**Highest Insulation Resistance**  
**Lowest Power Losses**  
**Splendid Appearance**  
**Excellent Machining Qualities**

The following dealers can supply you with FORMICA sheets, tubes and rods.

Manhattan Electrical Supply Co.,  
17 Park Place, New York, N. Y.

Clapp-Eastham Company,  
139 Main St., Cambridge, Massachusetts.

The Radio Electric Company  
3807 Fifth Ave., Pittsburgh, Pa.

Pennsylvania Wireless Mfg. Co.,  
507 Florence Ave., New Castle, Pa.

Radioelectric Company,  
919 Huron Road, Cleveland, Ohio.

The Wireless Manufacturing Co.,  
Canton, Ohio

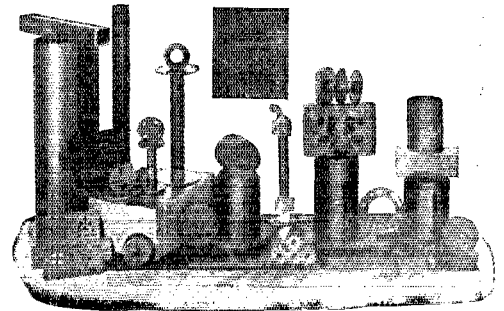
The Precision Equipment Co.,  
2437 Gilbert Ave., Cincinnati, Ohio

Detroit Electric Company  
434 Shelby Street, Detroit, Michigan

The Wireless Shop,  
511 West Washington St.,  
Los Angeles, California

Leo J. Meyberg Company,  
428 Market St., San Francisco, Cal.

**The Formica Insulation Co.**  
CINCINNATI, OHIO



# CLASSIFIED ADVERTISEMENTS

Five cents per word per insertion, in advance. Name and address must be counted. Copy must be received by the 10th of month for succeeding month's issue.

**LOG BOOKS AND POSTAL CARDS.** Tell the other fellow how and when you heard him. Your name and call on 100 postals giving information about signals heard and your own equipment, dollar fifty. Eighty page Log Book, special pages abbreviations, calls, other information, postpaid, dollar. Call and name printed on book cover free if order both. Commercial Press, Everett, Washington.

**AN EXCLUSIVE FEATURE OF THE Remler socket** is the elimination of the usual metal shell which so often causes ground hum and other noises encountered in the operation of amplifiers. All bakelite with four nickeled binding posts. Neatest socket out, \$1.50. C. Stuart Johnson, Oakland, Nebr. Service first; quality always.

**FOR SALE:** Regenerative receiver, CR-1 style, beautifully made, brand new, fifty dollars and express. A. P. Southworth, Chestnut Street, Wakefield, Mass.

**FOR SALE:** Fully mounted 1/2 KW Acme transformer. Acme oil immersed condenser .007 mfd 10,000 volts. Grebe CR-3 Instruments perfect condition, used very little—same as new equipment. F. E. Cannings, 5254 a Page, St. Louis, Mo.

**WILL SELL:** New rebe CR-3 \$50.00 F.O.B. Atlanta, also Acme amplifying transformer \$4.00. Richard H. McMillan, 149 E 3rd St., Atlanta, Ga.

**FOR SALE:** Marconi transmitting tube \$6.50; Radiotron \$4.00; Variable condenser .001 M.F. panel, \$3.00; Grid leak resistance \$1.50; Clarence Kelley, 374 Beach St., Saco Maine.

**EXCHANGE:** Fairbanks Morse 115V, 10A. D.C. Generator for Paragon short wave receiver or Honey Comb coils. George Hancock, Fairfield, Nebraska.

**MAGNAVOXES** carried in stock. New 45, type at \$36.50 postpaid. Cash must accompany order. Carl Furnberg, Fargo, N. Dak. R. #1 to Osgood.

**ALKALINE STORAGE "B" BATTERIES** equipped with rectifiers and single cell control switches. Thirty two volts \$8; Fifty volts \$10; Seventy volts \$12. Pictures and further information upon request. Get estimates on unmounted cells. Kimley Electric Mfg. Co., Buffalo, N. Y.

**FOR SALE:** 14 Electrose 4" Insulators, \$2.50; 4 Turnbuckles, \$1.50; 450 feet No. 14 Antenna Wire, \$3; Italian Marble Panel with Switches, 14"x30" and large assortment of accessories at your price, plus parcel post or express charges. Henry Eberlein, 95 Sanderson St., Greenfield, Mass.

