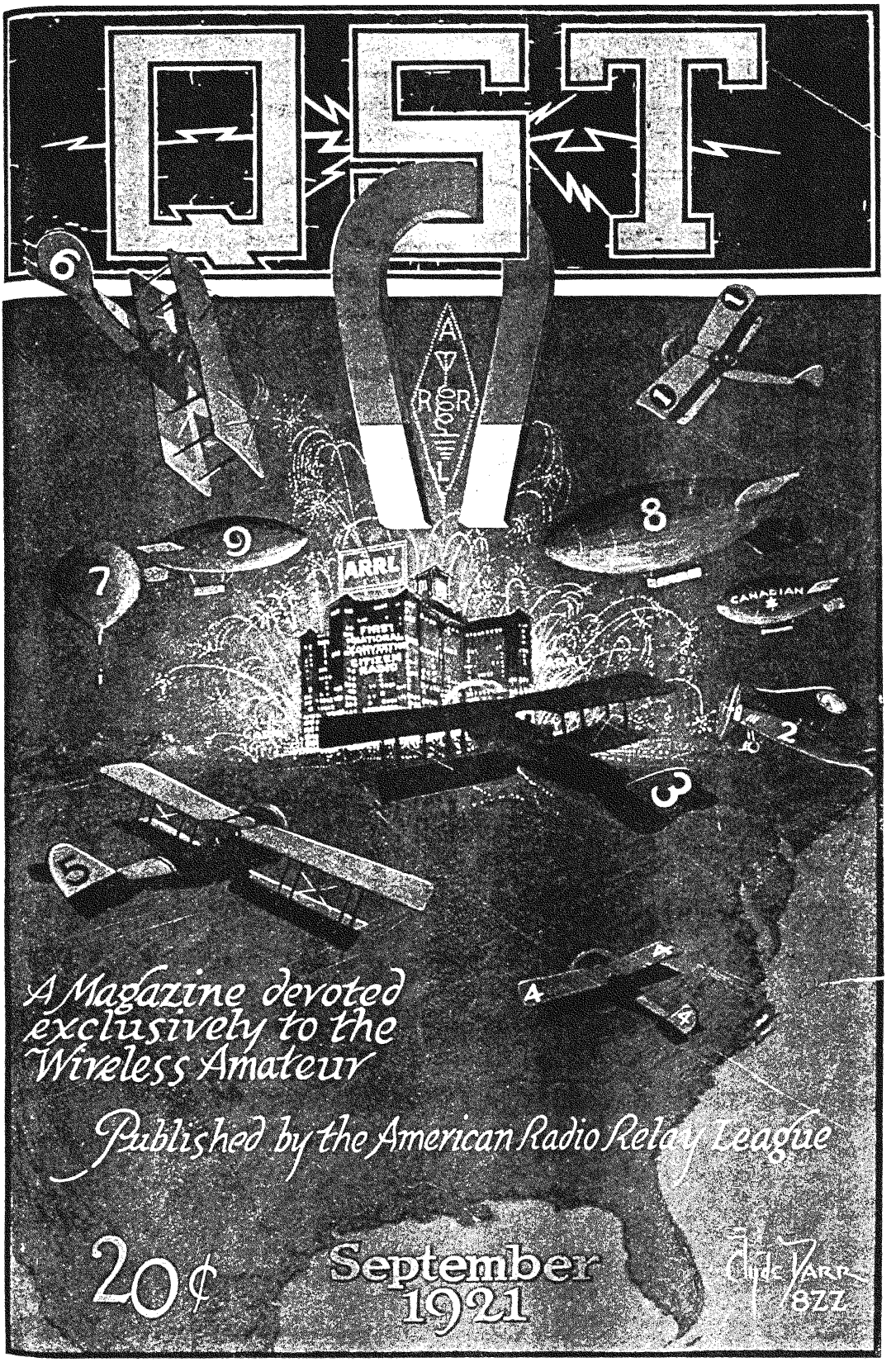
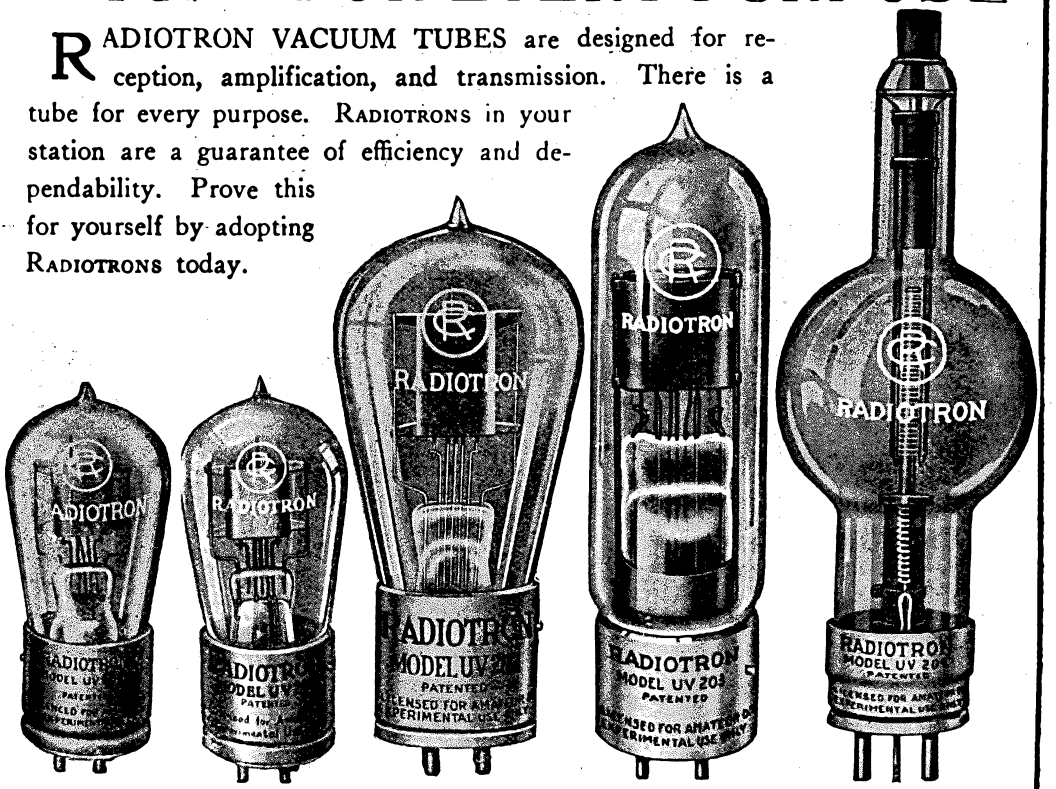

QST
ARRL
CANADIAN
A Magazine devoted exclusively to the Wireless Amateur
Published by the American Radio Relay League
20¢
September 1921
Dick Varrt 8ZZ

A TUBE FOR EVERY PURPOSE

RADIOTRON VACUUM TUBES are designed for reception, amplification, and transmission. There is a tube for every purpose. RADIOTRONS in your station are a guarantee of efficiency and dependability. Prove this for yourself by adopting RADIOTRONS today.



Tube	Radiotron U.V. 200	Radiotron U.V. 201	Radiotron U.V. 202	Radiotron U.V. 203	Radiotron U.V. 204
Fil. Current	1.1 Amps.	1. Amps.	2.35 Amps.	6.5 Amps.	15. Amps.
Plate Voltage	15-22.5 V.	40-100 V.	350 V Normal	1000 V. Normal	2000 V. Normal
Plate Current			.045 Amps.	.15 Amps.	.25 Amps.
Price	$5.00	$6.50	$8.00	$30.00	$110.00
Use	Detector	Amplifier	5 Watt Transmitter	50 watt Transmitter	250 watt Transmitter

Announcement We take pleasure in announcing a change of location. Our Boston store is now situated at 727 Boylston Street,—in the heart of the Back Bay business section, directly reached by train or trolley. Additional floor space and an increased sales force enable us to give every customer immediate attention. This applies to mail-orders as well as over-the-counter purchases. We cordially invite you to visit our new store.

Atlantic Radio Company, Inc.

727 Boylston St.
Boston, 9 Mass.

Bulletin 14 gladly sent on request to any reader of QST.

Branch--15 Temple Street
Portland, Maine

RAC-3 AUDION

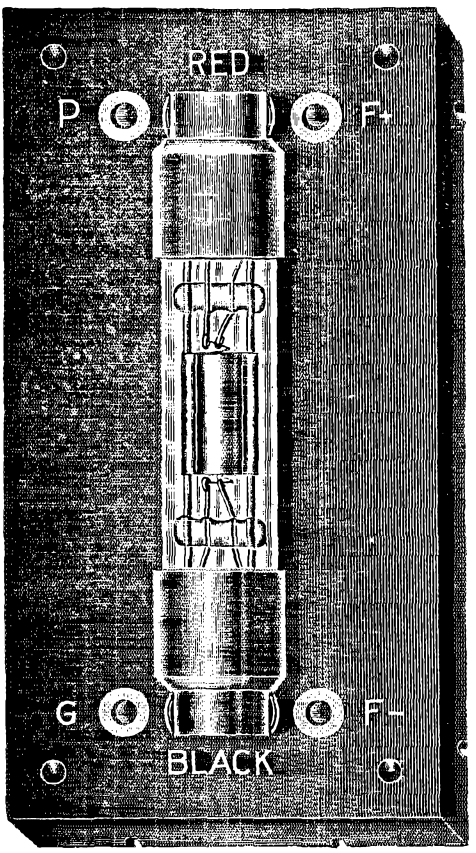
Price

AUDION

and

RECEPTACLE

$4.50



AUDIO FREQUENCY AMPLIFIER

RADIO FREQUENCY AMPLIFIER

AUDION OSCILLATOR

Full Size

FIRST UNIVERSAL AUDION

Manufactured under DeForest Patents No. 841,387 and No. 879,532

RADIO AUDION COMPANY

90 Oakland Avenue, Jersey City, New Jersey

No Radio outfit up to date without the RAC-3 Audion.
No need for buying "soft" or "hard" tubes.
RAC-3 Audions are interchangeable without necessitating critical readjustments.
RAC-3 Audions are not critical to A or B battery adjustments.
Low battery consumption. Filament current 0.8 amp. at 4 volts, maximum. Plate voltage 2 to 22 volts.
Clear signals and great sensitiveness on long distance reception.
Perfect oscillation for use in regenerative circuits.
Small size. Rigid construction. Non-microphonic. No tube noises due to mechanical vibration.
Maximum insulation between filament plate and grid terminals resulting from new type of tube and receptacle.
No soldered audion terminals.
Maximum direct mechanical contact between audion leads and receptacle clips.
Audion base caps and Receptacle block moulded Grade A Condensite.
Receptacle block is designed to permit built-up panel construction for amplifier panel. Circuit connections may be made from front, back or sides.
If your dealer is not carrying RAC-3 Audions in stock, send attached coupon.

Mail Order Coupon

Radio Audion Company,
90 Oakland Avenue, Jersey City, N. J.

Enter my order for.....RAC-3 Audions and.....Receptacles for shipment by return mail. Forward by Parcel Post insured. Enclosed herewith is Postal Money Order for $.....plus 10 cents for postage and insurance.

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

City ..... State .....

Do Amateurs Realize the Wireless Opportunities that Await Them?

How the President of the National Radio Institute Answered this Question When It Was Put Up to Him. What Would You Have Said? Is the World's Fastest Growing Field Actually Going to Slip Away From Those Best Able to Cash in Big on It? These Are Questions Which Will Interest Every Radio Amateur.

THAT was one of the questions recently put up to me by a well-known authority visiting Washington. "In your opinion," he said, "do amateurs realize the wireless opportunities that await them?" For a moment I was stumped! Then I replied, "Yes, with just one 'but.' I think that amateurs are well aware of the tremendous expansion of wireless that is daily going on. They realize that it is sweeping the world like wild-fire. BUT I do not think that they realize what this means to *them*—they do not realize that they can easily get the 'plums' that the field offers. They 'have the jump' on everyone else, and they should realize now that 'the fastest-growing field in the world' besides being a fascinating hobby is a wonderful, opportunity-filled field offering splendid present advantages—and growing so rapidly that the future is beyond estimation!"

I wonder if many amateurs have ever considered the fact that what is to them a fascinating hobby is also a fascinating profession, filled with big opportunities that they can easily share whenever they are ready to do so. It's only a short step for them now to a splendid field that they can put their hearts into—and offering a bigger future than older businesses which are overcrowded.

Big Opportunities Are Knocking---Are Some of Us Saying "Please Go 'Way and Let Me Sleep?"

After the caller who started me thinking about this matter had left, I jotted down on my pad some of the items which I had recently noted regarding wireless expansion. On land and on sea big opportunities are opening, and even greater uses for wireless are being found every day. No doubt you too have read these items, but I am going to have them printed here because I want to impress upon you what this tremendous expansion can mean to *you*.

Mr. James E. Smith,
President, National Radio Institute

When I read every day how wireless expansion is sweeping over the world I often say to myself, "Big opportunities are knocking—I wonder if amateurs realize that they can cash in big on this growing field. While opportunities knock, I wonder if some aren't saying, 'Please go 'way and let me sleep.'" Of course, they aren't sleeping by any means, but I want *all* of them to know just how easy it is to fully qualify for a field which is undeniably filled with greater advantages than most others in the world today.

Easy to Qualify In Spare Time—At Home

I want to tell you without obligation to yourself in any way—more about wireless

opportunities and how you can take advantage of them. I would like to tell you about our Institute, which, is officially recognized by the U. S. Dept. of Commerce and whose name *heads the list* of the schools recommended by the U S. Shipping Board. This National Radio Institute was the original and is today the oldest and largest school in America teaching wireless by mail. The government allows our graduates five to ten points credit when taking First Grade Government License examinations. We have graduates in almost every part of the world who have quickly qualified through the special method through which we make Wireless amazingly easy for anyone to learn completely at home in spare time.

These are some of the main points about this Institute and I am sorry I haven't room to tell you all of them. I should like to tell you more about our wonderful new methods of teaching, about our remarkable new invention, the "Natrometer," which each student gets free, and which almost cuts in half the time necessary to learn Wireless thoroughly. Then too I'd like to tell you about our free Post-Graduate Course and about "Dots and Dashes," about our Diploma, our Relay League, Employment Service, and about our special easy-payment plan. But there is not enough room here to tell you about all these things so I am going to ask you to write me for a new interesting booklet we have gotten up.

Write Me For Booklet

A little coupon is being put here so that you can save youself trouble in sending for this illustrated booklet, "Wireless, the Opportunity of Today." By mailing this coupon you will not be obligating yourself in any way and no solicitor will call upon you. But the coupon *will* bring you some mighty interesting facts about Wireless Opportunities and about how you can quickly and easily qualify for them—at home and in your spare time.

Won't you mail this little coupon at once? Whether you are a junior Radio Amateur and want to learn all about Wireless or whether you are anxious to fully qualify so as to enter the wireless profession now in one of the fine opportunities open on land or on sea—write me for this booklet. All that I ask is that you write as soon as possible. And—since there is no obligation—why not write me today!

P. S.—By the way, we are making a special short-time offer, for a strictly limited time, in which we are giving all new students, our complete new course in Wireless Telephony FREE. Mail the coupon direct to me, today, and let me tell you about it by return mail. **Mr. James E. Smith, President, The National Radio Institute, Dept. 289, Washington, D. C.**

WHAT I JOTTED DOWN

Here are the items I jotted down on my pad, showing how wireless is growing by leaps and bounds all over the world. Let me tell you what this world-wide sweep of wireless expansion means to you and to your future.

A $20,000,000 American corporation has been formed to establish wireless stations in every part of the globe.

The U. S. Merchant Marine operates over 30,000 vessels. Wireless is now a necessity on ships.

The Chicago Tribune now receives foreign news by wireless. Other papers are calling upon Wireless too.

Huge wireless stations are springing up all over the world. Saint Assise, France; Bordeaux, Ville Juif, and Lyons, France; Peking, China; Geneva, Switzerland; Shanghai, China; Fiji Islands; Warsaw, Poland—and these are but a few.

Many railroads are calling upon Wireless to dispatch trains and carry on communication. The Lackawanna, The Louisville & Nashville, The Canadian-Pacific, The Nashville, Chattanooga & St. Louis, are some of them. —New York, Cleveland, Chicago and Detroit are connected by an inter-city wireless service.

Criminals are being intercepted by wireless through the Police Department of New York, Dallas, Chicago and other cities.

Brokers, Bankers, Merchants, Manufacturers and other business concerns are calling upon wireless. John Wanamaker, Goodyear Rubber Co., Standard Oil Co., New York Stock Exchange, are only a few.

Farmers are getting Market and Weather reports daily by wireless in all sections of the country.

New wireless stations are springing up in every part of America. Belfast, Maine; Cape May, N. J.; East Pittsburgh, Pa.; San Francisco, Cal.; Helena, Montana; Seattle, Washington; Mobile, Alabama—these are but a few.

The Aerial Mail Service of the Post Office Department already has 12 radio stations in operation.

The Japanese are constructing a powerful station in the Orient.

A big new wireless service is being established between England and France.

The Federal Telegraph Co. is establishing a complete chain of stations on the Pacific Coast.

Messages are sent from the Philippine Islands to Washington (10,000 miles) in 3 minutes.

Daily wireless service between the United States and Japan is in full operation.—St. Johns, Newfoundland is operating a large service.

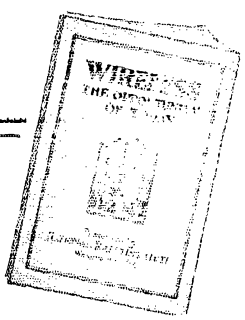
Danzig, in Europe, is carrying on large wireless operations.

Three tremendous stations are operating on Long Island at Easthampton, Port Jefferson, and East Moriches.

South America is planning to establish a chain of stations at Rio de Janeiro, Asuncion, Buenos Aires and Montevideo.

One single American concern offers wireless communication between the United States and France, England, Germany, Norway, Denmark, Sweden, Finland, Poland, Honolulu and Japan.

And these are only a few of the examples showing how Wireless expansion is spreading over the whole earth. It brings you amazing opportunities—and you can now easily grasp them.



Mail this Coupon Today

Mr. James E. Smith, Pres., National Radio Institute, Dept. 289, Washington, D. C.

Send me your FREE book, "Wireless, the Opportunity of Today." Tell me about your Institute and your special short-time offer.

Name .....

Age..... Occupation.....

Address .....

City..... State.....

[ ] I am interested in a sea position

[ ] I am interested in a land position.

QST

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

VOLUME V. **SEPTEMBER, 1921** No. 2

QST is published monthly by The American Radio Relay League, Inc., at Hartford, Conn. Kenneth B. Warner (Secretary, A.R.R.L.), Editor and Business Manager.

Edwin C. Adams, Advertising Manager.

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

Entered as second-class matter May 29, 1919, at the post office of Hartford, Connecticut, under the Act of March 3, 1879.

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.

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
R. H. G. Mathews
6423 Ravenswood Ave.
Chicago

Assistant Manager
L. A. Pease
2256 W. 24th St.
Chicago

ALASKAN DIVISION
Manager
Roy Anderson, 71T
P. O. Box 206
Ketchikan, Alasaka

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
248 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
137 Sutherland Road
Brookline, Mass.

ROANOKE DIVISION
Manager
W. T. Gravely
864 Main St.
Danville, Va.

DELTA DIVISION
Manager
John M. Clayton
1301 Welch St.
Little Rock, Ark.

Assistant Manager
Hubert E. de Ben
1044 City Park Ave.,
New Orleans.