**BARGAIN:** 2BH's fone set with high voltage batteries. Ten mile range. Will trade for snake or crocodile; must be non-poisonous. H. Muller's Museum, 2900 8th Ave., N. Y. C.

**FOR SALE:** 2 1/2 KW Thordarson Transformer and Shramco Oscillation Transformer. Geo Swayze, Danville, Penna.

**FOR SALE:** Acme 500 nearly new, \$15.00; large oil condenser \$14.00, non-synchronous rotary gap \$16.00; large oscillation transformer \$7.00; 2 W.E. Vt-2's \$12.00 each; W.E. Vt-1, \$10.00; Honeycombs, L-500, \$1.50; L-750, \$1.75; L-1250, \$2.25; 2 L-1500's, \$2.75 each. Trade for or buy General Radio 143 wave meter, 1 KW resonant transformer, synchronous motor. Willard McCulla, Waukegan, Ill.

**WANTED:** Experienced amateur operators east of Chicago having or who can rig up for long wave up to 4000 meter receiving apparatus with 2 stage audio-frequency-amplifier, vacuum tube detector, 2 storage batteries A & B. Address G. F. Von Kummer, 116 Nassau St., New York.

**AUTO MOTOR SUPPLIES:** Buick—Michigan—Stoddard-Dayton—E. M. F.—Cadillac—Overland—Continental and Buda Motors. All types, \$50.00 each and up. New Dixie Magnetos \$20.00. Splittdorf High Tension Magnetos \$10.00. Kellogg Pumps \$3.50. Auto-Lite generators, new \$10.00. Air gauges \$0.65. Remy Ignition Coils, new \$3.00. Electric and gas headlamps, coils, distributor heads, air compressors, etc. Write for catalog. Motor Sales Dept. 19, West End, Pittsburgh, Pa.

**GENERATORS** 10, 450 Volt 1-10 K.W. Westinghouse externally excited generators. New \$20.00 each. Money back guarantee. Frank Creswell, 920 West 55th St., Los Angeles, Cal.

**FOR SALE:** The record breaking receiving set, 3300 miles, used by 2KF, as illustrated in March issue Radio News, consisting of detector and 3 stage amplifier. Hardwood Cabinet. Bakelite panel. This outfit is a beauty and a bear for long distance. Perfect working condition is guaranteed. Tunes from 175 to 800 meters sharp. Will take \$110.00 cash, or send \$40.00, balance C. O. D. Selling because of installing radio-audio set. H. D. Seivage, 45 Durand Place, Irvington, N. J.

**FOR SALE:** Cabinet, bakelite panel, and complete parts for a partly assembled CW set, with high voltage generator \$25. Clapp-Eastham Navy loose-coupler \$8. Electron Relay detector tubes \$3 each. Information upon request. Hubert E. DeBen, 1044 City Park Ave., New Orleans, La.

**RADIO PHONISTS ATTENTION:** High voltage generators. We supply motor generator units in various capacities especially designed for radio phone work. Low powered rotary converters, dynamotors, fractional H. P. motors, storage batteries. Various types of meters, condensers, spark gap rotors. The new SYNCHRONOUS SPARK GAP. Get acquainted with our SERVICE. RAY-DI-CO., 2653D, N. Clark St., Chicago, Ill.

**FOR SALE:** New 650 M. Regenerative set, \$25.00; 6000 M. Navy Coupler, \$15.00; 2-inch spark transmitter complete, \$20.00. List. Lester F. Wertz, Temple, Penna.

**FOR SALE:** 1 \$85.00 short wave regenerative set. Brand new \$40.00 or will swap for 2 step amplifier. O. J. Spetter Box 865 Clovis, N. M.

**FOR SALE:** Unmounted Choke Coils for CW sets approximately 1 Henry well made wound with silk insulated wire price \$3. H. T. Cottrell, 1214 Allen, Owensboro, Ky.

**FOR SALE:** 0-10Amp. Clapp-Eastham H.W.A. \$8. 50 Watt 350 Volt Generator \$20.00; .017x1 3/4" copper ribbon 8 cents per foot, Grebe CR-1 receiver \$70; 1/2 K.W. 900 cycle transformer \$10, burned out W.E. VT-1 \$1; Marconi class 11 50 cents. Thomas A. Reid, 1219 N. Limestone St., Springfield, Ohio.

**5000 VOLT** 0.32 mfd. mica Condensers, \$1.00; W.E. 47A Plugs, \$0.50; Jacks, three terminal, \$0.45; Seven terminal, \$0.75, with plugs \$1.10; 3" bakelite on 6" bakelite impregnated tubing, \$0.60 per foot. \$60.00 Galvanometer relays for radio work, \$25.00. Western Instrument Repair, 314 N. Fairfield, Chicago, Ill.

**HAVE YOU HEARD** the clear, powerful, musical note of the harmonic disc? Gives three notes at once which blend into a chord. Tests have proven that the note produced is far superior in carrying power to the note produced by the ordinary disc. Very simple to construct. Be first in your town to own one. Blue print and complete instructions sent promptly upon receipt of \$2.00. Earl Lester, Box 111, Houston, Texas.

**OUR HIGH VOLTAGE SIGNS**, aid the attractiveness and keep off inquisitive fingers, 15c. Service first; quality always. C. Stuart Johnson, Oakland, Nebr.

**RADIO SPARK STATIONS ATTENTION:** Equip your transmitter with a HYRAD SYNCHRONOUS GAP and GET THAT PEAK! Features of the HYRAD are GEAR ADJUSTMENT, BALANCED DISC, accurate adjustment of stationary electrodes to within .003 inch of rotor and rocker arm rotated without hitting. Work through SUMMER STATIC, you can do it with "Z-NITH" RADIO EQUIPMENT. Get acquainted with our SERVICE. SUPRENUM RADIO LABORATORY, Box 61, West Norwood, New Jersey.

**SYNCHRONOUS GAP MOTORS** 1/2 H.P. 1800 R.P.M. \$35. Guaranteed satisfaction. Sent C.O.D. upon receipt of 1-3 of price. R. M. Carson, Colfax Ave., Springdale, Pa. Dealer. Rdo. 8RQ.

**BARGAINS:** Short wave regenerative receiver \$10.00, detector panel, \$5.00, photos on request. Lynn Matthias, Antigo, Wis.

**FOR SALE:** Five dial omnigraph with buzzer attached \$15.00; home made rotary gap, suitable for 1/2 K.W. 2 moving points. G. E. induction motor 3600 R.P.M. \$10.00. Both in A-1 condition. W. D. Olson 330 S 15th St, Corvallis, Ore.

**ARLINGTON TRESCO.** \$8.50; 1 1/2" Coil, \$5.00; three inch \$12.50; Knapp dynamo \$3.50; five honeycombs. Send stamp. Address 1QQ.

**SPECIAL GARAGE MOTORS:** Manufactured by the General Electric Co. 1 H.P. \$78.50—2 H.P. \$110.00—3 H.P. \$128.50—5 H.P. \$166.50. All sizes both single and Polyphase Motors for immediate delivery. Special charging generators all voltages. Write for catalog. Motor Sales Dept. 19, West End, Pittsburgh, Pa.

**UNMOUNTED LONG DISTANCE RECEIVING INDUCTANCES.** These are duo lateral wound coils, each tapped at five points. Two coils with a tickler make an unbeatable receiving combination. Range 2500 to 25000 meters, Arlington to Lafayette. Prices Primary and Secondary Coils \$3.50 each. Tickler Coil \$2.00. Send \$9.00 for the three coils and diagram, and made a guaranteed receiving set. P. J. Stockwell, Reading, Mass.

**AERIAL WIRE.** 16 strands #28 pure copper braided. Surplus from Gov't contract intended for airplane use. \$1.00 per coil containing 200 feet. Shipping weight 3 lbs. per coil. Postage extra. Cash with order. Address Amrad, 205 College Avenue, Medford Hillside, Mass.

**FOR SALE:** Several rewound generators for C.W. work. Good as new. Give 400 to 500 at 1750 R.P.M. Price \$15.00. Abt 10 lbs. #14 D.C.C. at \$0.80; also some #16 D.C.C. \$0.90 lb. and #18 D.C.C. at \$1.00 1/2 H.P. 25 cycle motor \$15.00. Amrad Quenched Gap, new, sells for \$14.50. H. F. Witzler, Perrysburg, O.

**VARIOCOUPERS,** wound on bakelite tubes, \$5.25, variometers, inside windings, \$4.25, complete for panel mounting, also carry all parts for above units, Magnet wire, DCC #24, 1/4 lb. \$0.40, #26 DCC, \$0.50, 1/2 lb. other sizes in proportion. Meade Bakelite and Radio Apparatus, 522 Central Ave., Brooklyn, N. Y.