WINNIPEG DIVISION
Temporary Manager
Boyd Phelps
3344 First Ave., South
Minneapolis, Minn.

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. E. CLAUSING
FRANK CONRAD
LEO C YOUNG
MINTON CRONKHITE
J. H. DELLINGER
C. L. FARRAND
PAUL F. GODLEY
L. A. HAZELTINE
C. D. TUSKA
R. H. G. MATHEWS
J. O. SMITH
S. KRUSE

Address General Correspondence to Executive Headquarters, Hartford, Conn.

QST

A Magazine Devoted Exclusively to the Radio Amateur

Simplified vs. Three-Circuit Regenerative Receivers

By Paul F. Godley

QUITE a little is being said just now about simplification of regenerative receivers, and several such are being offered by various ones. Activity in this direction gives rise to several questions of importance and worthy of answer:

What are the advantages of a "simplified regenerative receiver" for either damped or continuous wave reception?

What are its shortcomings?

What will it do that the conventional regenerative receiver will not do?

What will the regenerative receiver do which the simpler receiver cannot do?

Are all the controls on the regenerative receiver necessary?

Is a simplified receiver which does not sacrifice sensitivity and selectivity now possible?

What would be the effect of the general use of any of the simplified types of regenerative receivers offered?

Would I be willing to sacrifice a deal of sensitivity and selectivity in exchange for the ability to pick up stations with less effort and without requiring an understanding of the principles on which receivers operate?

The first receiving tuner was a single-slide tuner, and therefore a uni-control receiver. It gave little freedom from interference as compared to the two circuit receiver in various forms which replaced it. There was no thought of again using a single-slide tuner in preference to the two-circuit receiver, notwithstanding that the two-circuit receiver introduced two new variables—the tuning of the second circuit, and the coupling between the two circuits—because, by the use of a second circuit coupled to the antenna circuit, we have in effect provided ourselves with a receiver from which the greater portion of the resistance of the antenna has been eliminated. This is highly desirable, since the lower the resistance of a circuit the lower its decrement and the greater its selectivity.

The Secret of the Regenerative Receiver

Latterly, the advent of the audion and its exploitation has made it possible to still further greatly increase selectivity by the addition of a fourth variable which is used to bring the plate circuit of this remarkable little relay-detector into resonance with the secondary (grid) circuit. And thus we have the best type of regenerative receiver—a receiver which carries sensitivity and selectivity to very remarkable extremes.

The proper "association" of the grid and plate circuits of the audion by tuning to resonance, or by coupling the two in such manner that their mutuality brings about resonance, will set up a constant repeater action and result in the continuous flow of an alternating current (oscillations) in the system. These oscillations will not be set up until *all* losses of the system have been offset. That is to say, the impulse which is passed from the plate circuit back into the grid circuit via the coupling between the two must be a stronger impulse than that initial grid circuit impulse which (by virtue of the repeater action of the audion) gave rise to the plate circuit impulse. These conditions having been met we have a generator of continuous waves, a system which has *no decrement*. It is then easily understood that, as the association of the input and output circuits of the audion becomes closer, those losses which give rise to decrement (lack of sensitivity) are being offset to a greater and greater degree until, finally, they are offset entirely and the decre-

ment falls to zero, and continuous oscillations start. And when the adjustment is such that the system is "poised" and ready to "break into oscillation" it is in the *most sensitive condition for the reception of damped wave signals* (spark, telephone, etc.) Conversely, when in the oscillating condition but poised almost ready to break into the non-oscillating state it is in the *most sensitive condition for the reception of continuous wave signals* by the heterodyne or "beat" method.

Simplified Regenerative Receivers

The secret of the regenerative receiver lies in the *completeness* of control which it affords. This completeness of control is as desirable for continuous wave as for damped wave reception. With a well designed three-circuit regenerative receiver it is possible to "poise" the circuits "on the edge" thus insuring sensitivity and selectivity of a degreee not to be found in a poorly designed receiver or in a single or two circuit regenerative tuner, because, as will be pointed out, neither of the latter can afford *complete* control.

When the three-circuit regenerative receiver is operated strictly as such, the grid circuit is in control. That is to say, the nature of the impulse which may exist in the grid circuit determines the nature of the signal receiver. Impulses which exist in the antenna may or may not control the grid circuit. In most cases there are many impulses in the antenna which do not perceptibly affect the grid circuit while at the same time there is, let us say, *one* impulse which does affect it. Perhaps this may be better understood by an examination of the following:

(1) Due to its disposition, its size, and its decrement the antenna is greatly susceptible to forced oscillations of frequencies different from that to which it is tuned.

(2) The secondary circuits, on the other hand, are susceptible to "off-tune" impulses in a decidedly minor degree, for the decrement of the secondary may be brought (for spark) to a *very* low value.

(3) It must be understood that as the energy which may exist in the secondary is increased, the reaction of the secondary upon the primary increases, thus decreasing the sharpness of resonance between the two. Regenerative amplification *greatly* increases the energy in the secondary circuit, and, if sharpness of resonance is to be maintained, coupling between primary and secondary must be smaller. We might say then that by virtue of the regenerative action the secondary circuits are *further removed* from the source of disturbance, for these smaller couplings (2% to 5%) render them very free from off-tune impulses, and in addition reduce the percentage of the *amplified* energy lost by transfer to the primary or antenna circuit. Thus the greatest degree of selectivity and the greatest values of energy available for the production of signals are simultaneous.

Maximum strength of signals obtainable on the best type of three-circuit regenerative receiver averages about 70% stronger when atmospheric strays of a medium order prevail, and about 55% stronger during periods when strays are at a minimum,

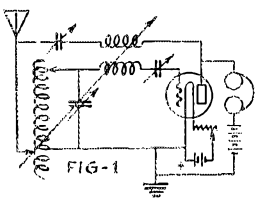


FIG-1

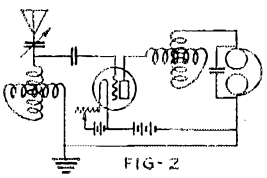


FIG-2

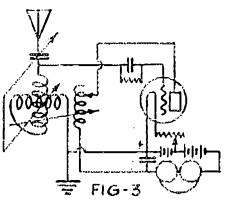


FIG-3

than best signals obtainable on a simpler type of regenerative receiver such as shown in Figs. 1, 2 and 3.

It is more difficult to make accurate comparison of the selectivity of the two types of receivers, but a fair idea of this may be given by an account of comparative performance during operation. For example:

(a) During steady static of medium strength while receiving a small radiophone set 15 miles distant on a wave length of 210 meters, lost words averaged 2 out of 5 on the three-circuit receiver; 4 out of 5 on a receiver using circuit shown in Fig. 3.

(b) During steady static of medium strength while receiving spark set 85 miles distant on 200 meters lost letters averaged 5 out of 10 on three circuit receiver; signal only occasionally audible on receiver using circuit shown in Fig. 3.

(c) While receiving small C.W. set about 30 miles distant on 220 meters with receiver using circuit of Fig. 3, reception was completely broken up by commercial stations 15 miles distant working on 600 meters and by amateur station 8 miles away working on 200 meters; whereas, reception was accomplished with great ease on the three-circuit receiver.

The observations above were made on an

antenna which has a resistance of about 7 ohms at 260 meters by quickly switching antenna and detector from one receiver to the other. Observations were checked by a second observer.

Receivers That Cause Interference

The comparatively poor showing made by the simple types of regenerative receivers is due to the impossibility of securing *completeness* of control over their energies. The grid of the audion is either directly connected to a point of high potential in the antenna or very closely coupled thereto, under which circumstances it is liable to influence by all impulses which exist in the antenna. To be sure the decrement of the whole system is *greatly* reduced by virtue of the regenerative action, but it is impossible to take full advantage of this action, particularly when strays and interference are being dealt with for there is no *gradual* approach to the point of zero decrement to be had after the circuits have been brought *near* it, since the grid is being continually "shocked". Such "shocking" of the grid renders the system unstable and places a very considerable amount of otherwise available amplification and increase in selectivity *beyond reach*. In fact, when static and interference is heaviest signals may be read with greatest ease when regenerative adjustment is well removed from that which gives loudest signals because when it is in a more sensitive condition it is being continually "shocked" into instability. This is true of the three-circuit receiver to a *far* lesser extent.

The lack of control found in the simpler regenerative circuits is equally disappointing for both damped and undamped wave reception. Stability of circuit for the reception of the C.W. calls for an adjustment such that, we might say, the decrement becomes quite negative. That is, having passed the point of zero decrement and continuous oscillations having been set up, the system instead of *wasting* energy is *producing* it. The energy thus produced in the direct coupled circuits, in great part exists in and is *being radiated* by the antenna! Such direct coupled circuits have been used many times for telephonic communication over distances of 1000 feet ("Applications of the Audion", QST, September, 1916) and for telegraphic communication over distances of several miles.

Efforts toward the production of a simplified receiver give expression to a hope which has long been alive in the breasts of radio engineers. This hope persists because of a very natural desire to get things down to their simplest form and most of all, perhaps, because *most* radio operators have failed to found themselves in the basic principles which govern the action of resonant circuits. I do not soon expect a satisfactory realization of this hope and I am tempted to compare receivers to automobiles which would be rather sorry mechanisms without clutches and brakes and gear-shifts and timer controls and throttles—with only switches for turning them on and wheels with which to steer them. Electrically driven autos are like that, and on the open road they always get the dust.

The forward step taken in the adoption of C.W. transmission as a worthy goal for all should not license a disregard of forward steps previously taken. The *right* simplified receiver will be a real advance. Freedom from body-capacity effects and the provision of verniers for fine adjustment control materially simplify the adjustment of the three-circuit regenerative receiver and overcome the principal difficulties encountered in connection with C.W. reception while the maximum of sensitivity and selectivity is retained. It is possible to build such a receiver.

To Relay Leaguers the interference problem is the most formidable one and calls for all that ingenuity can provide toward its solution. The little of time or trouble saved to the practiced operator in the adjustment of the simpler circuits may be lost many times over due to interference, and the simpler circuits *increase interference*. Some governments *forbid the use* of receivers which *radiate energy*.

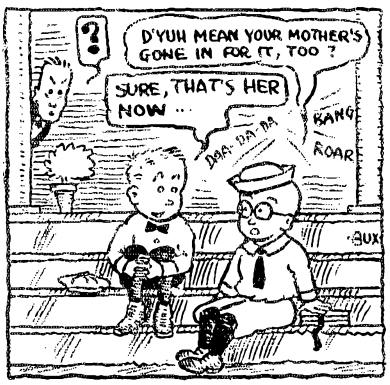
[We believe it is established as a fact that the utmost in selectivity and sensitivity is obtained on the three-circuit regenerator, and that any simplification of circuit heretofore proposed represents more or less of a sacrifice in these two qualities in favor of simplicity. However, in the case of the circuit of Fig. 1, which will be recognized as that of the set described by Mr. J. L. Reinartz in June QST, and confining the case to the reception of C.W. signals, we believe that the gain in ease of adjustment, which is remarkable in this set, considerably more than offsets the losses in selectivity and sensitivity, which lossses seem less than in more common simplifications of the Armstrong circuits. Prominence was given the latter set in QST because C.W. has suffered in its expansion for lack of a receiver that would more readily pick up undamped signals, and in the belief that such facility of operation truly more than offsets extreme selectivity and sensitivity when the latter are coupled with complexity of adjustment, which is particularly evident in the case of C.W. reception.

Another article by Mr. Godley on "How to Understand and Operate Regenerative Receivers" will appear in an early issue.—Editor.]

Overheard By The Old Man's Son

By R. K. B.

YOU folks have had a fine time with The Old Man and his Rotten Stuff, and the Old Woman whenever she breaks out, but say!—they're not a patch on my kid brother! He's only ten, and he doesn't know much about this radio business, and he hasn't much more use for it than I have; but—well, wait till I tell you what I heard him say to his chum, a few days ago.



Did you ever hear two kids talk? Real kids, I mean—and talk about radio, when they don't know much? As I say, my brother is only ten and he hasn't much use for radio. He and this other kid came along from school and sat down on the porch step. They didn't know I was in the hammock and I kept still. I heard him say "Every man needs a home and home comforts."

"You're darn right," said the chum. "What's that?" as a spark started up.

"There goes that blamed thing again," said my brother.

"Wot cher goin' to do about it?," says the other kid.

"I dunno. Guess I'll go be a pirut till The Old Woman gets over it."

"The Old Woman! D' you mean your mother's gone in for it, too?"

"Sure. That's her, now. She's a member of the A.R.R.L. 'n'ev'rythin'. Listen to that! Wouldn't it make you sick? Daa-da-da-da,-da-daa,-daa-da! Gosh!"

"What's the Old Man say about it?"

"The Old Man? Gosh, he's got it worse'n she has. He don't talk any more. When they sit down to the table he chews dots and dashes in his meat, an' she hammers on her plate with her fork. 'F anybody talks they both say 'sh-sh-sh', an' then they bang away harder'n ever."

"Gee! Tough luck!"

"Yeah; an' then if I start to pound on my plate they both jump on me an' tell me I ain't perlite—it's very rude to make noises with your knife an' fork."

"Huh! Darn tough luck."

"Yeah. I spoke to the Old Man about it last week, an' told him I thought it had gone far enough, but he says he likes to think him an' the Old Woman—only *he* didn't call her that—has the same int'rusts. 'N' then,—aw, chee!" He heaved a deep sigh and then he says—and you'd think he was fifty,—"When I was a little feller—of course that was a good many years ago, now,—they used to spell words, an' I could get a lot of it, but now—'daa-da-daa, daa-daa-da' Gosh! It does rile you!"

They sat still for a few minutes, and then the other kid says "You might come over to my house 'n' live till they get sensible again."

"Yeah, I s'pose I might, but you see there has to be someone to look after the baby, when he hollers. Oh, chee! He had a great time last night; he sat down on one of The Old Woman's storage batteries, and the wires had peeled, an' he had his thumb in his mouth. She started the thing goin' an' the kid got a shock. Gee! You'd ought to heard him yell!"

"Aw, you can't get a shock from a storage battery."

"Yer can so!"

"You—can—not! My brother says so."

"All right, maybe you can't on his, but you come 'n' try it in our house, that's all I got to say. Well, then he done somethin' to upset The Old Man's things, an' when he come in an' went to work to put dots in the air with his friends, it wouldn't work. He says somethin',—all I could get was 'Rotten', 'cause he had chewin' gum in his mouth,—but The Old Woman says, 'You must not use such *un-gawdly* langwidge before the children,' an' he comes back with, 'What sort of a coil do you think you're usin' just now, anyway? I'll talk as I want!' Gee! To hear 'em you'd think they was all bugs."

"'Bugs'? Aint that what they are, anyway?"

They sat for a minute, and the other kid picked up some pebbles and started tossing them about as he asked, "How late do they keep it up?"

"Oh,—till about—I dunno. I go to sleep after I've put the baby to bed and done my lessons; an' they're at it then. Him an' her has sets in diff'rent parts of the house an'—Hey!! Look out!! Don't chuck that stone that way! Can't you see all them wires stringin' away from the winders? You hit one o' those an' somebody 'll be givin' you H-2-L."

"Givin' me *what?*"

"H-2-L. Don't you know how to *swear* yet?"

"I did n't know that was swearin'. If H-2-L's swearin, what 's H-2-O?"

"Aw, you're only a kid, you don't know nothin'. H-2-O—why, that 's—that's—well you are too young for such things. An' it ain't right I should tell you what that is. You want to forget the one I said, too. You see, kids of nine is too young for the way us men talk—QRK!"

"Eh? Well, I heard my brother talkin' about 2 D M the other day; is that swearin'?"

"Nah!" in a superior tone. "You put the number first—that's some fat-head's call."

"What 's a call, anyhow?"

"Why, don't you know what a call is? Gee, but you 're a dummy! It's a Call!"

"Oh, well, my brother, he was workin' on his thing an' he yells into a big—a big, big—thing,—he yells 'What 's your call?' an' then he starts his big wheel goin'—like your Old Man's—an' he makes daa-da-daa-da, just the same's your mother. Then he yells at the—the thing again, an' says 'How did you get me that time?' n' m' mother come in an' she says 'If you don't stop that noise you gotter go out in the barn'."

"Oh, your brother 's tryin' a talkin' machine, is he? *We* 've gone back to International Morse as being more satis-factory for gen'ral pur-poses." (You'd have

thought it was the Old Man himself talking to hear that.) Presently the kid exclaimed, "Do you know what I'm goin' to do? I'm goin' to make one o' those Four-Step Audotime Amplifiers an' I'm goin' t' put a hammer an' a bell on it, an' every time you hit the key it's goin' to ring an' wake everybody in the whole house. Then maybe they'll stop."

"Gee, that 's Some Idea, that is!"

"Yeah. It's goin' to be fierce. (Aw, home 's a heck of a place!) An' when I get the bell an' hammer fixed, I'm goin to put up a arial a *mile* long. Then I can be heard all round the world."

"Naw yer can't!"

"I can so, too! It'll go round so fast I'll hear it in my receivers a minute after I send it."

"Huh! You're crazy."

"Think I got a short circuit somewhere, do you? You wait and see."

"What do you mean by short circuit? Is that some more swearin?"

"Naw, little boy, it's only another way to say you got a screw loose."

"Oh! I'll say that to my brother tonight. Do you s'pose he 'll call me 2-H-L?"

"He may call you a lot o' things, but 2-H-L is a call."

"What was it you said, then?"

The kid shook his head; "No, I said you was to forget it—you're too young. Aw, there's that darn kid yelin' again, an' the Old Woman's still at it. So long, see yer termorrer."

If this thing keeps up in our house I'm afraid I'll get bit by the Bug, too, and then only the baby and the cat will be left. The baby has begun already for he says "Daa-daa-daa" now.

What do you know about it?

1st District Calls Changed

ON July 1st all three-letter calls in the First District were changed. It seems that after the two-letter calls were allotted a series of three-letter ones was started using the letter A as the *middle* letter, instead of as the *first* letter, as is regular practice. When this series was exhausted the next one had B as the middle letter, instead of the first, etc. The change in three-letter calls has been made in order to correct these errors.

By memorizing the following little system it will be easy to figure out what any old friend's present call letters are, or, hearing a strange call, to figure out what

it used to be, from which the QRA can be determined in the call book:

Calls 1AA to 1WZ are not changed. Calls 1AAA to 1WAZ have the first two letters transposed. For example, old 1RAY is now 1ARY. Now notice that in the erroneous way in which the calls were first issued, the combinations having the common letter A had to conclude at 1WAZ, calls beginning with X, Y and Z being specials; but when corrected by transposing the A to become the first letter this difficulty no longer holds. Consequently the calls 1ABA to 1CBZ have been appropriated to fill in this blank at the end of the A scale, and this throws the middle letter of the rest of the B system three letters behind. Therefore, calls 1DBA to 1WBZ have had (1) the first two letters transposed; (2) the resulting middle letter slid back three letters in the alphabet. For example, old 1GBC is now 1BDC. Similarly, the calls 1ACA to 1FCZ were necessarily appropriated to fill in the blank, now twice as large, at the end of the B scale, and this throws the middle letter of the rest of the C bunch six letters behind. For example, old 1GCN is now 1CAN.

Transatlantic Sending Tests

By The Traffic Manager

THE Operating Department wishes to announce that the second attempt to span the Atlantic Ocean will take place December 8th to 17th, inclusive. Until the complete list of transmitters is known the exact time cannot be given, but the tests will start about 8 p.m. Eastern Standard Time and continue until about midnight, giving each transmitter a fair chance to accomplish this almost unbelievable feat.

In order to have only the very best and most far-reaching transmitters in this test, preliminary tests will be held November 7th to the 12th, inclusive. The preliminaries will be over land and probably will specify that 1000 miles air-line must be covered in order to qualify for the finals. Details will be announced soon.

Mr. Phillip R. Coursey, B.Sc., F.Inst.P, A.M.I.E.E., assistant editor of "The Radio Review" (London), will have complete charge of the receiving stations in England and other countries where amateurs will listen for our signals. Should we be successful in our attempts, Mr. Coursey will decide the winners after he has received all the data from his receiving stations. It was thru the untiring efforts of Mr. Coursey that we received the splendid co-operation of the English amateurs in the tests of last February, and Mr. Coursey assures us that they are keen to try it again.

Whether or not we shall have prizes rests entirely with our manufacturers and dealers. If the fascination of this idea of getting 'cross-seas is such that they wish to donate apparatus to be given the winners, we will be glad of the opportunity to give them full credit and announce their prizes in this magazine.

Fellows, our good old A.R.R.L. is calling to you amateurs with your excellent transmitters, inviting you to enter this contest in the name of good sportsmanship and in the interest of the advancement of Amateur Radio. We know you will answer as you have in the past. We want the Atlantic Ocean spanned on schedule by an amateur station and we want definite proof that it has been done. Full credit will be given the amateur or engineer who has anything to do with the transmitter that succeeds. The only requirements are those of the U.S. Radio Communication Laws. The power input must not exceed 1000 watts and the wave length must be 200 meters. The laws permits transmission on waves below 200 meters but since the English stations will be tuned for reception on 200, we ask you to use that wave.

This announcement is for the purpose of getting entrants. If you have a good DX transmitter or contemplate having one by November 8th, then send in your name. Applications will be accepted up to and including October 12th. Use the form below, or make up one similar thereto if you wish to avoid mutilating your copy of QST.

Traffic Manager, A.R.R.L.,
1045 Main St., Hartford, Conn.

Please enter my station as a transmitter in the Transatlantic Sending Tests, December 8th to 17th. I will be ready to transmit in the preliminary tests on November 7th to 12th, and if I fail to cover the specified distance in the preliminary tests I shall relinquish my rights to transmit in the final tests.

Name..... Call Letters.....

Street.....City and State.....

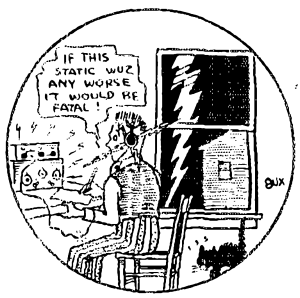
Power of transmitter.....

Type (CW or spark).....

Greatest distance heard (give three records).....

The Static-Puncturing Contest

OUR Traffic Manager certainly picked a peach of a night for our mid-summer night's party! He picked the right kind of weather for our Transcons, and his intent this time was to give us plenty of atmospherics so as to actually see whether spark or C.W. was the better in bumping thru. But he went too far, as the night of July 19th was marked over almost the whole country by bad storms, violent electrical displays being the rule. So bad was it that in the eastern half of the country one could not sit in in safety and most of the gang abandoned all hope of participating.



We are disappointed, then, in our hope for stacks of returns that upon analysis would yield scads of data on the relative merits of spark and C.W. Only fourteen reports were turned in and nothing remarkable was accomplished, most of the copy being very "ragged." Because of the small number of reports we publish them all in order that they may be studied at leisure and any possible lessons learned. In the dope below we list first sparks, then C.W., and under each head we present first the station heard, its distance in air-line miles, and the percentage of the message correctly copied.

Edmond Bruce, Washington, D. C.

Spk.			C.W.		
3XF	5	100%	9AL	650	1/11
			2ZL	250	100%
			4GL	540	7/13
			8DE	300	Too slow
				1740	

S. Kruse, Washington, D. C.

Spk.			C.W.
3SP	175	100%	(None)

J. V. Wise, Walnut Grove, Cal.

Spk.			C.W.
7DA	600?	9/10	(None)
6OH	20?	8/10	
	620		

A. Rechert, New York.

Spk.			C.W.
2JU	8	2/11	(None)

J. B. Mannon, Ukiah, Cal.

Spk.			C.W.		
6ZX	125	100%	6EN	500	100%
7DA	450	100%	7XF	450	100%
	575			950	

G. P. Rankin, Jr., Macon, Ga.

Spk.			C.W.		
(None)			4GL	170	100%

T. A. Reid, Springfield, Ohio.

Spk.			C.W.		
8SP	200	100%	4GL	500	6/13
			8DE	180	100%
			9XI	800	3/11
				1530	

C. Radoslovich, Arlington, Mass.

Spk.			C.W.		
(None)			2ZL	185	3/11

K. B. Warner, at Lake Coventry, Conn.

Spk.			C.W.
1ZE	100	100%	(None)

G. Wedemeyer, Ann Arbor, Mich.

Spk.			C.W.		
9ZN	200	2/11	2ZL	550	100%
8SP	280	100%	8DE	135	100%
	480			685	

D. E. Watts, Clear Lake, Iowa.

Spk.			C.W.		
9LC	350	11/12	2ZL	1025	1/11
9OE	425	7/8	8DE	600	8/11
	775			1625	

R. H. G. Mathews, Chicago.

Spk.			C.W.		
3XF	600	Nil	8ZW	385	Nil
8SP	425	Nil	8DE	325	100%
9LC	275	1/12	9XI	350	4/11
	1300			1060	

J. P. Weirick, Loudonville, Ohio.

Spk.			C.W.		
9ZN	290	7/12	4GL	675	100%
1ZE	600	Nil	8DE	50	100%
1AW	500	4/10	8ZW	100	4/13
3XF	310	3/10	9XI	650	1/11
8SP	125	9/12			
	1825			1475	

H. P. Maxim, Hartford, Conn.

Spk.		C.W.	
(None)	9AL	350	Nil
	2ZL	100	100%
	8DE	450	100%
		900	

Drawing conclusions from these few reports is a precarious business, but we will do our best. As between classes, C.W. signals covered a reported total distance of 10,320 miles, as against 6063 for the sparks. This takes no account of cleanness of copy, in which honors seem to be about even. Mr. J. P. Weirick, 8AGZ, Loudonville, Ohio, copied signals from the greatest total number of miles, 3300, and accordingly is adjudged the winner of the contest in this respect. He has to his credit the highest number of spark miles, 1825, and is second in C.W. miles, first place in which goes to Mr. D. E. Watts of Clear Lake, Iowa, whose figure is 1625. This, however, includes the reception of 2ZL at 1025 miles, in which only 9% copy was made. 2ZL was the best-heard C.W. station, reported 5 places totalling 2110 miles; 8DE second, 7 places totalling 2040 miles; 4GL third, 4 places totalling 1935 miles. 8SP is the only spark reported from more than two points, having a total of 1205 miles from 5 places.

This is one time O.M. Static slipped it all over us. The data are inconclusive but from such as they are it is evident that C.W. had considerably the better of the contest.

Portable Wave Meters for Short Wave Radio

By R. T. Cox, Assistant Physicist, and
S. Kruse, Associate Electrical Engineer, Bureau of Standards.

THIS paper represents the accumulated observations of the past half-year on the various kinds of wavemeters submitted for test to the Bureau of Standards at Washington. It is probable that no laboratory in the country sees and handles such various types of wavemeters as does the Radio Research Laboratory of this Bureau, and, for the most part, commercial and amateur instruments alike give evidence of the fact that their designers, usually without any need and often with great diligence and ingenuity in the face of obstacles, have violated one or more of the basic requirements that should be fulfilled in the construction of a wavemeter. Although these requirements are quite simple they may easily be overlooked by anyone who has no opportunity to compare different types and it is with this in mind that it is thought possible that this discussion may be of use to amateurs, based as it is on observations of fairly wide extent.

The parts of a wavemeter are a variable condenser, a fixed inductor, and a detecting device of some sort. This statement takes no account of wavemeters which have a fixed condenser and a variable inductor, nor will such wavemeters be discussed in this paper except to call attention to the disqualification which they possess in the fact that every change in the inductance must necessarily cause a change in the coupling between wavemeter and generator, thus producing changes in current in the wavemeter circuit which have nothing to do with resonance.

The condenser may first be considered. It will be well at the start to eliminate certain large classes of condensers whose construction makes them unfit for use in wavemeter circuits. Variable condensers which make use of other dielectrics than air and condensers whose capacity is varied by a screw which changes this distance between the plates, however serviceable they may be for furnishing a variable capacity, will not retain their calibration and are therefore entirely untrustworthy for the measurement of wave length. This process of elimination leaves only air condensers whose capacity is varied by changing the overlapping area of parallel plates, the usual type of variable condenser. By no means all condensers of this type can be used in wavemeters. A wavemeter condenser should have fairly heavy plates, rigidly held together with ample tie rods and nuts, spacing washers of large diameter and sufficient thickness, liberal cone bearings, and unimpeded traverse through 360°. Particulars in which variable condensers commonly fail to meet these and other necessary requirements are: flimsy plates, spring-supported bearings, extremely close spacing of plates, play of the shaft in its bearings, contacts made by brushes wiping on movable parts, stops to arrest the rotating plates and jar them out of line, shifting scales or indices, and faulty workmanship which allows short-circuiting at some parts of the scale. In general, anything that allows a capacity change without a change in scale reading or a change in reading without a capacity change destroys the usefulness of a condenser for wavemeter purposes. Shielding of the condenser is not necessary but is desirable. Condensers whose movable plates are symmetrically placed with respect to the axis, or which have a

counterbalance or a lock for the movable plates, will stand transportation better than condensers which have none of these features and are therefore to be preferred.

The coil may next be discussed. The requirements of a wavemeter coil are: first, that its inductance be such that with the condenser used it can cover the range of wave length desired; second, that the resistance and effective capacity be low; third, that inductance, resistance, and capacity all be constant. Let us start with the first requirement which has to do with the range of wave lengths. See Fig. 1. It is

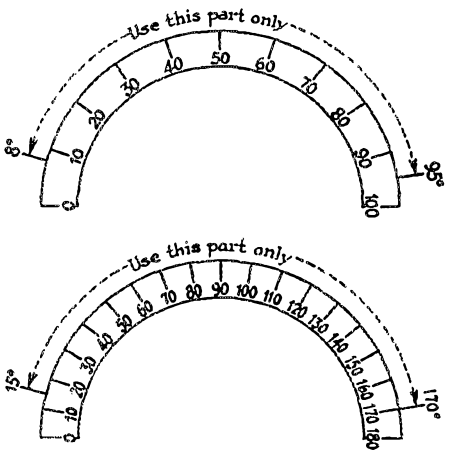


FIG 1

well to restrict the part of the condenser scale used for wave length measurement to the angle between 15° and 170° on a scale graduated in degrees or between 8 and 95 of the scale is graduated in hundredths. Since the capacity at 170° or 95 hundredths will almost always be more than four times the capacity at 15° or 8 hundredths, the wave length with any one coil at the upper end of this region will be not less than twice the wave length with the same coil at the lower end. This will make it possible with a single coil to cover the range from 175 to 375 meters, which is probably the range which will be required by amateurs.

The following table gives the number of turns required for a single-layer coil, 4 inches in diameter and 1 inch long which will cover the range stated with each of the maximum capacities most general among commercial condensers bought by amateurs. It will be noted that the size of the wire and the spacing between turns are not specified. The inductance is nearly independent of the size of wire used, and the spacing is controlled by the number of turns and the length of the coil, which are both stated. The length, 1 inch, refers, of course, to the length of the actual winding, not to the length of the core.

A Wavemeter Coil for the Wave Length Range 175-375 Meters

Diameter of Coil: 4 inches. Length of Windings 1 inch.

Maximum Capacity of Condenser	Number of Turns of Coil
0.0005 µf.	23
0.0007 µf.	20
0.0010 µf.	16

The second requirement stated for the coil was that the resistance and the effective capacity be kept low. The desirabilty of keeping down the resistance will not be questioned. The reasons for keeping down the effective capacity are two. The first is that this capacity serves to increase the total capacity of the circuit. This increase will be only a small part of the capacity at the upper end of the condenser scale and hence will not help appreciably in extending the wave length range upward; but it may be a considerable part of the capacity at the lower end of the condenser scale and may prevent the downward extension of the wave length range as far as is desirable. The second and more serious objection to a large effective capacity is that this capacity is always to a greater or lesser extent beyond control, and since it can not be regulated it should be as far as possible reduced. There is a regrettable tendency manifested in commercial as well as amateur instruments to load the circuit with large quantities of miscellaneous insulating material. This is especially to be avoided in the case of wavemeter coils. The best core for the coil of an amateur wavemeter is a hollow spool of dry wood lightly varnished. Wood is chosen in preference to bakelite, glass, or pasteboard. Bakelite and similar compositions largely increase both the resistance and capacity of the coil. Glass, while its electrical properties would make it admirable for a core, presents too great mechanical disadvantages. Pasteboard is not rigid enough and also increases the

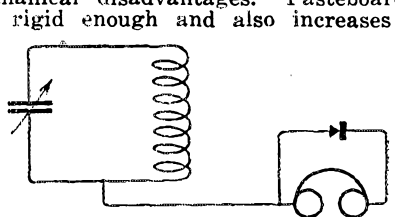


FIG 2

capacity and resistance of the coil. The wire used should not be of a smaller size than No. 24. Double cotton covered wire, lightly shellaced if the coil is closely wound, is sufficiently insulated and any

more insulation merely increases the resistance and capacity of the coil without compensating advantages. *Litzendraht*, if good, has a much lower resistance at short wave lengths than other wire; but it is apt to have broken strands, and it may also easily happen that not all the strands are made bare and joined at the coil terminals. These defects, when they occur, are so serious as to make it advisable generally to use some other wire. A single-layer coil has a lower capacity than a multi-layer one, and this together with the greater precision with which specifications can be furnished for winding a single layer, was the reason for choosing this type of coil in the table already given. Since capacity comes from having parts near each other whose extent and potential difference are considerable, it follows that the leads from the coil to the condenser should not be long or close together. An additional reason for having them short is found in the third requirement previously stated for a wavemeter coil, namely, that the characteristic quantities of the coil (its

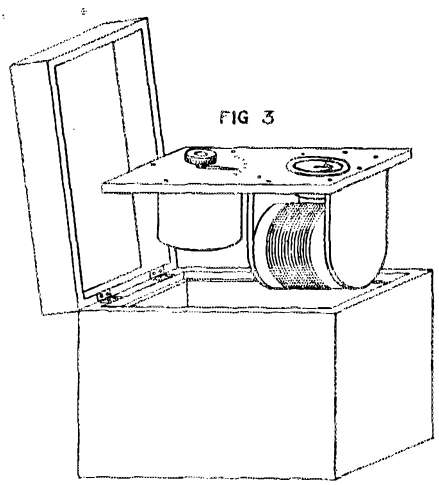


FIG 3

leads included) be kept constant. Long leads are apt to be flexible and flexible leads, long or short, introduce possibilities of change in inductance, capacity and resistance, which can not be compensated for by any slight advantage they may give in convenience of handling. The best leads are rigid metal terminals, soldered to the ends of the wire and screwed to the wooden core. The position of the coil should be such that it is either some distance from the condenser plates or perpendicular to them. This is to prevent the induced current in the coil from itself inducing eddy currents in the condenser plates. Since it is almost always desired for convenience in coupling to have the coil vertical, and incidentally perpendicular to the condenser plates, this matter will usually take care of itself. The same consideration will show that no large element of the wavemeter should be placed in the immediate field of the coil. A further and very important precaution in stabilizing the coil is to draw all the turns tight and so fasten them that with ordinary care in handling they will not shift.

The third part of the wavemeter is the device that indicates resonance. The favorite seems to be the crystal detector and telephones. Where they are used, only the one-point connection should be employed; that is, the detector and telephones are joined in a closed circuit and one point of this circuit is joined to one point of the wavemeter circuit, as shown in Fig. 2. This arrangement is sufficiently sensitive and makes the calibration of the wavemeter independent of the position of the telephone leads, at least so long as they are not closely drawn across some part of the wavemeter or wrapped around it.

The most satisfactory indicating device of moderate cost is the combination of a thermo-element and a direct-current galvanometer, commonly called a thermo-galvanometer. It is far preferable to an instrument of the expansion type, commonly called a hot-wire ammeter although it has no exclusive right to that name. The thermo-element and galvanometer combination, in addition to being much more reliable than the expansion type, has a very great advantage of standing a large overload for a considerable length of time. The indicating instrument is generally inserted directly in the wavemeter circuit, sometimes with a shunt to keep down the resistance of the circuit. It is important to note that, since the parts of the instruments have an appreciable capacity, the wavemeter should be calibrated with the same instrument or another of the same model in the circuit.

Sometimes the instrument is not put directly in the wavemeter circuit but is coupled to it by one or two turns of heavy wire. The purpose of this is to keep the wavemeter circuit itself as simple as possible. When this method is followed, the coupling, both for calibration and use, should be loose enough that no change in the calibration can be noticed if the coupling is slightly changed, or else it should be kept the same at all times by having the coupling coil rigidly held relative to the rest of the circuit. Having the instrument in the wavemeter circuit will in general, be preferred to having it in a coil coupled to the wavemeter.

An inexpensive indicating device, and a very satisfactory one when the power output of the oscillating circuit is large enough, is a miniature lamp inserted directly in the wavemeter circuit. To avoid any

possibility of changing the calibration of the wavemeter, the lamp should not be changed if it can be avoided. If it must be changed it should be replaced by one of identically the same kind. The sensitivity of this device can be greatly increased by having a dry cell and rheostat in parallel with the lamp in the wavemeter circuit. By adjusting the rheostat until the temperature of the lamp filament is raised almost to the point of illumination, it is possible to have the lamp lighted by induced currents much smaller than would otherwise be required. However, changes in the battery and rheostat can hardly be expected to leave the constants of the circuit unchanged, and this device can not be recommended on that account.

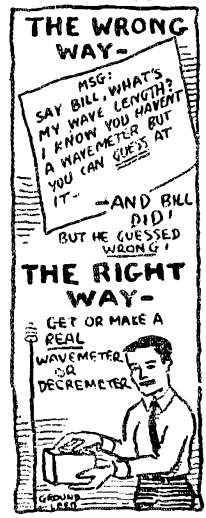
In concluding this advice on the construction of an amateur wavemeter, it may be well to emphasize again the primary importance of having all the parts of the circuit rigid in themselves and rigidly joined to the rest of the circuit. Mounting in a box is as good as any from the standpoint of rigidity and superior to any in portability and in the protection afforded to the parts. A convenient box mounting is shown in Figure 3.

With a good wavemeter constructed, it remains to calibrate it. It has become customary to make calibrations by comparison with any wavemeter available. Since many of the cheap wavemeters (and some of the expensive ones) either are not carefully calibrated or do not hold their calibration, this practice may result in serious errors, perhaps 100 meters in 300. The Bureau of Standards at Washington furnishes calibrations by comparison with its standard wavemeters, correct to the highest degree of accuracy warranted by the wavemeter submitted for test. Tests of wavemeters are made for the public when the Bureau is asked to act as referee or where the nature of the case demands an authoritative test or where the Bureau is interested in the test from a research standpoint. Lists of charges for these and other tests are furnished on inquiry. Wavemeters submitted for test should be packed in a wooden box large enough to give room for three inches of excelsior on every side. This is not an excess of caution; a wavemeter is a delicate instrument and may easily receive serious internal damages which do not apear except in its subsequent behavior. The package should be marked, "Scientific Instrument. Handle with Care."