**SELL:** Paragon RA6 \$35, CRL type AM2 two step \$35, RACO Navy coupler \$12, RJ4 DeForest audion cabinet \$6, 43 plate variable \$3.50, Century buzzer \$1.50, coupler \$6, aerial switch \$1, crystal detector \$1, Model X Vibroplex \$12, Brand new audiotron unused \$4.50, also Marconi (United) aerial switch, few crystal detectors, DPDT porcelain switches, ten inch electrose insulators, etc. cheap. Satisfaction or refund. 92L.

**WANTED** A 1 K.W. 500 cycle transformer. Endly Box 356, Mansfield, O.

**ROTORS** turned. Any size under 3 inches diameter 50c. Over 3 inches 75c. H. Riggs, Hightstown, N. J.

**FOR SALE:** Complete 1 K.W. United Wireless spark transmitter, generator for charging batteries—cheap—Roland Palmer, 470 East Buchtel Avenue, Akron, Ohio.

**FOR SALE:** Doolittle Amplifone \$12. Used about two weeks. Reason for selling—have large loud speaker. S. W. Brown, Mechanicville, N. Y.

**SELL:** 1/2 K.W. Amrad Gap, new, \$17.00; 1/2 K.W. Thordarson, bargain \$15.00; Kermel 0-5 Ammeter \$6.00; Improved Penn "C" Regenerator \$30.00. Radio SASH, 642 Upson St., Akron, Ohio.

**SELL:** 1/2 Acme, \$22; condenser, \$11; Gap \$10; O. T. \$7. 1DAV.

**BARGAINS** in new and used Navy radio material, commercial and good home made radio apparatus. List for dime including leyden jars, relays, synchronous 1/2 K.W. rotary \$25.00; quenched gaps \$3.00; \$45.00 A.C. voltmeter \$18.00; A.C. ammeter \$13.00; standard switchboard size, transformers, antenna transfer switch, long wave titz variometer, 2-step jack and plug type amplifier \$33.00; telefunken spark coils 32V. Radio 1FBV, Box 426 Woods Hole, Mass.

**RADIO Variocoupler** \$7.50, Variometers \$6.50 (includes dials) Vario sets for low-wave \$20. (3 Varios) Amplifying transformer \$4.25. Bakelite panels 1/2" thick 2c square inch. Charlotte, N. C.

**STAGGERWOUND PANCAKE COILS** guaranteed to give greater signal strength and selectivity than your present receiver. Mountable on panel or switchboard. set of 3 coils 200 meters \$7.00, 600 meters \$7.50. 1 KW O.T. \$9.00. Loops \$4.00. West Phila. Radio Co., 4054 Chestnut St., Philadelphia, Pa.

**FOR SALE:** New DeForest RS-100 Jewelers time receiver with coil. Carter Moore, 3029 Penn Ave., Dallas, Texas.

**FOR SALE:** Short wave regenerative and audion control combined, \$25; 1/2" coil transmitter panel, \$6.50. Rodney Roach, 41 Janvrin Ave., Bronxville, N. Y.

**RADIO CABINETS** Mahogany or oak finished or unfinished, to your design. Send rough sketch for quotation. Prompt service. Formica cut to size. Radio supplies, parts, etc. Pacific Radio Exchange, Dept 2, 439 Call Bldg., San Francisco, Calif.

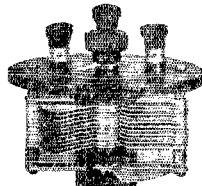
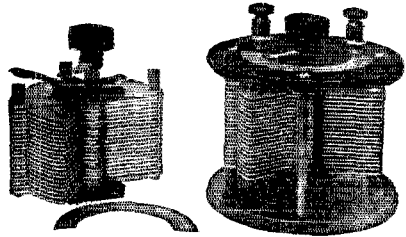
**SELL:** Set 10 unmounted duolateral coils (leads and spade tips attached) one each, numbers 25 to 400. Cost \$14; sell \$8. Chas. Jacobs, Metuchen, N. J.

## THE "ILLINOIS" VARIABLE CONDENSER

The Condenser with "Star Spring" Tension

MADE RIGHT - STAYS RIGHT

Hard Rolled Aluminum Plates



Style No. 1	No. 2	No. 3
67 Plates, \$7.00	\$8.00	\$8.50
43 Plates, 3.50	4.50	4.75
23 Plates, 2.75	3.75	4.00
13 Plates, 2.25	3.25	3.50

Money back if not satisfied. Just return condenser within 10 days by insured Parcel Post.