At present the volume of radio testing work is too large for the force available and calibrations are not likely to be furnished within a month after the instrument is delivered to the Bureau. This is a most unfortunate situation as there is a rapidly growing demand for dependable wavemeters. There is a good opening for a commercial firm which will furnish accurate wavemeter calibrations. It would be necessary to have constructed a standard wavemeter from the specifications of one of the very few good wavemeters now in laboratory use and to take the precaution of learning to make good calibrations.

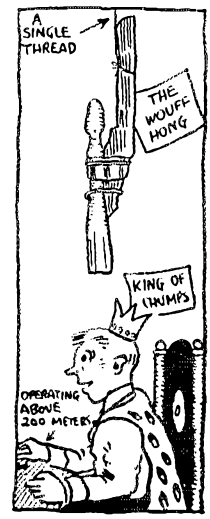
Two cautions may be in order as to the use of the finished and calibrated wavemeter. The first is not to subject the instrument to any treatment apt to change its calibration. The second is not to couple the wavemeter too closely to the generator. This error can be avoided by never having the wavemeter so close to the generator that it can not be brought closer without changing the calibration.

It is very easy to make a decremeter out of any wavemeter by simply placing a suitable scale on the variable condenser. For one having a condenser with semi-circular plates, it can be shown that the decrement scale applicable to such a condenser



The fellow who hasn't got ambition enough to get himself a wave meter doesn't deserve to have a transmitter.

"The Sword of Damocles." He'll look up presently and see what he's got coming!



is one in which the graduations vary as the logarithm of the angle of rotation. Such a scale, shown in Figure 4, originally appeared as figure 8 on page 50 of the February 1919 "Proceedings of the Institute of Radio Engineers" in the paper "Measurements of Radio Frequency Resistance, Phase Difference and Decrement" by Dr. J. H. Dellinger. Copies of the scale may be obtained from the editor of the Proceedings. The scale also appears as figure 13b on page 197 of Circular 74 of the Bureau of Standards, called "Radio Instruments and Measurements." This circular contains so much information of value to anyone concerned with radio communication that it will be well worth the price to any amateur. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C. Price is 60 cents per copy

The decrement scale may be cut from the present article or from Circular 74 and trimmed to fit the radius of the condenser with which it is to be used. It is suited to any wavemeter having a condenser with semi-circular plates and may be made stationary with a moving pointer traveling over it or may be mounted on a dial rotating under a fixed pointer. The zero point must be in coincidence with the graduation corresponding to maximum capacity. Since most condensers read counter-clockwise this arrangement usually places the decrement scale in the unused space opposite the capacity scale.

A measurement of decrement is made by first observing the current-squared at resonance, then reading the decrement scale at the settings on either side of resonance where the current-squared has one-half its value at resonance. The scale is so constructed that the difference of these two readings is equal to $\delta' + \delta$; that is, the decrement of the transmitting circuit plus the decrement of the wavemeter itself. It is then necessary to subtract the wavemeter decrement from the total just obtained. This is done once for all when the wavemeter is calibrated by going through the process of measuring the decrement with an electron tube generator. Since this generator has zero decrement, it follows that the reading obtained is the decrement of the wavemeter alone. This value is to be subtracted from all decrement values obtained with the decremeter. We are here making the assumption that the decrement of the wavemeter will not show any large changes at different points on the scale. This assumption will usually be warranted, but it is well to make sure by measuring the decrement at different wave lengths. If it is found to change very much a table or curve can be prepared to show the decrement at all points of the scale and for any setting of the condenser the corresponding decrement can be found from this table or curve and subtracted from the total decrement measured to give the decrement of the transmitter under observation.

The conditions necessary to permit the use of this particular scale are:

1. The condenser must have semi-circular plates. Condensers with plates of a different pattern will have different decrement scales just as they have different

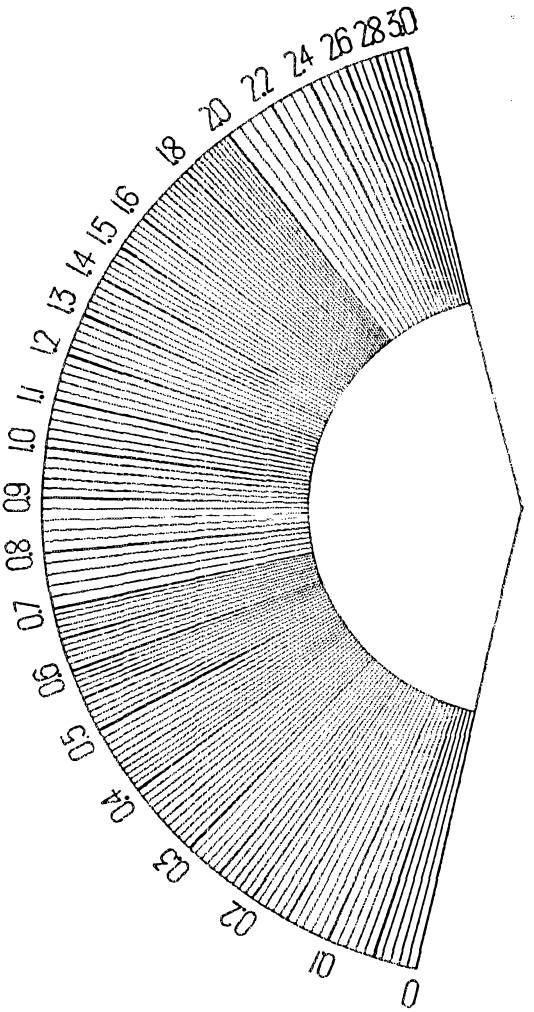


Fig. 4., Simple Decremeter Scale. Makes a direct-reading decrementer out of any ordinary wave meter having a condenser with semi-circular plates.

capacity calibrations. Even a semi-circular plate with the leading edge slightly trimmed is not satisfactory.

2. It must be remembered that this method is designed to be used where the resonance indicator is a current-square meter. If an ammeter is used the reading must not be reduced to one-half its maximum value but to the maximum value divided by the square root of 2, or about 0.7 times the maximum value.

The processes just described can best be illustrated by examples. Let us first determine the decrement of the wavemeter. To do this we place the wavemeter near an electron tube transmitting set having an output of at least 5 watts. Now we tune the wavemeter to the transmitting set. Keeping the condenser set at the resonance point, we shift the wavemeter toward or away from the transmitting set until a convenient deflection (preferably not less than two-thirds of full scale reading) is obtained on the current-square meter. Suppose that this reading is 80 on the scale. Now we detune upward until a deflection of 40 which is one-half the original deflection is obtained and at this point read the decrement scale. We will suppose the reading is 0.83. Next we detune downward, passing through the resonance point until again the deflection is 40 divisions. We will assume the decrement scale now reads 0.68. The difference between the two readings, 0.83—0.68=.15, is the decrement of the wavemeter, which must be subtracted from subsequent determinations of decrement made with this instrument in order to find the decrement of the circuit being tested. The following precautions must be observed in calibrating or measuring the decrement of the wavemeter:

1. The electron tube generator must really have no decrement, that is, it must operate on continuous current, not on an alternating or pulsating supply such as is obtained from a rectifier.

2. The generator must have an output considerably greater than is necessary to deflect the pointer of the current-square meter. A receiving tube is not satisfactory and a 5-watt sending tube is somewhat doubtful.

3. Neither the generator nor its coupling with the wavemeter must be changed during the measurement of decrement.

Now let us use the wavemeter to measure the decrement of a spark set. We tune the wavemeter to resonance as before and as before, move it toward or away from the generator until the deflection of the current-square meter is at some convenient value. We now increase the capacity until the deflection is halved and note the reading on the decrement scale. Suppose this is 2.06. Next we decrease the capacity until the deflection of the current-square meter passes through its maximum value and declines to half maximum again, and again we note the reading on the decrement scale. Suppose this is now 1.72. Subtracting this from the first reading, we have: 2.06—1.72=.34. Then .34 is $\delta' + \delta$, the added decrements of the wavemeter and the transmitting set. Since the decrement of the wavemeter has been found to be .15 the decrement of the transmitting set is .34—.15=.19. Since the accuracy of the meaurements is not high the second place cannot be too much depended upon. The figure had best be read as .2.

The following precautions must be observed in measuring the decrement of a transmitting set:

1. The decremeter must be coupled only to the antenna circuit to be measured, not to the primary or driving circuit. Consequently one should keep it well away from the oscillation transformer, six feet or so, and obtain coupling to the antenna circuit by placing the decremeter near the antenna or ground lead, preferably the latter. If the antenna current is small it will be necessary to make a single turn of small diameter in the lead to which the decremeter is coupled.

2. Extreme care should be taken in all decrement measurements in the various steps of the procedure especial attention being given to keeping the coupling constant. The sources of error in any decrement measurements are at all times considerable, particularly with open fixed spark gaps.

Reception Without Aerial

REGARDING the business of receiving without aerial or ground (concerning which, by the way, we will have some interesting data from A. L. Groves as soon as we find room to publish it), 2WM, Mr. Wm. Leyh, Ridgewood, N. J., has been copying DX on a Grebe CR-3 located in his cellar, using neither aerial or ground connection and with the primary circuit idle. The set was first tried out on the ground floor but only locals were heard, and it was discovered that results increased

(*Concluded on page 25*)

As The Reporters See Us

WITH thanks to Mr. G. R. Entwistle for the idea, 1ZE presents the following from the "Marion Blunderbust", a typical write-up of a radio amateur's activities as usually reported in the press.

Radio Amateur Hears Wireless Phone 3000 Miles and Does Other Marvelous Things

Benny led the way down a long winding pathway to the little shed where his wireless shack stands, and the reporter was duly impressed by the two tall trees on which hung several slender wires. Benny explained that these wires were the ground system for his wireless,and pointed with pride to the wires buried in the ground, where all his messages were caught and received.

Entering the shack, Benny thought he would see what was in the air coming out of the ground, and slipped the detector over his ears as he whispered "Hark! Here's a signal I well recognize. 'Dash dot, dot dash, dot dash', sure enough", said Benny, "there's POZ. That's all over the room." "Who is our friend POZ?" asked the reporter. And to his amazement he was told that it was Arlington, Va., sending the weather to Guam, Philadelphia. Saying this, Benny reached over and gave his rotary gap a swift twirl and with his free hand sent frantically to the man at the other end. Benny was asking POZ why he had neglected to send the time at the right time instead of wasting his time talking to Guam. The youthful operator frenziedly turned the knobs of his transformer, and pulled his antenna up higher in a last mad effect to get his wave cars in the upper strata. Most of this was greek to the reporter, but, as Benny understood, it was all right.

Benny now slid the slider on his phones and lit the oscillating transformer. He explained carefully that this was done so as to turn out the static which was very bothersome. No sooner was this done than a great wheezing noise came from under the table and smoke issued heavily from that district. But Benny, ever on the job, explained to the reporter that the grid condenser was leaking and some amateur in the tenth district was sore about it. The amplifier was next switched on, and it revolved at a terrific rate, giving off a loud series of bluish sparks, which were said to represent the dots and dashes of the code. Benny was calling NAA, Germany, whom he had often been in communication with.

After listening on NAA's short wave length, Benny was astounded to hear the detectors which were still clamped tightly to his ears tell him in no uncertain voice that "This is the Catalina Islands in the Pacific Ocean". Benny had heard it with his own ears and of course it was so. He had received a wireless telephone message three thousand miles away on his little set. It was his greatest regret that he could not talk back to him but he said he would make arrangements for the assistant at 1XE to do so the very next day. Benny's hot wire voltmeter was showing 2½ microhenries all the time this was going on, and the reporter was dumbfounded to learn that this was the way Benny told when his set was on the right tune, 290 wave trains per kilowatt hour, at ten cents a square root foot.

Benny now pulled a rope, quenched his gap, and pointed to a long Slitz wire, and when the reporter asked what he did with that, he replied in a high falsetto voice, "Hook 'er to yer bulb."

Aurora of Middle May

NUMEROUS reports were made in response to our request for data on the auroral disturbances of middle May last, from which the following are excerpted.

An Amrad transcontinental relay was scheduled on May 17th and resulted in a complete fiasco, due to the auroral effects. No Amrad station recorded DX signals with the exception of 9IF at Giltner, Neb., who heard 9OE, 9ANV and 5HZ, fading out entirely, and 5YH, uncommonly strong. The only stations heard by 2PL, 2DX and

2ALY were 3AHK and 3XQ, both swinging badly. 8AMQ, Rochester, worked a station 45 miles distant shortly before midnight, complete silence reigning thereafter.

M. Silver, N.Y.C., reports a most peculiar observation. On the evening of May 14th he was endeavoring to get a CW set working for a friend in Newark, and was puzzled to observe the antenna current frequently and suddenly jump from 0.7 amp. to 2.3 or 2.4 amps, accompanied by freak readings on the plate meter. The antenna was disconnected and the reading dropped to zero; reconnected, it again read 2 amps. Repeated efforts thereafter gave only flickering antenna and plate readings altho the set was OK, and work had to be abandoned.

2TT, New York City, reports that on the Saturday night when aurora was first observed, DX was fairly good; Sunday night everything quiet; Monday and Tuesday, sigs improved again and became normal.

2KV, Bronxville, N. Y., reports May 8 was last date in that period on which DX was heard. Watch was kept every night from May 8 to 20th and not a station out of day-light range was heard. On May 20 stations from 1st, 2d, 3d, 8th and 9th districts were logged but nearly all swinging erratically, especially 3IW and 8AXC who faded about 8 times per minute.

A. L. Groves, Brooke, Va., advises he experienced a "messing-up" of short wave work by intermingled harmonics on short waves from NSS and WGG, and suspects them of having added to the auroral effects in hampering reception. He listened in every night during the disturbance and found all amateur signals swinging "jerkily", but that *they would improve every time NSS shut down.*

D. C. Strawn, Calexico, Cal., reports that at the beginning the display was of a greenish tint, afterwards shading into red. Returning to his set after a half hour's watching, he found QRN increased to such proportions that phones could not be worn. Gave it up and returned outdoors for "an hour or two", and when next going to his set discovered a crackling brush discharge between antenna and ground binding posts, a distance of about four inches. Threw ground switch and quieted the racket.

6ABA, Altadena, Cal., reports aurora first observed at 7:30 p.m. May 14, while the western sky was still pink from the sunset. It was first seen in the northeast, greenish white, in patches. It is reported that the desert beyond the mountains behind Altadena was lighted up like day, and rangers in the mountains got on the job in the belief that they had a forest fire to fight.

V. Andrew, Wooster, O., advises that on "the night of the aurora" LY came thru clearer than ever, not so much louder than usual, but wholly without the usual "noises", presumably strays, that generally hamper copying him.

8WA, Detroit, advises that on the night of the 14th no DX sparks were heard in Detroit, but CW stations were numerous and QSA, without QSS, and not a bit of static, air being clearest ever heard.

8AXC, Marietta, Ohio, reports the effect lasted a week in his vicinity. On the first night, the 14th, neither signals nor strays were heard. On the 15th, at 10:15 p.m. DX suddenly began to come thru and he heard 8ANK, 8BO, 9ME, 8QY and 3XF. By 11:30 nothing could be heard. On the 16th 3VV and 4GN were heard. Nothing outside of day light range on the 18th, and on the 20th nothing between 9 and 10:12 p.m. but at 10:12 amateur DX came thru OK and was fine from then on.

8HR, Milton, Pa., reports no signals heard beyond day-light range and air sounding exactly like a "Sunday afternoon". All stations heard were QSA with no fading, which is peculiar as stations were heard without swinging who ordinarily at night QSS badly, notably 8XE and 3AQR, State College and Hershey, Pa., respectively. On the first night weird whistling sounds, starting as a low pitched clear note and going up the scale to a high shriek and then down to the same low note, were heard, especially noticeable right after transmission when the switch was thrown to receive.

9ZL, Manitowoc, Wisc., reports observations from NTY: during entire duration of aurora, night and day, a continuous hum of considerable intensity was heard, somewhat similar to the hum caused by a DC motor running nearby. No DX could be copied thru this hum, altho 600 meter DX was in the phones the same as usual. The hum was strongest while the aurora was at its greatest intensity.

9DRQ, Kansas City, advises aurora not visible on the night of the 15th but unusual radio conditions observed. Before 11 p.m. 9's and 8's galore were heard, but at about 11:20 they faded completely out and not a thing was heard thereafter except 5's. They faded, not as fading is commonly known but in and out about once a second, as regularly as clock-work, most of the calls being uncertain except 5ZA, who was heard once, and who, strange to say, was an exception in that he did not fade at all while heard.

9AZX, Jonesboro, Ind., reports no signals heard beyond daylight range, and NAA almost inaudible at times on press schedule, which is unusual. He experienced difficulty in getting his tubes to oscillate, and compares it with the trouble experienced when some form of radium is brought into the operating room. Anyone know anything about this?

9BW, Richmond, Ind., also a Morse operator, reports heavy and varying ground currents on the railroad wires, with intervals of 10 to 30 minutes when the wires would be in service. Listening in on radio at 11 p.m., a pronounced absence of static was noticeable. No stations out of day light range seem to have been heard.

9AHC, Ellendale, N. D., advised neither slightest strays nor slightest trace of DX signals heard on the 14th. On the 15th very brilliant aurora was noticed. Between 10:25 and 11 p.m. 9AKC and 9AKH and a few other unidentified 9's were heard, and also 5YH and 5IF were heard several times, just little more than readable, altho 5IF normally can be heard 25 ft. from the phones.

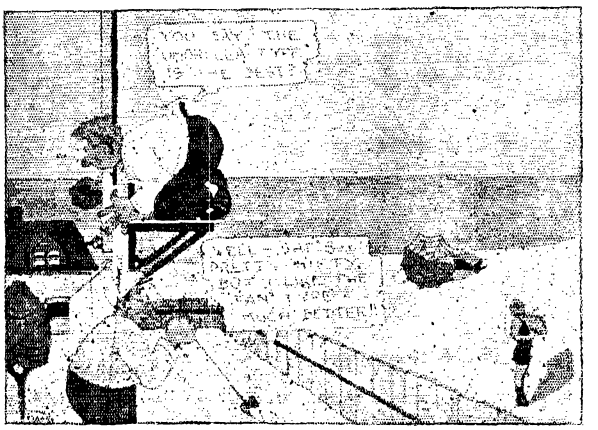
W. C. Bridges, 9YAC, Superior, Wisc., reports observations at NUX, advising that during the first two weeks in May signals from outside their normal day-light range were very seldom heard and then very weak. On the 14th NAA, normally very loud, was weak and unreadable thru a smothering sort of static. Up to the 20th almost no work was done outside the day-light range, but from 3:25 a.m. to 9:30 a.m. on the 20th, lower lake stations, and NRQ, KURJ, VBB, NUR, NUK, NTM and NRQ, all never before heard during day-light hours, were copied strong on galena and one step.

9AMU, Marshalltown, Iowa, reports air quiet on the 14th except for nearby 9's; not a trace of strays; NAA as QSA as ever.

A very interesting report of observations has been sent in by R. P. Worden, operator S.S. Charles L. Hutchinson, which was in the north central part of Lake Superior on the night of May 16. The observations were made on crystal detector during the transmission of Arlington, from 10 p.m. to 11:15 p.m. The display of aurora was preceded by a period of abnormally loud signals, steady without swinging. After the aurora started the signals would change as the auroral glow varied. The type of display which in every case produced loud signals was a wide-spread glow, or the appearance of an "arch" in the north and the absence of lights in other directions. On the other hand, brilliant "curtain" effects, red lights resembling distant flames, and streamers or beams radiating from a given point as well as any brilliant irregular display, seemed to produce either weak signals or marked swinging or frequently both. As the auroral display diminished in brilliancy, the violence of swinging increased, as did strays, and Mr. Worden's log shows that at 11 o'clock NAA was swinging rapidly between strong and inaudible, very little aurora was noticed, and strays had increased to steady grinders. At 11:05 NAA finished, the aurora had disappeared, and the grinders were only moderate in intensity, while at 11:15 all strays had died out and entirely normal conditions had returned.

It will be noted that the duration and brilliancy of the display varied in different parts of the country, as would be suspected. In some sections short-wave DX was tied up for a week, while in New England the night preceding the display (i.e., Friday the 13th) was a dead one but conditions were getting back to normal on Monday the 16th, some DX being heard.

We hesitate to draw any very definite conclusions from these meagre reports but we believe it is shown that the ionization evident by aurora results in the more or less complete absorption of that component of short-wave signal energy which depends for its propagation on its ability to travel over a stratum of "atmosphere" normally of low absorption. In other words, in heavy aurora amateur DX is absorbed, as are strays, and conditions almost identical with those of normal day-light work prevail.



A New Rectifier Scheme

AT the Third District Convention in Philadelphia recently, Mr. Harry L. Strang, 3IL, of Washington, described an ingenious rectifier system used to supply the plate power for his radiophone.

This consisted of a transformer having an open-circuit secondary voltage of 450 volts, two "73 puncture-proof" 5 mfd. condensers, and a bank of 24 small rectifier jars, 1" square and 6" deep containing 7/8" x 5½" electrodes of lead and aluminum separated by Bakelite blocks, the electrolyte being sodium bicarbonate. This apparatus is connected as shown in Fig. 1, and the rectifier itself is depicted in the halftone.

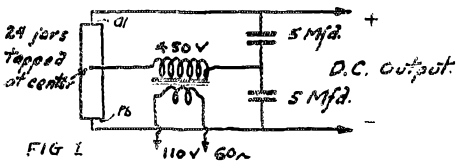


FIG 1

Now theoretically if the secondary alternating voltage is 450, the D.C. voltage will be 900. This is due to the fact that first one condenser and then the other is charged to the secondary voltage of the transformer and the two voltages, being in series, add. The impedance of an ordinary voltmeter being so low that the voltage drop was too great to permit verification by such measurement, the output of the rectifier was connected to an oscillograph with a high resistance in series, and the voltage determined graphically. It was found to be twice the secondary alternating voltage. It was further found that when the impedance of the oscillograph was reduced to 2500 ohms, (equal to the input impedance of the two-tube set with which the rectifier was to be used), the voltage dropped to 500. Since this was the value desired, several additional tests were made to determine the rectifier characteristics under operating conditions.

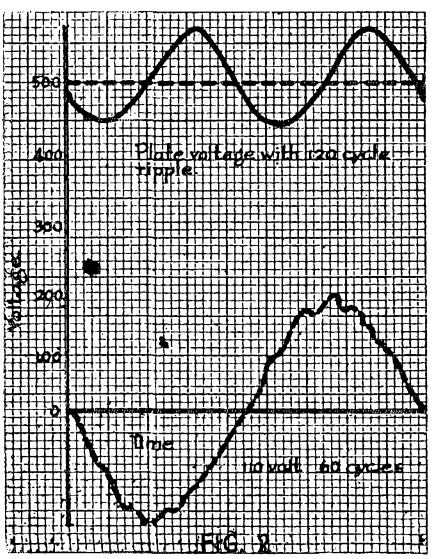


FIG. 2

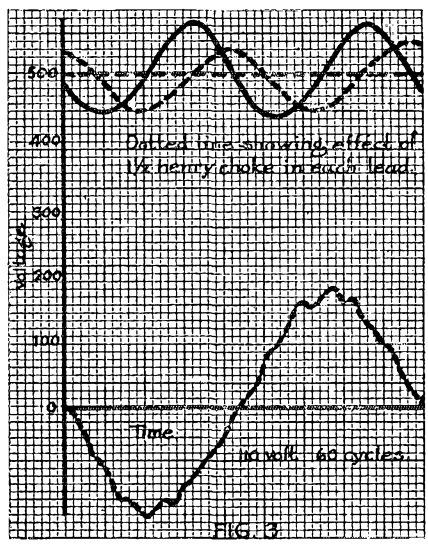


FIG. 3

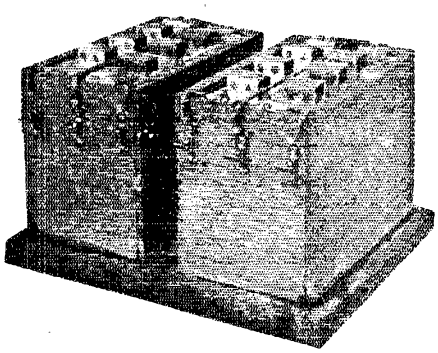


Fig. 2 shows the form of the applied 110 volt alternating potential and the rectified voltage wave with its attendant double frequency ripple, the voltage apparently varying about 75 volts on either side of the mean, 500 volts. This ripple of course is an objectionable feature, and altho 3IL

has done very satisfactory phone work over a distance of but a mile and a half with modulation excellent and voice intensity much greater than the A.C. hum, a filter circuit should be used to reduce it. To determine the effect of a filter, 1½ hy. chokes were placed in each lead. Fig. 3 shows the decrease in the intensity of the ripple and the attendant phase displacement due to the added inductance. It is evident that the ripple is not sufficiently reduced unless capacity is also used, this time across the leads beyond the choke coils, then giving the usual form of filter circuit. In Fig. 4 the effect on the ripple is quite noticeable, the voltage apparently varying but about 25 volts on either side of the mean.

Mr. Strang will gladly give further information to anyone enclosing a self-return envelope.

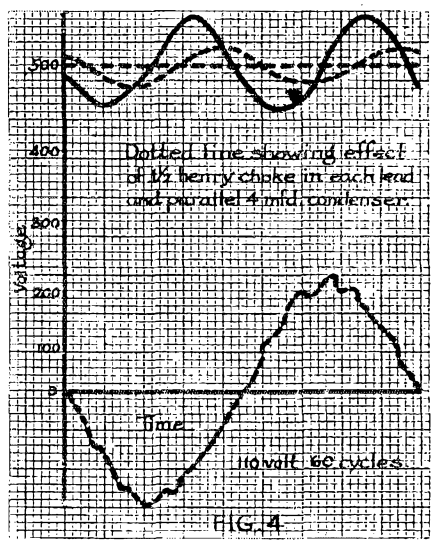


FIG. 4

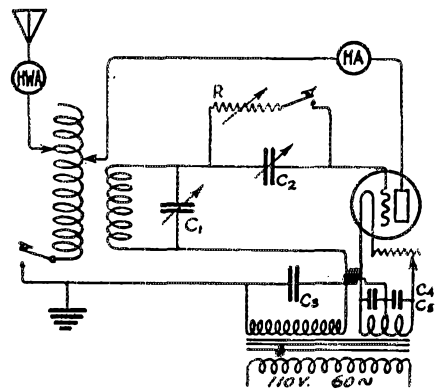
An Interesting C.W. Contest

THE Radio Club of Hartford (affiliated) recently conducted a very interesting contest in the building of C.W. sets. Several months ago the rules were drawn up and about a dozen members entered. The idea was to devise a simple inexpensive C.W. set of low power, preferably operating from 110 volt lighting current, to supersede the spark coil in the small stations about town. The sharper wave and greater distance with reduced interference made this very desirable, and the Radio Club of Hartford is to be commended for instituting steps that can well be followed by other cities in the reduction of QRM.

One of the members of the club offered a silver loving cup as a grand prize, and in addition there were five 5-watt power tubes offered by the club. The rules called for the award of the prizes to the men having the highest scores on the following basis:

Overall electrical efficiency	50%
Workmanship	20%
Ingenuity in construction	15%
Economy in cost	15%
	100%

The awards were made at the final meeting of the club before closing for the summer, and eight contestants were on hand with their sets. These were of every imaginable description, but mostly following the general idea of a small base bearing a vertical panel carrying the controls, with the apparatus behind. Considerable ingenuity was displayed in the source of power. Several of the sets used step-down ("toy") transformers on the 110 volt supply, the low potential current thus obtained being used both to light the filament and to operate a spark coil with regular interrupter, the secondary voltage of which was dropped by a shunt condenser and then fed to the plate of the tube.



These sets of course would operate from a storage battery equally well.

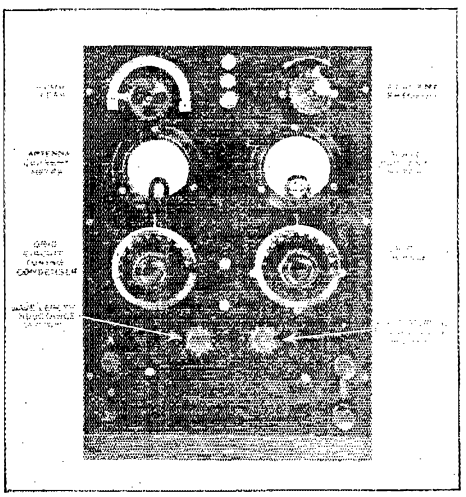
It was a condition of the contest that the operating wave length should not exceed 200 meters, and thru faulty design only two sets were able to achieve this—those submitted by J. C. Randall, 1ANQ,

Dist. Supt., and F. H. Schnell, 1MO, our Traffic Manager, who is incidentally vice president of the club. Both of these sets, however, were able to get down to 180 meters, altho readings were taken at 200. A phantom antenna was used, consisting of a 12-ohm resistance and a mica condenser of .0005 mfd. capacity, in series with a Jewell thermo-couple ammeter.

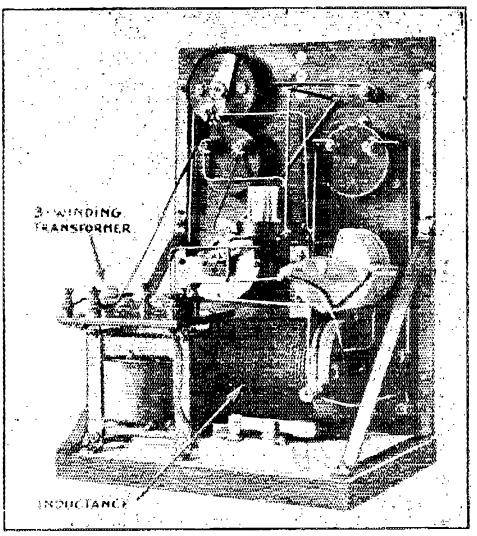
Mr. Randall's set was an experimental one, very neatly mounted on a large drawing board, and connected up very similar to the schematic hook-up. It used a 50-watt Radiotron excited by an Acme 250-watt transformer and achieved an over-all efficiency from supply mains to antenna of 13.65%. The transformer was probably too large for the tube for utmost efficiency, and the iron losses seem to have been relatively large, whereby 1ANQ was handicapped in his competition with 1MO.

Mr. Schnell's set made an over-all efficiency of 18.82%, putting 1.12 amps. in the 12-ohm antenna at 200 meters while drawing 80 watts from the line; antenna watts, 15.1. His set was declared the winner, altho the decision was very close, and he was awarded the cup.

Photographs and the hook-up of the winning set appear herewith. It uses a single 5-watt Radiotron and achieves its 15 watts in the antenna with 750 volts on the plate, the plate current being 46 m.a. At this input the plate remains unchanged



in color. The oscillating circuit is the one described by Mr. Whittier in the July QST. The inductance is a Tuska No. 181, built into the panel, and the transformer, which has three windings, was built to order by Thordarson. Inside the inductance the tickler may be seen, which consists of 25 turns of bell wire on a form 2½" in diameter. This is shunted by the variable C_1, the tuning of which is critical. The grid variable, C_2, might just as well be a fixed condenser of .0003 mfd. C_3 is a mica by-pass, capacity not critical, preferably about .002. C_4 and C_5 by-pass the radio component across the two halves of the filament windings, and are small paper condensers of .001 mfd. The grid leak, R, is an ordinary graphite potentiometer sector used in series as a variable resistor. Mr.



Whittier uses the key in series with the grid leak, but in this set such operation caused a continual "gurgle" when the key was idle which was very distressing for local work, altho it disappeared at a distance. To overcome this the key is now placed at the bottom of the inductance as shown. The general arrangement of the set will be apparent from the photographs.

This set gives the familiar "one-side-of-the-cycle" note which when heterodyned is not at all unpleasant. During June 1MO has worked 2KL, Redbank, N. J.; 1UN, Manchester, Mass.; 2UD and 2AJW, New York; etc., which speaks for the carrying powers of the C.W. in summer.

The cost of this set, including tube, was $34.00.

RECEPTION WITHOUT AERIAL

(Concluded from page 19)

as the set was lowered below the ground level. Evidently the action is similar to buried wire reception; i.e., by propagation thru the ground. The stations heard, then, (including NSF, 8BC, 8RQ, 8AGK, 8OZ, 8JL, and many 2's) are probably within the daylight range of 2WM.

The scheme is well worth trying out, as static of course is practically absent in such reception.

Regarding That Summer Achievement

By S. Kruse, Chairman, Committee of Judges

THERE is a fixed impression that the Summer Cup is to given for summer traffic work. Now station performance is admitted to the contest but the contest is *not limited* to station performance. That's not the idea at all. Look back at the announcement. The cup is to be given for ANY NOTEWORTHY ACHIEVEMENT and we surely hope that it will be for something doing us more permanent good than the getting off of a flock of summer "greetings via radio." Here are a few suggestions:

Receiving sets—We have not a receiving set that is really very good for CW and also really very good for sparks. We have the two separately but when they are combined we have in the past always lost either the ease of adjustment on CW or the selectivity on sparks. Who will design that new set—and prove it to us?

Duplex working—At present we waste too much time caling and signing and tho we have heard of break-ins since 1907 none of them are today good enuf to be in general use. We need one.

Rotary gaps—We still have not got a quite satisfactory gap. Can't we have one that will handle a 40,000 volt transformer safely, cause the discharge to happen in a gas, and muffle it with some degree of completeness? Several of the new gaps meet *some* of these requirements.

Condensers—Has anyone seen a condenser that will stand up on a coffin with a 60 cycle "synk" gap?

C.W. transformers—Have you a tube set with a good power factor? Those we have seen are terrible. How did you get the good power factor—90% or better?

Electrolytic rectifiers—Electrolytic rectifiers for plate are the coming thing. Has any one of you any really *complete* experimental data on the proper solution—proper elements—size of elements per ampere—proper operating conditions—with a complete set of meter readings to back up your statements? A really trouble-proof electrolytic set would come pretty close to being the "achievement."

C.W. sending sets—We have yet to see a CW set that does not have some very marked circuit defect—either the high voltage is on everything in the set and makes it deadly—or it is on the antenna waiting for the innocent passerby—or the same variable tunes two circuits—or the circuit works best at 360 meters—or the hook-up contains two tuned circuits and flops around between the two waves such a set *always* has—or perhaps the adjustments are too critical—something always has seemed to be wrong. Have you the ideal circuit?

Kick-Back preventers—The so-called kick-back that is really high frequency induction has been with us since 1906. Have you any comprehensive information, backed up by data and experiment and sketches, to prove that some method you can give will *cure kick-backs?*

Grounds—Mr. Stroebel has given us a masterly antenna article. Has some one of us an equally good article on grounds available? It will have to be most awfully good to get into the same class.

Litz and solid wire.—The old scrap between ribbon and litz has started all over again with the advent of the tubes. A lot of our tube men seem to think it needs settling again. Someone in this outfit has the experimental facilities to settle it.

Radio Amplifiers—There does not seem to be such a thing as a good short-wave radio amplifier. Now *radio amplification has audio lashed to the mast* for it amplifies the thing we want instead of specializing on the station and the street cars as does the audio stage. A good short-wave amplifier of one or two stages would be a great blessing. But it has to be a good amplifier and preferably so constructed that it does not "smear" the best thing we have—the tuned plate regenerative tuner.

The QRM situation—Some city—some radio district—must soon produce a system for a better division of time and privileges. There is no use at all in attempting to sidestep the plain fact that no one has the *right* to use the ether as he wills without consulting his neighbors. Somewhere the *best* scheme is being tried out. Is the scheme yours?

A non-radiating receiver—As more of us receive CW we will fill the ether clear full of radiation from our receiving sets. We need a device to cut that out. A receiving set is not supposed to send and *no one is supposed to send out a continuous smear of radio for hours.*

Tube control—At present we use rheostats in the filament circuit of our gas tubes that work by running a slider over a wire coil. It is not fine enuf for a gas tube. We need a perfectly smooth adjustment. A compression rheo would be f.b. if it had enuf range and worked smoothly and was not bulky, but so far none of them do those things. In the plate circuit we use a potentiometer (which wastes battery) or a switch (which is not fine enuf) and neither quite fill the bill.

A good ICW system—We have heard ICW sets that swung in wave length, others

that changed pitch, others that change tone quality, but darned if we ever heard one that stood still and let you *copy* it. Will someone *please give us a decent way of modulating without using another fortune in tubes and apparatus.*

Now there is a good bunch to start working on. The list is not complete and of course any other good thing you can think of is worth going into. If you do a good job of it never fear that QST will overlook your work—cup or no cup. Anyone that has some real radio information "rates" space with us.

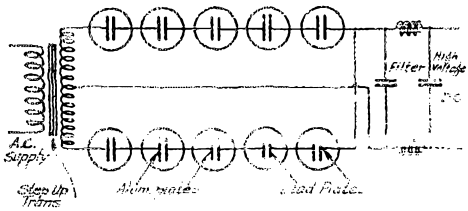
And recollect also that station performance is not barred—it just isn't the *only* candidate.

The gentlemen tentatively mentioned in the July QST as forming the committee of judges have all accepted. There is one for each radio district. When a real accomplishment comes to your notice, please report it to the judge for your district.

Operating Notes on Electrolytic Rectifiers

By Roy Atkinson

WHEN an aluminum plate and a lead plate or a carbon plate are placed in certain solutions, such as sodium borate or ammonium phosphate dissolved in water, a current can be made to pass in but one direction, namely, from lead to aluminum. In other words, by using a step-up transformer and electrolytic rectifiers, you will get a unidirectional, pulsating current which can be used for the high potential in C.W. work, as effectively as vacuum tube rectifiers or a motor-generator.



The step up transformer that I am now using with 12 jars will give an output of 620 volts and 210 M.A. Using an "Acme" 200 watt C.W. transformer and 8 jars, D.C. output of 450 volts and 125 M.A. can be obtained.

Best results were secured by using 1 pint Mason jars filled with a saturated solution of ammonium phosphate in which an aluminum plate 3" x ⅛" x 1" and a lead plate of same dimensions, spread 2" apart, were immersed. [Note: Carbon or polished steel can be used in place of lead, and sodium borate (Borax) can be used in place of ammonium phosphate.]

The greatest trouble will be in forming the aluminum plates. This process usually takes from 1 to 2 hours and is usually hard on the transformer, as there is practically a "short" in the secondary coil, and should be done intermittently. It may help matters by first oxidizing the aluminum plates over a flame. When the aluminum plates are functioning properly there is a sparking all over the plate. When taken out these plates can be seen to be covered with a white coating of small crystals. This coating acts as a valve, allowing the current to pass in only one direction. The better this plate is formed the higher the voltage that can be rectified.

If, after two hours, the aluminum plates fail to spark, take them out and you will find that they have black "scabs" composed of black crystals, over them. These "scabs" act as a short between the element and the solution without any rectification and therefore destroy the valve action of the jar. The plates that form "scabs" should be taken out and cleaned. A good plan is to start over again with new solution and a new aluminum plate.