### VERNIER

Three Styles; No. 1, Panel; No. 2, Open Type as shown; No. 3, Fully Encased. Anti Profiteer. Less than pre-war prices. Fully assembled and tested. With Style No. 1, we will, if desired, furnish 3 inch metal Dial with large knob, instead of Scale and Pointer. Extra Price 75 cents. Or we will send Condenser with smooth 1/8" center shaft, without Scale Knob and Pointer, at 15 cents off list, for those who prefer to furnish their own dial. Vernier with single movable plate applied to 13, 23, and 43, plate Condensers, \$3.00 extra.

Sent Prepaid on Receipt of Price.

Except: Pacific States, Alaska, Hawaii, Philippines and Canal Zone, add 10c. Canada add 25c.

**G. F. JOHNSON, 625 Black Ave., Springfield, Ill.**

**EXCHANGE OR SELL:** Have brand new Oliver Type-writer, DeForest Honeycomb Coils, 3-Coil Mounting on base, 1/2 K.W. Packard, Murdock O.T., 2 United Wireless Copper Plated Jars, Rotary Gap, Audiotron Detector One-Step Cabinet. Want Grebe CR-3 or Paragon RA-10. Radio 2NZ, 151 Main St., Totten-ville, Staten Is., N. Y.

**GREBE RENGENERATIVE CR-2, \$35.00, 500-700 volt generator \$30.00, Radiotron Detector \$3.50, Murdock Antenna Switch \$2.00. A. Hengelbrok, 922 Washington, Newport, Ky.**

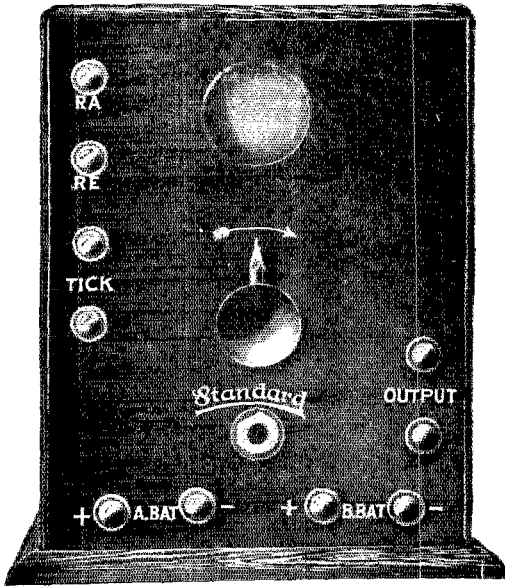
**WANTED:** 1 Kilowatt United Wireless or type R Thordarson transformer. O. M. Selph, Box 48, Rio Vista, Va.

**FOR SALE:** Receiving set 4A1. Regenerative short wave \$30; Detector cabinet \$18.00; 2-stage Amplifier with Federal transformers shielded \$30.00; All mahogany finish, fine work—Highest type DX work with this set.

**FOR SALE:** 1-5 H.P. 110-60 cy—1750 R.P.M. induction motor \$16.00; 1-6 H.P. 110 D.C. motor, 2500 R.P.M. \$11; Stamp collection catalog value \$220 trade for 1/2 to 1 K.W. Spark Set or CRL Paragon and Amplifier. No Junk wanted. All communications answered. SAKK, 1319 North St., Rochester, N. Y.

**FOR SALE:** 1 Cresco Regenerative 170-800, \$28.00 1 Cresco Audion Control Set, \$12.50. 6FK, 920 West 55th St., Los Angeles, Cal.

**"STANDARD"**  
wired and unwired  
Radio Instruments



This detector control cabinet is beyond question the finest ever offered radio experimenters. It is of the same high standard as other instruments of our make which contain materials and parts so costly that this grade of apparatus has heretofore been available for government and commercial stations exclusively.

General Radio socket with reconstructed Paragon rheostat, and our own special knob and pointer, with non-removable head binding posts, mounted on a handsomely engraved grained Formica panel, make this the neatest appearing and most efficient VT control on the market.

This instrument is supplied wired and unwired, in cabinet or for table mounting. The same instrument is also supplied in a second grade style known as type "B." Type "B" instruments are the same in external appearance. Units of lower cost are used in the assembly.