As the temperature of the solution increases the leakage of current becomes excessive and the efficiency decreases. Best results are obtained by keeping the temperature of the solution below 110° Far.

One might think that the output from an electrolytic rectifier would be hard to smooth out for phone work, but this is not the case, as tests were made by using the same filtering system for a vacuum tube rectifier, an electrolytic rectifier and a motor-generator, and the reports from listening stations showed that, so far as filtering was concerned there was practically no difference in the three.

Remember:

The necessary number of jars increases with the increase of the voltage to be rectified.

The efficiency decreases with an increase of temperature.

The efficiency increases with a decrease in current.

The better the plates are "formed", the higher the voltage that can be rectified.

Three-Phase C. W.

AN interesting development in the application of alternating current to C.W. work is the use of multi-phase currents so arranged that each phase supplies a separate oscillator and the oscillatory outputs overlap and are combined in the antenna. The idea is hardly one that will appeal to the average amateur because most of us have single phase current in our stations, but college laboratories, etc., would do well to experiment along this line as it is most promising.

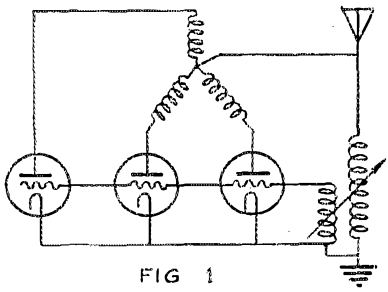


FIG 1

The general idea is shown in Fig. 1, taken from British patent No. 127,008 issued to Societe Francaise Radio-Electrique, and somewhat more detail given in Fig. 2, taken from U. S. patent No. 1,373,710 issued to V. J. F. Bouchardon. In Fig. 2, G is a 3-phase generator the star connection of which is completed thru the filaments and each phase of which is stepped up in voltage thru the 3-phase transformer whose primaries and secondaries are marked P and S, respectively.

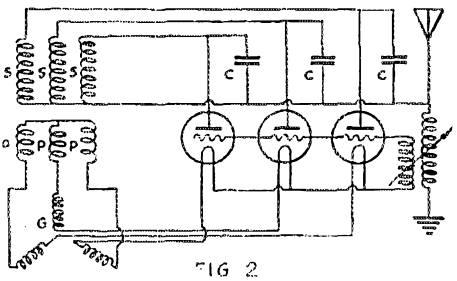


FIG 2

Condensers C are provided to byepass the radio frequency around the transformer windings.

Both of these diagrams are seen to have a series plate supply and it seems to us that an improvement would result if parallel supply were used so that large reactances could be placed in the leads to reduce the supply modulation. We would also suggest to experimenters that since each tube is idle about half the time, this 3-phase idea might be combined with the scheme of using a duplicate arrangement to employ "the other half of the cycle", as is becoming popular in our single-phase C.W. sets, thereby still further improving the quality of the output. The Editor would be glad to hear from anyone who has experimented along these lines.

Grid Potentials

By Harold F. Hastings

IN undamped receiving circuits, the writer is of the opinion that better results can be obtained by eliminating the grid condenser, and, when necessary, using a grid biasing potential. When the grid condenser is eliminated the bulb is never deadened by strays or loud signals, and the operator is never bothered with howling or bubbling.

In most cases where Western Electric VT-1's are used, simply connecting the negative A, negative B and secondary leads together as in Fig. 1 will work satisfactorily. The characteristics of most other bulbs, and in some cases the VT-1, make it necessary to use a grid biasing potential. The device to secure this is

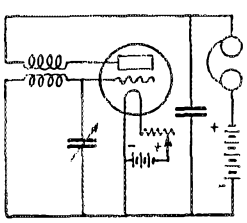


FIG. 1

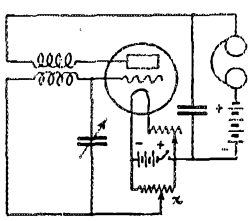


FIG. 2

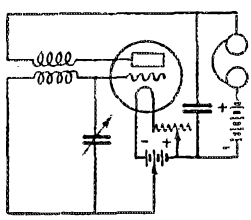


FIG. 3

shown at X in Fig. W, and consists of a slide contact resistance of not less than 60 ohms and not more than 100 ohms, shunted across the A battery and with the slide or variable contact connected to the secondary lead as shown. To adjust, vary the slider and at the same time open the coupling between the grid and plate coils until the minimum coupling that still allows the bulb to oscillate is obtained. If the experimenter does not care to go to the expense of making or buying a slide contact resistance, let him try the variable lead on each different cell of the A battery as in Fig. 3, and loosen the tickler coupling as described above, making sure that the positive A battery is connected to the negative B battery.

A Method of Obtaining High Plate Voltages

*By Robert E. Goll**

HAVING noticed several articles in the recent numbers of QST pertaining to methods for obtaining the desired high plate voltages used in conjunction with valve transmitters, the writer recalls to mind a rather simple arrangement developed by the French engineers during the late war which he observed while attending the Advanced Radio Engineering course at the Sorbonne, Paris, after the conclusion of hostilities. As the French field sets (E-3, E-3 bis, and E-10) use a plate potential of 320 volts, this unit, known as "Convertisseur Type B," is designed for that voltage. The writer, however, recently constructed a set along the same lines, but operating from 110 volt D.C. mains and producing in the neighborhood of 3000 volts at secondary terminals; same being used in conjunction with Telefunken valve transmitter with very good results. The operation of these sets is very simple. By substituting transformers with ratios giving voltages best adapted to your needs, operating same from either storage cells or generator, and employing the commutator arrangement described below, it is possible to overcome the expensive high voltage generator drawback.

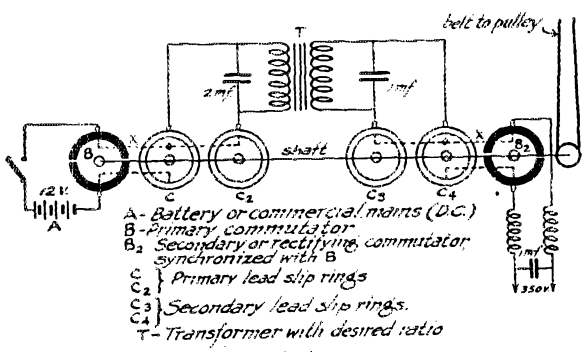


FIG 1

The French set operates as follows (Fig. 1). A is an accumulator supplying 12 volts which, by means of commutator, B, is converted into A.C. and fed to transformer primary through slip-rings, C, C-2. After being raised to the desired potential, a second commutator, B-2, SYNCHRONIZED WITH THE FIRST (mounted on same shaft) rectifies this high voltage A.C. which is further smoothed out by means of capacities and chokes. The commutators are of the two segment type, and as the motor drives them at an approximate speed of 2400 r.p.m., in the neighborhood of 80 reversals (40 cycles) per second are obtained through the transformer.

The only difficult feature of the construction is the commutator and slipping arrangement, and, after wasting a considerable amount of time, energy and good humor in a vain attempt to procure commutators and slip rings to suit the purpose, I finally decided to construct same myself. To this end a Bakelite rod 1 inch in diameter, and a brass tube with an inside diameter of 1 inch were used. The tube is forced over the rod and then sawed into six sections 1 inch in length. The two sections to be used as commutators are then drilled, tapped, and fastened to rings divided into two segments by means of a saw. These commutators, together with slip-rings, are then drilled through exact center, and forced on ¼ inch shaft in the order shown (Fig. 1), the assembled unit being mounted on bearings which allow it to revolve freely, and connected to motor shaft. It is advisable to drill a second hole in two of the slip rings through which wires X are led from commutators B and B-2 to slip-rings C-2 and C-3.

The eight brushes are then mounted, connections made as per diagram, and the two commutators adjusted to synchronism. The latter adjustment can be made by simply twisting commutators on shaft until position is reached where D.C. voltmeter

ceases to fluctuate. This result will be obtained when both commutators are "in

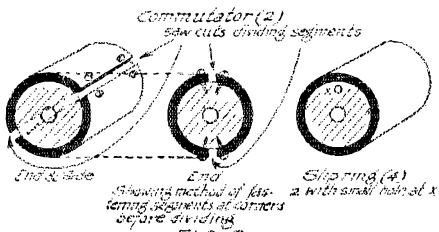


FIG 2

line," providing commutator brushes are also "in line."

No doubt those who construct one of these sets will incorporate their own ideas as regards shaft bearings, motor couplings, brush mountings, etc.; therefore a description of these details has been purposely eliminated in order to conserve space. Should, however, anyone desire additional information, the writer will be pleased to furnish same upon request by addressing him at 1342 East 22nd Street, Brooklyn, N. Y.

*Chief Eng., European Radio Co.

Rude Radio Men

(Extracted from London "Star")
By W. W. Burnham, M.I.R.E.

(The following short article will give our readers some idea of conditions and activity in England, and is interesting in informing us that one of their chief causes of QRM comes from a source that, strangely enough, has not yet amounted to much of an annoyance here.—Ed.)

THE Wireless Society of London has begun a campaign against rude radio-men.

Nothing more exasperates the wireless experimenter than having to remove his headgear to escape the tintinnabulations of some inexperienced novice who delights in filling the ether with superfluous magnetism, stodgy Morse, and a monotonous repetition of such questions as "Please how is my note?....Is it good?...Can you hear me O.K.?...I am receiving badly, are you?" So the Postmaster-General is to be asked to put a stop to radio-rudeness and incompetent operating by allowing approved societies to police the ether and run down all offenders.

They "Jammed" America

It should have been done long ago. The recent amateur transmissions from America were undoubtedly "jammed" by ignorant people at this end. Like a boy with a new motor-cycle who scorches up and down his suburban road to test its 40 m.p.h., the wireless novice switches on all his receiving valves, hears stations he has never heard before, buys more valves, switches them on too, hears still more stations, and starts saving up for still more valves. He doesn't stop to consider that his receiver acts throughout as a miniature transmitter, that other experimenters can hear him receiving, and that if a weak signal is amplified and magnified it is drowned in the multiplied howls and hoots of his many valves.

During the American test (when amateurs "over there" tried to get into touch with British amateurs using only small power), I picked up a very weak American signal on the night in question and was breathlessly magnifying it when some brainless novice two streets away switched on his transmitting instruments and said, in a note that wobbled precariously and in Morse that seemed to be sent with his left foot: "Please has anyone heard America yet? What is the correct time please? Please answer." By the time he had finished trying his spark and asking everybody why they didn't answer him, my American had either finished his program or gone to sleep: I heard no more of him.

Filament Transformers

CONTINUOUS Wave Radio Telegraphy and Telephony for the amateur is now emerging from the experimental stage to the practical working stage and, as every one agrees, is destined to be the form used almost exclusively in the near future.

Until recently C.W. has been held back by the lack of available sources of high voltage D. C. and other necessary apparatus. Now however, by means of rectifying tubes, condensers and choke coils, high voltage D. C. is available for all equipped with the proper transformer and an alternating current supply. This same source of alternating current can be used for heating the filaments of all tubes used, thus doing away with storage batteries. To accomplish this most satisfactorily, a transformer should be used to reduce the line voltage to from 8 to 10 volts secondary. This secondary should be tapped in the center so that the grid circuit may be connected to the filament at a point of practically zero potential. If the grid circuit is connected to either terminal of the transformer secondary, the grid potential is alternately varied from 8 to 10 volts positive to the same negative, and a modulating effect is produced in the plate circuit causing the C.W. to be varied at a frequency proportional to that of the line supply.

(Concluded on page 46)

EDITORIALS
de AMERICAN RADIO RELAY LEAGUE

Greetings!

AS this issue of QST is mailed, the A.R.R.L. is realizing an ambition of years —a National Convention. In Chicago, August 31st to September 3d, we meet from all over the States and the Dominion, in the greatest congregation of Amateur Radio enthusiasts ever assembled, and at this writing the finishing details are just being put on a program that will break all records for things of interest to radio folks. The Chicago Executive Council has worked hard for months in the handling of the administrative details and now it is assured that the affair will be a splendid success.

QST sends greetings to the First National A.R.R.L. Convention and Radio Show! May we all have a good time, learn much, and have renewed in us that spirit that stands for all things good in Amateur Radio—the old A.R.R.L. spirit!

The Spark and the C. W.

CERTAIN of our good friends have pointed out to us that we are in danger of starting an unprofitable controversy between the Spark and the C.W. These friends, endeavoring to view the matter unprejudicedly, cannot agree that we have been quite fair to the Spark. From which it seems that we should say something for ourselves.

Let us study the situation a little. That both types of sets continue to be installed indicates that both have virtues. That both are criticized shows that they both have defects. In favor of the spark we can mention that short calls are heard because the wave is not too sharp, that it is easy to copy and hold and the receiving sets don't jam each other, the power can be readily changed, and each station has an individual characteristic that identifies it. On the other hand the broader wave causes more QRM and static breaks up the reception. The C.W. is vastly more efficient in transmission, quieter in operation, causes less QRM, and gets thru the static better, but on the other hand it is hard to tune in, the wave shifts, receiving sets jam each other, and the sharpness of tune is so pronounced that most C.W. stations are guilty of making illegal calls and interminable and unsigned tests.

Now a study of these things led us many months ago to the belief that C.W. would be a very much better transmitter for us amateurs than the spark, and QST has been whole-heartedly boosting C.W. Our faith in it grows as it begins to do the things we looked for and as one after the other of its objectionable points are overcome, and we continue in our belief that it is nearer the ideal than the spark. But we recognize the merit of the sparks and do not want to be considered ever as throwing mud at them. We want the C.W. to win, if it can, on merit. Good-natured rivalry is a healthy sign, we think, but we hope that absolute fairness, real sportsmanship, and co-operation will characterize the work of A.R.R.L. members. We are in trying days, with legislation pending and with the financial situation affecting our manufacturers, and we don't want a row that will divide us into two camps who will conduct jamming contests or engage in verbal battles.

Let the C.W. win on sheer merit if it can, and if it can't let's junk it by all means. QST pledges itself to a policy of rigid fairness, and its pages will be devoted, as ever, to the endeavor to improve short-wave communication.

The Coming of Fall

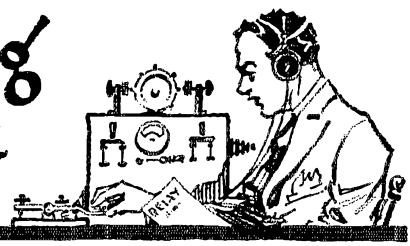
IT seems to us that no fall season has ever been more eagerly awaited than that one which is due to start its visit with us this month. The weather has seemed hotter than usual this summer, the strays have certainly been fiercer than is their wont, the Great Outdoors has been hard to resist, and our radio work has suffered. All hail, then, to the coming of decent WX!

Night by night now the static will be less severe, the absorption less marked, and in just a little while we will be again in our element, with cold starlit nights of crystal clearness when signals go reaching out and out and on and on to distances that fill us with pride for our chosen hobby. Let us not be found wanting when good air comes to us once more. To work, then, O.M., with right good will, and let's be set for the greatest season in Amateur Radio.

QST's advertisers offer a most enticing and complete array of equipment, and surely from our advertising section one can pick everything needed for an A1 station. And it's almost needless, we hope, to remind you to always mention QST in writing them—it helps all around, you know.

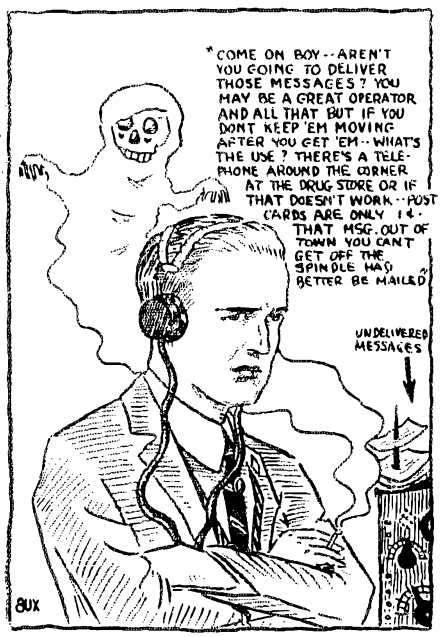
The Operating Department

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



MESSAGE traffic has fallen off so badly that we have not enough to show for the entire Operating Department. It seems that the heat keeps the "gang" out of doors and the QRN prevents those who would attempt to work.

This report will be read in QST at the National A.R.R.L. Convention in Chicago and the Traffic Manager invites construc-



Don't let this bugaboo have occasion to bawl you out like this—deliver that message without delay.

tive criticism for the betterment of our Operating Department reports. Suggestions will be given due consideration and you are invited to make them in person. Suggestions also may be left at the A.R.R.L. booth or may be given to any member of the Operating Department who will forward them to this office. If there are any questions that you want to ask, please feel free to hunt up the Traffic Manager and state them. We are out to improve this Operating Department and we are going to do it. You fellows have many good ideas but you just do not take the time to submit them. Our chance to get together is right at the convention and I feel sure that if we can get in touch with each other we can develop some new kinks that will be interesting to us all.

First honors in traffic handling this month go to the Northwestern Division.

MUMFORD BROS., 7ZJ
Vancouver, Washington
324 Messages
Northwestern Division.

The biggest thing that I have on my chest this month is the old story, NON-DELIVERY OF MESSAGES. For gawd-sake if you accept a message, deliver it without delay or mail it. This has become a bugaboo in amateur relaying and it must be eliminated if we are to uphold our prestige. If you do not intend to deliver your messages do not accept them.

The division reports follow:

NEW ENGLAND DIVISION
G. R. Entwistle, Mgr.

Conditions in and around Boston are extremely bad for DX work and, in fact, for any kind of radio activities. Reports, or rather lack or reports, seem to prove that the same conditions hold throughout the New England Division. Electrical storms are a common occurrence and the QRN hangs on all of the time.

Robinson (1CK) has been off the ether for some time now and is erecting an entirely new antenna system. Many of our most reliable operators are either reconstructing their stations or are on vacations. The closing of schools and colleges has also placed an extra burden on the few fellows who still stick.

The O.W. at 1XE (Miss Eunice Randall) has opened up a station at her home in Mattapoisett. This is an A.R.R.L. station and Miss Randall holds a 1st grade amateur license.

2OM was in Boston and visited some of the fellows about July 1st.

Supt. Johnson (1DY) is still on the air and is attempting to hold up Boston's end of the DX work.

A.D.M. Mix (1TS) advises that many times the number of reported messages (110) were actually handled in his section. Much interest is being shown in CW relaying and there are now more CW than spark stations handling traffic. Daylight communication has been established between Bristol, Conn., 1TS, and New Haven, 1QN, and Bridgeport, 1HO (spark). 1AJP has been coming through fine lately on a new CW set. Daylight work (noon) has been accomplished between 1TS and 2AQM, 2ADL and 2BML and also with 9ZN at 6:30

A.M. 1ANQ is doing fine work and handling a bunch of traffic. He is being reported regularly in the 8th district. 1AJP in Bridgeport works 1QN without trouble. 1AJU has increased his spark power and is breaking through well.

1WC is now in operation at Plymouth, Mass., for the period of the Tercentenary Celebration and will handle traffic, broadcast police reports and press. This station has been installed by the Massachusetts Radio and Telegraph School and consists of two 50 watt tubes with accessories. 1WC will operate on 325 meters, CW, modulated and phone using self-rectified A.C.

Traffic Reports: 1ZE, 182 messages; 1DY, 120; 1ASF, 81; 1TS, 76; 1HO, 26; 1LZ, 20; 1BM, 8. Total 513.

ATLANTIC DIVISION
Chas. H. Stewart, Mgr.

Ass't D.M. C. J. Goette reports thru his superintendents as follows:

Northern New Jersey, F. B. Ostman, Supt: Considerable traffic is moving over the reorganized route through this section for Philadelphia and other Pennsylvania points. The bulk of the traffic is being handled by 2UE, 2OX, 2BG, 2SQ, 2OM, 2CL, 2ALY, 2RU, 2ACD, 2KY, and 2UK. Plans are under way for a Jersey Shore Route and stations wishing appointments should communicate with the above. Msgs. reported, 2BG-21; 2OM-106. Another appeal is made to all stations that reports must be in my hands by the 17th.

Hudson Valley, C. E. Trube, Supt.: Traffic is still moving well despite the QRN. East-and-west traffic is going through. There seems a tendency to install small CW transmitters and traffic is being handled on these sets. 2BFZ is taking the lead handling traffic with 1st, 3rd, and 8th district stations using but one 5 watt tube. 2GR and 2UA lead in spark work. 2UA handled 141 msgs. last month. 2AID and 2DJ are starting in relay work. 2OA has quit the game. (He will come back.—T.M.) His gap must be filled by 2UA or 2DK. 2BK is being remodeled and a mast of 100 feet will be a new addition. 2BK had the pleasure of meeting 8FE and 8AWP while in Buffalo. An invitation was extended to all to come to New York whenever possible. Schaefer, 8AGK, lost no time in accepting for he immediately bought a Ford and came rattling down and stopped at a boarding house opposite 2BK. 2UA has a regular schedule with 1DY.

Northern District, Benzee Bros., Supts: Total messages for this district, 229. City Manager of Elmira reports 13 msgs. City Manager Graham of Rochester reports 48 msgs. No reports from Jamestown, Lockport, Niagara Falls or Lancaster. S. Woodworth, 8AWP, has been appointed City Manager of Syracuse. His address is 425 Brownell St. Write to him for appointments. 8AWP handled 169 msgs.

New York City, E. A. Cyriax, Supt.: 2DI is on the job and cleared 104 msgs. with stations in the 1st, 3rd, and 8th districts. Tests are being arranged for daylight tests with 3HJ and 3CC. The Fordham Radio Club stations are doing good work with stations in the above named districts, 2XK handling 71 msgs., with a total of 83 for the club stations. 2ACY is acting as local distributor, 2ACT is handling the New England traffic, while 2XK reaches the west. These are all CW stations.

Long Island District, H. E. Collins, Supt.: 2EL and 2AJW are about the only stations handling traffic as most of the other stations are closed for the summer. 2AJW handled 57 msgs. No report from 2EL. Reports are missing from Brooklyn and Southern New Jersey.

Ass't. D.M. Duvall reports as follows for the Southern Section:

Mr. S. W. Place, Dist. Supt. for Eastern Pa., announces the following appointments: I. Earle Aston, 3WX, 140 E. New St., Lancaster, Pa., has been appointed Tfc. Asst. covering the counties of Lancaster, York, and Berks. P. C. Peterson, 3BG, Folcroft, Pa., has been appointed Tfc. Asst. for Delaware Co., and Temp. City Mgr. for Philadelphia Co. reports 3HX and 3CC handling most of the traffic. 3CC is using both CW and spark and works on schedule with 2UK. 3CC handled 56 msgs. K. K. Keck, 117 S. St. Cloud St., Allentown, Pa., 3FR, has been appointed official station on Branch Line #1 of Trunk Line B. His station is in communication with Reading

and Norristown. 3FR handled 8 msgs. Tfc. Asst. Ehrhardt reports 8ACS and 8RH using CW. 3HJ reports 64 msgs. and is working on schedule with 2ARY. W. A. Cauley, Tfc. Asst. Central Pa., reports Mr. Walleze is getting over his recent marriage. 3AJX is tuning up for DX work. 8HR and 8BG have broken their traffic records, having handled 50 msgs. No report has been received from Dist. Supt. Barr. 3ZY has regular schedule with 4GL on CW. 3ZY reports 72 msgs. 3XF is heard once in a while. 3IW and 3ALN must have closed down. The Asst. Div. Mgr. would like to hear from anyone located in the section comprising the counties of Frederick, Alleghany, Washington, and Garret and Maryland who could devote some time to working up efficient traffic routes. This territory was under R. W. Clipp who has taken a position on a ship. G. L. Deichmann, Jr., Dist. Supt. for Eastern Md., reports very little lag in relay affairs in spite of QRN. 3EQ has handled 19 msgs. with his 20 watt CW set. 3HG on spark is in communication with 2ARY. 3OU is holding his own and keeps in touch wtih the north and northwestern stations regularly. Msgs. reports, 3EQ-19, 3HG-14, 3OU-13, 3EM-2.

B. P. Williams, Dist. Supt. Western Pa., advises 8VH reports 17 msgs. and is the only station sending in a report with a sufficient number of msgs to note. 8VH is on from 6 to 9 P.M. and from 5 to 6 A.M. This rather short schedule is due to QRM from arc lights. 8VH wishes to hear from all stations hearing 8AHE, 8PU, or 8VH with a view to arranging a working schedule. Canadian traffic is going through via 3BA. 8DV is using CW and 240 cycle spark but QRN prevents traffic work. 8DV and 8ZV resumed their old schedule on July 17th. 8RU has a new 240 cycle set but has condenser trouble. He is getting 4.2 amps. into the aerial. 8HA is using CW and phone but do not know what he is doing in traffic work. 8AFC has spark and CW and is handling some traffic. We presume that 8JQ, 8LW, 8EV, 8HY, 8CH, 8PN, and 8VQ are closed for the summer as none of them has been heard *here for some time.* 8AIO who is not an official station is using CW.

ROANOKE DIVISION
W. T. Gravely, Mgr.

From reports which are coming into the Division Manager this month it would appear that a radical change is at hand, which will mean the ability to clear a tremendous amount of traffic during the days which are to come. I refer to the advent of CW in this Division, and it does seem that we will have a number, and some excellent sets, too. Some of our best sparks have been quiet for a long time, and not because the sets were out of commission or the operators away but because these fellows have been busy experimenting with tube transmitters, and other station improvements.

Relaying in the Division is practically at a stand-still with an exception here and there. The fellows are mainly taking advantage of the tremendous spell of static to make improvements and changes but they will all be back again soon, better than ever.

City Manager White of the Norfolk District states that, due to the hot weather, things have been unusually quiet in his locality and not expected to open up until the latter part of August or the first part of September.

Mr. White reports the following stations lining up for work as soon as conditions permit: 3GO, spk. and CW; 3ACG, spk. and CW; 3ACJ, spk.; 3AB, CW; 3MM, CW; 3MK, CW and fone; 3VV, CW; 3ACE, spk.; 3EZ, spk.; 3ACZ, spk.; 3AAG, spk.; XF-1, 3½ k.w. CW, ambition Honolulu.

C.M. White closes by saying that Richmond amateurs report hearing his CW in daylight, and with two or three good stations there, he believes the daylight route to the Division Manager is sure. He further states that with 3ZY (formerly 3AAO) at Washington, the Norfolk stations, 4GL at Savannah, several in Atlanta, and others north and south, he believes we will be lined up in great shape.

C. D. Blair, D.S. Central Virginia, advises that 3ZP is now attending Columbia University, taking a course in vacuum tubes. 3ABT and 3JY are at Bliss Electrical School. 3AUK expects to install a tube transmitter. 3MO has an ICW set, Ford coil and VT, which carries well, and with a new regenerator, will be one of the locals. 3TJ will install a 1KW spark and with his favorable location he is the logical DX station for Richmond. 3ZL, the Dist. Supt., will be in the game with both feet, a 100 watt tube set going in in addition to the spark. He desires to thank the Richmond men for the way they have observed the club rule of a silent hour for phone concerts.

Supt. Wohlford, 3CA, of the S.W. Virginia District, reports a great deal of

activity in his section, and as far as practical he is visiting in person each one of the stations and is trying to clear up other points. 3CA will operate a tube transmitter. 3AOV, Stonega, will also prove a valuable assistant to the D.S., as well as Higgins, 3HL. 3APA, Salem, will soon be in the game with a tube set.

Out of the ether these hot sultry nights comes booming, 4EA, Parker of New Bern, N. C. He did not get his set going last winter, but is now ready to help shoot traffic through by the way of the coast route. Winston, N. C. has three excellent stations in 4AL, 4CK and 4CX, with others developing. With New Bern, Greensboro, Charlotte, Asheville and Winston, the Old North State can be relied upon.

At this writing nothing officially from Supt. Heck of West Virginia, although 8EF is heard working, as well as 8SP, so we know traffic is moving.

Will stations in Clarksburg, Charleston, Hinton and Bluefield please get in touch with the District Supt., or the Division Manager, with a view of perfecting the route to the south?

3AEV, Clarke of Danville, is now operating a 20 watt tube transmitter, and will handle practically all of the traffic going through this point. He will also operate at 3BZ when occasion demands, and thus relieve the Division Manager to a considerable degree.

In conclusion, there is a wonderful fall and winter season ahead for all. It will be a most happy one if all will lend their hearty co-operation, and dwell in the A.R.R.L. spirit.

Remember please, that your section cannot be properly represented in QST unless Division Headquarters are kept properly informed. Therefore, it is requested that all reports be made up in regular report form; also, where there are districts not covered, we will ask that the individuals make reports.

DELTA DIVISION
J. M. Clayton, Mgr.

Due to almost continuous QRN "storms" the amount of traffic handled in the division has been practically nil.

While general interest hasn't slackened a bit in the Division, for various reasons practically none of the stations in the division are in operation at the present time.

5ZP is still down at Bay St. Louis leading the quiet and simple life. Hubie is having a hard time of it, but will certainly be well long before next season rolls along.

5ZAC is re-locating his station and in addition is rebuilding and re-equipping the entire station.

5ZAB is doing likewise. The Pullen Gang warn us that there will be a sink gap signing 5ZAB next season, and also a 5ZAB fone and CW set of 100 watt power.

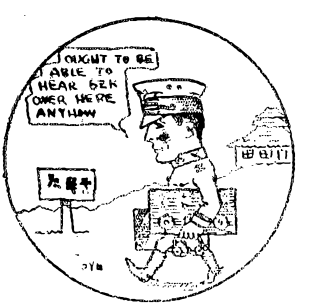
As usual no report has been received from 5ZS or 5ZD. We wish these two birds would come across with a little information. We presume they are still alive, altho they haven't been heard on the air in ages.

5YH is no more. Captain Baldwin has been detailed to go to China as Military Attache to the Minister at Pekin, and to learn the Chinese language. YH will be a chink for four years! A fine job for a radio man is that. But he won't be down and out. He carried, yes carried, with him his short wave and three step amplifier set, and a long wave-er. Maybe YH won't be a perfect code guy when he comes back to these United States but he certainly ought to be able to copy 'em as well as anyone after four years of copying Chinese Px! He sails from San Fran on the 2nd of August. Luck be with ye, OM, and hurry back.

5JD has been appointed City Manager for the city of Little Rock. JD is still plugging away every night the QRN lets up.

Mr. Botto, 5EK, of Memphis, has been appointed A.R.R.L. Relay Station for that City. 5EK comes in nicely here at Little Rock and seems to have a fine set, from the way his sigs carry. We're extremely glad to have a station in Memphis again and know that 5EK will have more than his share when traffic opens up again.

No reports were received this month from the following: W. L. Barrow, Dist. Supt. of Louisiana; W. C. Hutcheson, Dist. Supt. of Tennessee; W. L. Kennon, Dist. Supt. of Mississippi.



We have begged and begged long enough for reports, fellows, so in the future we are going to leave it entirely up to you as to whether we have a report from your section or not, ONLY don't come out and say "Why doesn't QST come south" as some are inclined to do. QST will come south just as far and as much as YOU make it come, and when we don't have news from the various District Superintendents we certainly can't be held at fault because their particular section isn't represented.

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

The traffic work of the Central Division during July has reached the lowest peak in this season's activities. Only a few reports have been received and these have been rather meagre owing to the fact that the D.S.'s have not received reports from their various stations. We believe that the National Convention will instil new energy and enthusiasm into our stations and that our next month's report will show better results.

K. A. Duerk, Supt. of the Toledo District of Ohio, advises little to report this month as no reports from either A.D.S. Quite a few stations have or are building CW sets. Among them are 8VJ, 8JM, 8ZN, 8ZR, 8DZ, 8AKM and 8ZY. The sparks on most in this district now are 8AJX, 8TK, 8DZ. There are two good stations now in Defiance in addition to 8ZY. They are 8BEP, Mr. E. J. Alen, and 8FU (correction), just reissued to Mr. Wm. Davison.

In the Dist. of Wisconsin the station of Supt. H. J. Burhop, 9ZL, is again in commission and reaching out. In order to keep traffic moving during the summer a Sunday day-light clearing schedule was inaugurated on July 17 on the plan that proved so successful in 1920. At 10 a.m. Sundays, Manitowoc clears with the Fox River Branch and then routes traffic south on the Lake Shore Route. At Manitowoc 9ZL is assisted by 9IX, 9DNL, 9DMU and 9DVY. 9DV has arranged alternate schedule for the Fox River stations 9DV, 9ALT, 9JP, 9UL, 9AUF and 9DRO; at Sheboygan 9FQ is arranging schedules for 9FQ, 9ACM and 9FN; while 9VD is arranging schedules for all Milwaukee stations in commission. 9GP of Kenosha hands the Wisconsin traffic to Chicago, while 9MH of Milton handles western-end traffic.

Mr. Burhop has been given temporary charge of the Upper Michigan Peninsula because of its proximity to his district and due to the fact that there seem to be no stations or operators in that territory capable of handling the job of D.S. Prospective relayers in that locality are requested to communicate with him.

Mr. R. O. Martin of 9GP, has been appointed City Manager of Kenosha, Wisc.

R. F. Palmer, City Manager of Akron, Ohio, reports another long distance station in his city. Mr. W. F. Warden, Jr., of 4AM, DeLand, Florida, has moved and is now living in Akron and is making preparations to get lined up for fall work. 8DE, Mr. Palmer's own station, has been doing remarkable work with C W of late and has been practically keeping up communication between Ohio stations and the east.

Mr. M. W. Hutchinson, Supt. of Northern Indiana, advises not a single report has been received for this month from any part of the district. He supposes that it is the old trouble, too much static and too much hot weather.

Mr. and Mrs. Candler, Supts. of the Miami Valley District of Ohio, advise no reports received from Troy, Dayton, Xenia, Lebanon, and only indirectly from Cincinnati. The trouble seems to be that many of the better operators have gone away on a vacation and others seem to have lost their interest and are not likely to revive it before good radio weather starts up this fall, while still others are spending their time dabbling in CW with such small sets that they cannot get any distance great enough to be a help to traffic work.

A report from 8EB, Norwood, Ohio, is at hand in response to the statement in last QST that Cincinnati had apparently fallen into her old position of keeping to herself rather than co-operating with the rest of the radio world, or words to that effect. I am glad that statement was published in QST for it stirred *one* operator into a report.

Traffic is moving in and out of Cincinnati on short jumps at the present as nearly all the DX stations are out of commission. During June, 8EB handled all the traffic coming through Cincinnati in this District.

8IV of Springfield reports two new CW stations starting up there, but that 8AGA, John Westcott, will be out of the game this season as he will be away to school.

8AOI of Columbus is sending out Police Reports at 9:15 Eastern Time. Any operator hearing these reports is requested to notify Police Headquarters of his own town.

DAKOTA DIVISION
Boyd Phelps, Mgr.

It's no use, OM, I give up. Don't hold QST a minute for my report because there isn't a darn thing to write about. I hate to break my record but I guess it can't be helped. This blamed hot weather is to blame for it all. You fellows have succeeded in getting some mighty fine articles in QST. It is in appreciation of the value of the space that I am not sending in a report because if I did write one it would be largely bunk and space filler, so I will make room for better things. I hope to have a real report next time as things are showing a wiggle of life now.

WEST GULF DIVISION
Frank M. Corlett, Mgr.

The terrific summer heat and the ever present summer brand of QRN almost compels me to report activities in three letters, i.e., QRN. There seems to be a general lack of interest or is it just a lack of PEP due to the all-fired-hot-weather. I know it is powerful hot with a pair of head-phones on one's head 'n all that. In some cases reports were not made at all; one live territory reported and the Dist. Supt. lost

the report. Yes Sir!! LOST IT!!! Can you beat that? Well anyway—maybe it will all some out in 5GJ's wash—how about it "Suds"?? John is all boiling over about that sketch in July issue of QST and says he's going to meet 8UX in Chicago. Hi!

Reports that were received are as follows:

New Mexico District, Louis Falconi, 5ZA, Supt., Roswell, N. M.:

Sorry but due to the usual bugbear, QRN, very little radio activity is taking place. 5ZA's CW is proving very effective, being reported by ships 2300 miles distant. If it proves OK next fall will probably junk the spark set.

Oklahoma District, L. G. Dill, Supt., 5HL. Oklahoma City:

Daylight intra-state routes have been working very effectively throughout Okla. during the past month, when it was impossible to work at night thru the rages of the mid-summer QRN. A schedule is being worked out whereby all traffic for Oklahoma can be delivered with little delay via the daylight routes. Traffic as a whole has been moving slowly. Thru station 5JR at Enid traffic can be handled from Kansas and then passed to Oklahoma City thru the worst QRN. A good reliable station is needed either at Lawton or some point in Southern Oklahoma. The Oklahoma Radio Co., of Oklahoma City have installed a testing station of ¾ K.W., call 5QP. Station is open for traffic at all times. 5QH is a new station at Enid. A new station is also reported at Norman Okla., 5HA, owned by Mr. Kelly.

Southern Texas District, W. H. Tilley, 5ZU, Supt., Austin, Texas:

5ZU and 5ZAG are sticking it out at Austin. 5BO has dismantled and quit the game but will operate the University station part of the time. 5YK, Sahm, of New Braunfels, burned out his motor again, (steenth time) and is out of the running for a while. Handled 109 messages during the 13 days of operation. That's going some! We need more with some of this spirit. 5ZU handled 60, 5ZAG 60. (??? One of 'em must have sent 60 and the other received 60. Huh? How about that?) Asst. Dist. Supt. A. P. Daniels of Houston makes an interesting report as usual. He advises they had one DX nite in the whole past 30 days! That was the fifth of July. It seemed that all the old gang were at their sets for the first time in moons. 9OE and 5JD, 5QI, and 5IQ, 5LC and 5XJ, 5ZAG and 5XI were all busy, and QRK at Houston.

Practically no traffic has been moving, as conditions have not permitted it. A tropical storm of considerable intensity just sidestepped Houston by a narrow margin. The velocity at Houston was about 45 miles per hour, strong enuf to carry with it the two 65 ft. masts of 5ZAA, one pulley rope at 5JM and the upstairs gallery rail at 5ZX to which one end of antenna was guyed. Quick work saved the day, however, and 5ZX was in commission thruout the storm.

Only three stations in Houston are in commission at this writing: 5ZT, 5JK, and 5ZX. 5AE is putting up an 85 ft. mast. 5HE blew up. 5NK, sink gap troubles. 5HZ, rebuilding receiver. 5JM transformer shot. 5JI, in California (thanks). 5ZAA at sea. 5CA at Porto Rico. 5EC in Tampico. 5YI and 5XB, deserted. 5LX and 5MS rebuilding. 5ZW working on CW.