Write for detailed information regarding type "A" and "B" Regenerative Receivers, Amplifiers, Long Wave Receivers, Radio Telephone Transmitters and other instruments of our assembly. Literature sent anywhere on receipt of stamp.

VT CONTROL NO. 3. WIRED	
Class "A" with cabinet.....	\$17.50
Class "A" without cabinet.....	14.50
Class "B" with cabinet.....	15.00
Class "B" without cabinet.....	12.00
UNWIRED	
Class "A".....	\$12.00
Class "B".....	9.00
Cabinet.....	3.00
SIZE	
Panel 6½"x5"	Cabinet 7"x6"x7"

**STANDARD ASSEMBLING CO.**  
19 Bridge St., New York City

**Eventually, A Phone Set !**

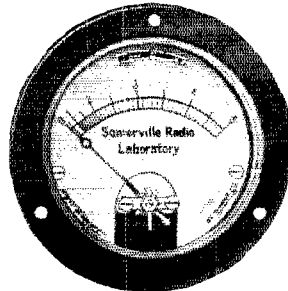
IF YOU wish us to make yours to specifications, begin saving your dollars now. And write us about it. IF YOU prefer to build your own apparatus, begin buying the parts now. **Our** prices have reached the new lower level.

Our new catalogue and treatise on **PRACTICAL CW and PHONE SETS** will be ready for mailing about July First.

Edition Limited Order now! **20c Postpaid**

Value **JUNE BULLETIN** Service

**TYPE J, D. C. AMMETERS**  
0-50, 0-100, 0-300, 0-500, and 0-1500 milliamps. 0½ and 0-3 amperes, for VT filaments. Price \$6.00.



(Also Type JX and JT)

ARE GUARANTEED

NOTE: No one has yet expressed dissatisfaction -- However we will make replacement if any meters should prove defective, and will repair at cost any damaged or burnt out meters.

Watch for our new thermo couple radio frequency amplifier.

**NEW TYPE JX VOLTMETER \$8.00**  
A.C. magnetic vane, jewel bearings, 3¼" Dia.

Radio Corporation recommends A.C. in filaments of power tubes, with critical voltage control. Don't buy an expensive storage battery,—use our meter and an Acme filament heating transformer.

Acme 75 watt Mounted.....\$12.00  
Acme 150 watt Mounted.....\$16.00

**MOTOR GENERATORS REDUCED**

15%

Let us quote you on any desired size.

H-C COIL ADAPTOR 65c.

Bakelite insulation. Adjustable arms.

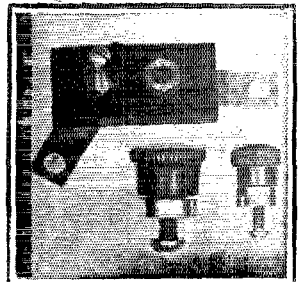
We carry Coto-Coils in stock.

All Sizes, 50c to \$2.50

Insulated Binding Posts

Medium—12c. Doz. \$1.25

Large—16c. Doz. \$1.65



**SOMERVILLE RADIO LAB.**  
102 Heath Street, Winter Hill, 45, Mass.



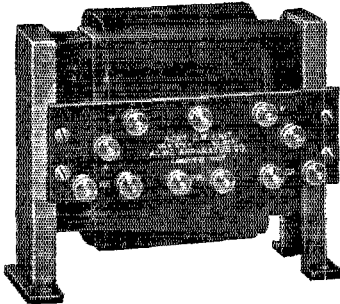
—FOR YOUR CONVENIENCE—

# QST'S INDEX OF ADVERTISERS IN THIS ISSUE

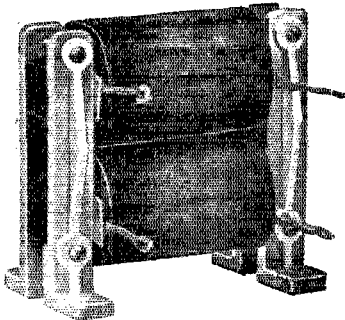
A.R.R.L. National Convention.....	93	Manhattan Elec'l Supply Co., Inc.....	109
Acme Apparatus Co.....	120	Marshall-Gerken Co., The.....	72
Ajax Electric Co.....	86	Massachusetts Radio & Tel. School.....	78
All-American Elec'l Mfrs.....	60	McTighe Battery Co.....	114
American Electric & Wireless Supply Co.....	90	Midwest Radio Co.....	96
American Electro Technical Appliance Co.....	70	Murdock Co., Wm. J.....	75
American Radio & Research Corpn.....	Fourth Cover	Mutual Purchasers Assn.....	102
American Radio Sales & Service Co.....	72		
Andrea, F. A. D.....	62	New Era Radio Sales Co.....	110
Atlantic Radio Co.....	Second Cover	New York Wireless Institute.....	92
Atlantic Radio Supplies Co.....	83	Newman-Stern Co.....	88
Audiotron Mfg. Co.....	84	Novo Mfg. Co.....	92
Benwood Co., The.....	76	Pacent Electric Co., Inc.....	2
Brandes, C., Inc.....	111	Pacific Radio Supplies Co.....	33
Bunnell & Co., J. H.....	80	Paquin Mfg. Co.....	92
Burgess Battery Co.....	107	Parkin Mfg Co.....	102
Burgess Electric Co.....	102	Penn Radio Apparatus Co.....	86
		Philadelphia School of Wireless Tel.....	68-69
California Elec. Supply Co.....	104	Pitts Co., F. D.....	79
Central Electric & Lock Co.....	74	Pioneer Elec. Co.....	98
Chelsea Radio Co.....	80	Precision Equipment Co., The.....	104
Chicago Radio Apparatus Co.....	97		
Chicago Radio Laboratory.....	105	Quaker Light Supply Co.....	78
Cino Radio Mfg. Co.....	98		
Clapp-Eastham Co.....	78	Radio Construction Co.....	115
Colebrook-Hamilton Battery Co.....	100	Radio Corporation of America.....	77
Connecticut Tel. & Elec. Co.....	100	Radio-Craft Co., Inc.....	112
Continental Radio & Elec. Corpn.....	Third Cover	Radio Distributing Co.....	1
Corwin & Co., A. H.....	63	Radio Electric Co.....	88
Coto-Coil Co.....	113	Radio Equipment Co., Boston.....	73
Crosley Mfg. Co.....	115	Radio Institute of America.....	91
		Radiolectric Shop.....	110
DeForest Radio Tel. & Tel. Co.....	109	Radio Specialty Co., New Btm. Ct.....	66
Detroit Electric Co.....	108	Radio Specialty Co., N. Y. C.....	99
Detroit Radio Laboratories, Inc.....	100	Radio Supply & Mfg Co.....	86
Doolittle, F. M.....	96	Radio Testing Station.....	105
Doubleday-Hill Electric Co.....	86	Ray-Di-Co.....	112
Dreyfuss Sales Corp.....	108	Remier Radio Mfg. Co.....	85
		Rhamstine, J. Thos.....	88
Eastern Radio Institute.....	81	Rose Radio Supply.....	102
Eastern V.T. Laboratories.....	64		
Eby Mfg. Co., The H. H.....	58	Saginaw Radio Elec. Co.....	62
Electric Machine Co.....	94	Ship Owners Radio Service, Inc.....	82
Electric Specialty Co.....	108	Shotton Radio Mfg. Co., The.....	59
Electrical Specialty Co.....	70	Simplex Radio Co.....	112
Empyrean Radio Co.....	111	Somerville Radio Laboratory.....	118
Experimenter's Information Service.....	103	Standard Assembling Co.....	113
		Stuart Products Corp.....	113
Federal Tel. & Tel. Co.....	64		
Firth & Co., John.....	61	T & H Radio Co.....	106
Formica Insulation Co.....	115	TeCo Radio Co.....	106
France Mfg. Co., The.....	104	Taylor Co., The.....	100
		The Radio Shop.....	95
General Radio Co.....	80	Thordarson Elec. Mfg. Co.....	67
Grebe & Co., A. H.....	87	Tresco.....	92
		Tuska Co., The C. D.....	76
Hallbauer, A. W.....	114		
Ideal Apparatus Co.....	114	Vimy Supply Co., The.....	80
J-Ray Mfg. Co.....	101	Westinghouse Elec. & Mfg. Co.....	65
Johnston, Charles H.....	108	Western Radio Electric Co.....	53
Johnson, G. F.....	117	Weston Elec'l Instrument Co.....	90
		Whitall Electric Co.....	89
Kariowa Radio Corpn., The.....	71	Wilcox Laboratories, Inc., The.....	66
Kelly & Phillips.....	60	Wireless Improvement Co.....	94
Kennedy Co., The Colin B.....	32	Wireless Press, Inc.....	96
Keystone Wire Co.....	106	Wireless Mfg. Co.....	74
Killoch Co., David.....	110	Wireless Shop, The.....	107
Klaus Radio Co.....	98		

ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS

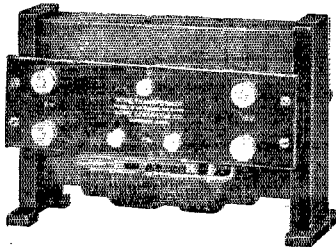
# ACME APPARATUS



**C.W. Power Transformer**



**1 1/2 Henry Choke Coil**



**Filament Heating Transformer**

*The Apparatus with a Guarantee.*

## *C. W. Power Transformers*

For use with rectifying devices or for A.C. directly on the plates of power tubes.

### Specifications 110 Volts 60 Cycles

Output	Filament voltage	Filament current	Plate voltage	Plate current
50	10	2.5	350	100
Two filament windings				
200	12	5	250-550	200
Two filament windings				
500	0	0	1000-1500	400
No filament windings				
600	12	13	1000-1500	400
One filament winding				

## *1 1-2 Henry Choke Coils*

For use in ironing out pulsations and for modulating single and double 150 MA capacity.

## *Filament Heating Transformers*

allow the use of A.C. for power tube filament heating

### Specifications 110 Volts 60 Cycles

Output	Secondary voltage	Secondary current
75	8-10	7
150	10-12	13
300	10-12	26

## *Modulation Transformers*

give maximum modulation without distortion.

*Your Dealer will be Glad to Show These. Ask for Bulletins.*

## THE ACME APPARATUS COMPANY

194 MASSACHUSETTS AVENUE, CAMBRIDGE 39, MASS.

*Transformer and Radio Engineers and Manufacturers*

# PARAGON R.A.T.E.N

*Protection Against Regrets Absolutely Guaranteed by Originator's Name*



*Do You Spend over \$50.00  
a Year for Radio?*

**T**HEN YOU CAN AFFORD A PARAGON. Altho' the original price is Eighty-Five Dollars, the iron-clad guarantee protects you from any up-keep expense for *two full years*.

Combine your radio investment for the next two years *now*, and invest in a Paragon. In no other way can you get such genuine pleasure, such remarkable results from an equal amount of money. For, every cent you pay for a Paragon represents high quality materials and workmanship. The unequalled design,—the secret of Paragon's marvelous selectivity and amplification,—doesn't add a cent to the cost over what you would pay for inferior engineering principles.

In last month's advertisement, we printed unsolicited letters from three operators, (including a Y.M.C.A. Radio School), all of whom had made actual tests and comparisons. In each case, the Paragon "fulfilled every advertised superiority." Certainly, it pays to buy the best. Order your Paragon or send for Free descriptive booklet, *today*.

**CONTINENTAL  
RADIO *and* ELECTRIC CORPORATION**

J. DiBlasi  
Sec.

Dep't B25, 6 Warren St., New York

J. Stantley  
Treas.

*Our word of honor to you is our guarantee. Let us prove it!*



*The Recognized Symbol of Superior Performance*

## **Amrad Wavemeter, Type E**

(3 Instruments in 1)

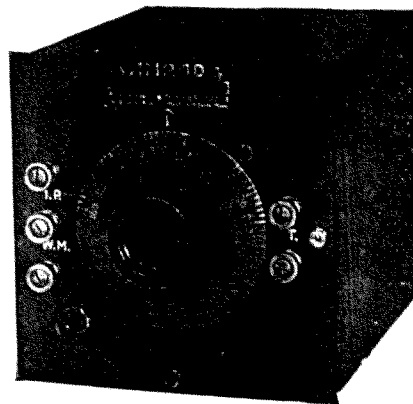
**Wavemeter:** An accurate, direct reading instrument to determine wavelength of any oscillating circuit between 175-340 meters.

**Variometer:** Has range of inductance from 3-15 mh. Makes ideal antenna circuit variometer for CW sets up to 20 watts capacity, on account of its high current capacity.

**Interference Preventer:** Overcomes interference from local high-power stations. Will at the same time measure the wavelengths of all short wave stations heard. As an interference preventer alone, the instrument is worth more than its cost.

For more detailed description write for bulletin W-2.

*Complete Catalog 10c.*



Wavemeter  
Variometer  
Interference  
Preventer

Price - - \$13.50

175-340 Meters

AMERICAN RADIO AND RESEARCH CORPORATION

205 College Avenue

Medford Hillside, Massachusetts