Traffic handled by 5ZX—total, 12 msgs. No other reports.

Northern Texas Dist., H. P. Heafer, 5AF, Supt., Dallas: No reports received from J. S. ("Suds") Dorsa, 5GJ, A.D.S. Northeastern Ter. or from J. L. Martin,

5IF, A.D.S., Northwestern Ter. Report received from Guy Neel, 5XJ, A.D.S. North-central Ter., but lost or misplaced by Dist. Supt. Ye gawds!

B. Emerson, 5ZG, City Manager of Dallas, reports a total of 125 msgs. handled by Dallas stations. Work of organizing the city into sections is progressing nicely and appointments will be announced soon.

The committee from the Dallas Radio Club supervising the installation of radio apparatus for the City Police and Fire Dept. has made considerable progress. The set will be in operation soon. Organization work has been in progress since the city became interested in this work last fall, and at present there are 70 receiving stations actually copying and delivering the police bulletins to their respective local peace officers daily. Circular letters are being mailed to nearby towns in an effort to perfect a complete net-work, surrounding cities being requested to make use of the broadcast facilities for their own police bulletins. Those interested in learning more of this system may write Mr. Emerson, 3730 Wendelken St.

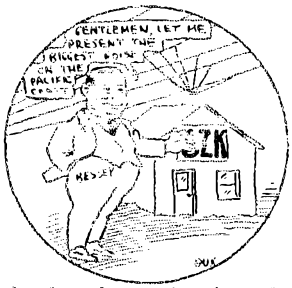
PACIFIC DIVISION

A. E. Bessey, Mgr.

Reported by E. G. Arnold, A.D.M.

The summer months, which ordinarily have put a check on amateur long distance

work, have not had such a distressing effect on us this year. Stations of the Bay district have been carrying on distance communication with little or no interruption due to QRN. Traffic is moving. 6APH of San Francisco is pounding through to Los Angeles, San Diego, San Ysidiro, Boise and other points. A significant point here is that this station handled 50 messages on the night of July 4 with Portland, Vancouver, and Los Angeles. 6APH reports that the high note, 400 cycle, which he now uses has the effect of cutting through the QRN to a much greater extent.



6ZR, who has been showing the way to amateur radio from every angle, has moved to Los Angeles. The bay district has lost a valuable asset in his removal. However, this will give us a relay station in Los Angeles that will surely stimulate construction.

6ZX can be heard hammering away with the regularity of a steam roller. Night in and night out he is on the job with a regularity that has brought the standard of our A.R.R.L. to its present level. He has a set that has not been excelled, both for the number of messages handled and distance. Anyone desiring to clear traffic call on the old reliable 6ZX. We take our hat off to him.

6ZK is at the height of his aspirations. He now has a set that from the sound will reach the utmost depths of space. He comes roaring in like a cloudburst in Haiti. We are wondering just where he will reach this winter. He has had some hard luck in the past few months with his set and now that he is up and leading the spark clientele he will probably step into the shoes of 6ZR, the much envied wizard.

On the whole everything has been going thru better than had been expected even though under bad conditions. Los Angeles amateurs are experiencing but little trouble clearing thru 6ZX. The work is then passed north thru 7ZJ, 7DA and 7BK. Those working thru from the south are 6ZN, 6KS, 6KP, 6EA, 6EB, and 6LC.

We all have noticed the shortage of Pacific Division reports in the QST. This is due to the fact that we have not been receiving the reports from our various Supts. Let's all get together and get those reports in.

NORTHWESTERN DIVISION

R. T. Galyean, Act. Mgr.

Altho summer QRN has slowed up traffic in the eastern section of the Northwestern Division thruout Montana and Idaho, traffic along the coast moves with the same old speed. As is usual in the summer months, communication between Seattle and Portland is at its best and no unusual difficulty is experienced.

Reports from A.D.M. H. E. Cutting at Bozeman, Montana, indicate that little relay work is being handled. The same is true of 7YA at Boise, Idaho, one of our best relay stations on the route to the east. He reports hearing only a few eastern stations on only one or two nights during the past month. All Boise stations except 7YA and 7OT have closed for the summer. R. M. Quarles, 7DI at Boise has erected a large tower and will soon start shooting DX. L. L. Martin, 7LN, at Nampa, Idaho is constructing a CW set. Dist. Supt. E. O. Selby, operator at 7YA, is constructing a radio frequency amplifier.

Communication to the north of Seattle is cleared with 7LS at Ferndale, Wash., and Canadian 5CJ and XEQ (ex-5CP) both of Vancouver, B. C. These stations are also worked from Portland and Vancouver, Wash.

Practically nothing has been going east from Seattle. 7FI at Pullman, Wash., is off the job for the summer.

From Seattle south, traffic has been going via 7DA, 7ZJ, 7ZB, 7ED and 7CN, while sixth district stations are worked only on "good" nights now. Credit is due Mumford Bros. 7ZJ, for the good watches they keep (continuous is right, Mason) and for their ability to put traffic thru with that "ton-of-bricks" spark. 7BK and 7IY were the busiest stations during the past month. 7FR and 7AY, both of Seattle, have sparks that carry south well. 7IU is finishing his station and will join the DX list before long.

Miss Winifred Dow, 7CB of Tacoma, says that they have not recovered from the banquet which they attended in Portland. (Neither has Bill, Winnie.) Fifteen of the Tacoma Radio Club's members were present. N. R. Benoit, 7BC, formerly of Tacoma and now at Camp Lewis, Washington, and Sergeant Andert, also of Camp Lewis, flew from Tacoma to Portland by aeroplane to attend the banquet, causing quite a bit of excitement over the novelty of it. 7BC is off the air now until sometime in September, rebuilding his entire set from the ground to the antenna. Mr. Reichert, 7CE of Tacoma, has installed CW. 7KM and 7BG are Tacoma's two most reliable stations, just now, getting thru in fine shape south. 7IY is also doing good summer work.

South of Portland, radio activities have

been practically nil for the past month. Many of the fellows are remodeling their sets and many off on fishing trips. How you goin' to keep 'em on the job when the fish are biting? 7IN at Salem, Ore., has erected a 100 foot antenna. 7IO, who has been handling most of the Salem traffic, has signed up with the Ship Owners and is on an Alaska run. Adair Lockwood, 7JT, ex-navy man from the S.S. Geo. Washington, promises a real DX station, both spark and CW. We are glad to welcome him on the air. He sure ought to do some wonderful work with CW in that location, as experiments with the Northwestern Radio Association's station erected last fall at the fair grounds at Salem proved that Salem is a fine location for work both east and south.

In the Marshfield district only one station, 7CN, is working out, and has not much trouble with fading. Considerable traffic goes thru to the south from this station when more northern stations are unable to work south thru QRN. It is a valuable station from this point of view. There will be several new stations there next winter and as the location seems to be a very good one for signals both north and south it will be a very good relay point.

At Seaside, Oregon, QRN has been so bad as to make it impossible to get out for L.D. work. As seems to be the general habit, there are several stations there remodeling for the winter work. 7SN, 7IG and 7HD are those putting in new apparatus. 7HD at Astoria, Ore. has been able to raise several stations east of Portland and would like to make tests with some of them.

At Vancouver, Washington, 7QQ is doing some fine work with his half K.W. working as far south as Santa Cruz, Calif., and as far north as Seattle. Two new stations, 7MR and 7RB, are both promising prospects. 7ZJ has been on deck every night working as far south as Long Beach, Calif., and north to Vancouver, B. C. Harold Lawson, of Vancouver, was caught in the act of constructing a CW set. E. R. Mumford of 7ZJ is spending the summer on his homestead near Chehalis while his two brothers hold continuous watch on the station.

Traffic north from Portland is going thru 7BA, 7BK, 7KM and 7IY and to the south of Portland thru 6ZX, 6TV, 6WZ and 6APH, and 7CN.

Geo. W. Cameron, 7DP (Dippy), has been appointed City Manager of the A.R.R.L. for the city of Portland and will see that a full and complete report from Portland reaches the D.M. every month. There are a number of new CW stations under construction in and near Portland, and it is rumored that one will use 250 watt tubes. A good prospective CW and phone relay station is under construction at the Hawley Pulp and Paper Co. in Oregon City, 12 miles south of Portland. Another CW set will be installed in Eugene, Oregon by Garrett Lewis, 7OZ.

Flecher of 7NI is at the forest ranger radio station at Zig-Zag, Oregon, and Fritz Stephens it at sea, or thinks he is, as he is on a tug at Astoria.

Wm. Leidigh, ex-7DS has been assigned the call 7ZB, formerly held by John Hertz. It is said that 7CB's receiving set has been adjusted to 375 meters and soldered there.

The auto theft reports for the Portland police department are sent every night at 9:30 and are meeting with very favorable reception by the department. Seattle has been unable to copy these reports owing to the intense QRM in Seattle; but now that there has been a radio club organized there it is hoped to control QRM to the extent that these reports may be copied. Seattle is not as yet transmitting these auto theft reports, but arrangements are being made with the police department there for the service. At Tacoma, auto theft reports are transmitted each evening at 9:45, different stations being assigned to transmit each week.

Owing to the many letters being received by the Div. Mgr. asking for information in regard to hook-ups, advice on things technical, etc., Mr. John Pearson, 7GD, 740 Schuyler St., Portland, Ore., has been asked to handle this for the Division. Mr. Pearson will be glad to answer letters asking for this kind of information.

Reported messages, 633. Busiest station, Mumford Bros., 7ZJ, Vancouver, Wash., 324.

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

Traffic has been practically at a standstill in Ontario for the past month. The holidays with closing of schools, frightful QRN, and the terrific heat have been the causes for the standstill. A new station has been put in operation in Kitchener, 3QJ at St. Jeromes College, with a ¾ K.W. transmitter and Grebe receiver. This will prove a valuable station to the Ontario Division. Two more special licenses have

(*Concluded on page 60*)

Who's Who in AMATEUR WIRELESS

Francis L. Pullen

Francis L. Pullen is "one of that Pullen gang" that the Fifth District seems to take such a delight in razzing. He was born on a cold night in January, 1900, at Houma, La., which is in the Delta section of the Delta Division. At the early age of seven he developed the marvelous ingenuity of hooking up a battery from the carbon to the zinc, causing the phenomenon of short-circuit. At twelve he took another lesson in electricity, being presented with a motor, which resulted in the desire for a radio set. Application made to father; result: none worth mentioning. Later, tho, he had better luck and they were about to put up a set when the war came. In November, 1919, he managed to get up an aerial which was a wonder for waves not shorter than 12,000 meters. Started with the regulation nightmare type of apparatus and rocked along with that for a while till one day a kind friend handed him a copy of QST

(*Concluded on page 46*)

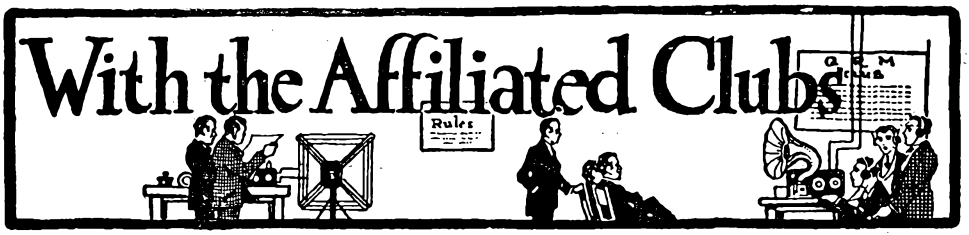
J. K. Hewitt

We all know of the wonderful work that both the rock-crusher and the CW set used to do at 2RK, but we haven't heard much about its owner.

At present both 2RK's station license and Hewitt's operator's license are under suspension for violation of the radio laws, as recently reported in QST, but we believe no one will deny that this recognition is due Hewitt's previous achievements.

J. Kenneth Hewitt was born in Elmira, N. Y., where he spent the first few years of his life. Moving to East St. Louis in 1911, he had his first spark coil set, followed by others in an ascending scale until 3 k.w. was reached. Then the radio laws and the reduction to 1 k.w., this time in DesMoines, Iowa. Later he moved to Albany, N. Y., and it was there, in 1915, '16 and '17, that he became really known on the air with old 2AGJ, the 40-cycle flutterer.

(*Concluded on page 60*)



Akron Radio Club

The Akron (Ohio) Radio Club has disbanded and surrendered its charter of affiliation. The Rubber City Radio Club there is affiliated, and application is pending from the Radiotec Club.

Galveston Radio Club

We have newly appointed the following officers: president, Louis Tissel; vice-pres., B. Duble; business manager, Louis Ratisseau; treasurer, L. Wallin; secretary, Ed. Rouse, 5IM, 1106 Avenue C.

We wish to announce the departure of our good friend Leroy Wallin, formerly president of our club. He is dropping out of radio and we hate to see him go but hope that he will come back some day.

Many of our stations are doing good work, especially 5IM, and with Mr. Tissel's set on the air there will be at least four stations here with a range of a hundred miles.

Maryland Radio Association

The Maryland Radio Assn. is preparing for an elaborate moon-light excursion down the Chesapeake Bay, with phone music to be transmitted from Baltimore and danced to on board via a 4-step and Magnavox. The date has not been determined.

Peoria Radio Club

With practically no advertising the Peoria (Ill.) Radio Club pulled off a get-together and ham-fest to popularize summer radio, with more success than was dreamed of. Nearly a hundred radio men from all over Illinois gathered there on July 2, with the Jefferson Hotel as their headquarters, and had a good time. They witnessed the Mississippi Valley Power Boat Regatta in the afternoon, and got the fight returns via radio from Chicago. A splendid banquet was held in the evening, Mr. Eugene Brown, president of the Peoria Aero Club, doing the honors. The program included talks by H. J. Mackley, president of our club; Paul Busey, president of the Urbana Radio Club; and R. H. G. Mathews, J. J. Novak, K. E. Hassel and N. E. Wunderlich, of Chicago.

This meeting was a success, and we will try it again. This is to announce our intention a year in advance so you will know all about it.

The Radio Club

After a very busy season of lectures, radio talks, banquets and conventions, The Radio Club, of Irvington, N. J., are having their club-house remodeled and redecorated and while the work is progressing we have departed slightly from our regular routine of business and are laying plans for another busy season next fall. We hope to have a 100 watt C.W. and telephone set, but will retain our ½ k.w. spark for emergency.

The Radio Club meets every week on Thursday evenings at 8:30 o'clock. Visitors are welcome at any of the meetings.

Rochester Radio Club

On June 16th the Rochester Radio Club held a banquet at the Powers Hotel. A number of fellows from the Radio Assn. of Western New York (Buffalo) were present, including their president, Mr. John G. Reiger, who gave a very interesting talk on co-operation, and Mr. Alexander, who gave a short talk on the 8th district convention to be held in Buffalo. Mr. A. H. Benzee, Jr., Dist. Supt., talked on the work of the district and urged co-operation among all the fellows. The principal speaker of the evening was Professor W. C. Ballard, Jr., of Cornell, who spoke on CW Transmission. The gang certainly took advantage of his promise to answer questions, for CW seems to be first in everyone's mind.

The 8th district convention is planned to be held in Buffalo some time this fall. Mr. A. H. Benzee, Jr., has been appointed general chairman and plans are well under way. Detailed announcements will be made thru QST.

Second District Council

At a recent meeting of the Executive Radio Council of the Second District the following amendment to the constitution was adopted:

"The officers of the council shall be an Honorary Chairman, who shall be the radio inspector or his assistant of this district, Chairman, Vice Chairman, Corresponding Secretary, Recording Secretary, Treasurer and Traffic Supervisor."

This action made Mr. Edwin A. Beane honorary chairman and left the office of

chairman open. At the regular meeting held July 12 Mr. J. O. Smith was elected chairman, to be the active head of the organization. The council feels that Smith, with his experience as traffic manager of the A.R.R.L. and his thorough knowledge of amateur radio in general, will prove an excellent leader. The other officers are as follows; John DiBlasi, vice chairman; Ferd. C. W. Thiede, corresponding secretary; Murray Blum, recording secretary; Carl E. Trube, treasurer; and Clifford J. Goette, traffic supervisor.

The council at the present time represents the following prominent clubs of the Second District: Radio Club of America; Armour Villa Radio Club, Bronxville, N. Y.; Bloomfield Radio Club, Bloomfield, N. J.; Radio Club of the Bronx, New York City; Fordham Radio Club, New York City; Hill City Radio Club, Summit, N. J.; The Radio Club, Irvington, N. J.; Radio Club of Long Island; North Jersey Radio Association; Radio Traffic Association, Brooklyn, N. Y.; Ridgewood Radio Club, Ridgewood, N. J.; Rutherford Radio Club, Rutherford, N. J.; Stuyvesant Radio Club, New York City; Technical Association Licensed Operators, N. Y. C.; Westfield Radio Association, Westfield, N. J.; Y. M. C. A. Radio Club, New York City; Yonkers Radio Council, Yonkers, N. Y.

The council has adjourned for the summer and will hold its first fall meeting on September 14th. In the meantime the Traffic Committee, of which Mr. Clifford J. Goette is chairman, will prepare a set of rules and regulations to be passed upon at the first meeting and distributed to all the amateurs of the Second District. The council feels that perfect co-operation can be obtained from all which no doubt will result in a speedy improvement of traffic conditions in the New York district.

Associations of the Second District that have not yet joined the council are urged to do so at once. Communications should be addressed to Ferd. C. W. Thiede, Cor. Sec., 486 Decatur Street, Brooklyn, New York.

R. T. A., Brooklyn

At the last meeting of the Radio Traffic Association for the season of 1920-1921, held at Brownes Business College, Brooklyn, on June 17th, the following officers were elected for the coming season:

Ernest K. Seyd, chairman; Ferd. C. W. Thiede, 1st vice-chairman; Uda B. Ross, 2nd vice-chairman; Louis J. Wadsworth, corresponding secretary; William E. Garity, recording secretary; Oscar Oehman, financial secretary; John P. Holder, treasurer; Clifford J. Goette, traffic manager; Frank A. Maher, editor, "Radio Traffic Bulletin"; Frank M. Squire, associate editor.

The association has grown to a membership of 115 and is one of the strongest amateur radio organizations in this section.

For several years the club has issued a semi-monthly paper, the "Radio Traffic Bulletin", and all associations publishing similar papers are invited to exchange bulletins with us. An exchange of ideas in this manner may prove of mutual benefit to the members as well as to their respective clubs.

Communications of this nature should be addressed to Frank A. Maher, Editor, 4903 Sixth Avenue, Brooklyn, N. Y.

Amateurs who may be interested and desire further information regarding the activities of the Radio Traffic Association are invited to write to Louis J. Wadsworth, Corr. Secy., 174 Alabama Avenue, Brooklyn, N. Y.

Fordham Radio Club

The Fordham Radio Club has heretofore been functioning as an institution dealing with radio work in general, while those in the club who specialized in continuous wave work organized a C.W. Chapter and were chartered by the Club. The interest in C.W., however, has grown to such proportions and the membership has increased so rapidly that it became necessary to change our system. Now we are organized as a C.W. Club, with a Spark Chapter for those members who are not yet C.W. members.

As a C.W. Club, we have adopted a standard transmitter that all C.W. operators use. At a recent meeting a paper was read in which the details of construction and theory of operation were fully described. We have found the adoption of a standard set to be of material aid in getting the spark men into C.W. operation, and in solving the problems always encountered in C.W. work.

We are at present formulating plans for the erecting of club-rooms where a C.W. set will be installed. At that time we expect to take an active part in relay work.

At the present time local traffic is being handled smoothly by a number of the phone operators throughout the district, while the greater part of the DX traffic is handled on several nightly schedules by 2XK.

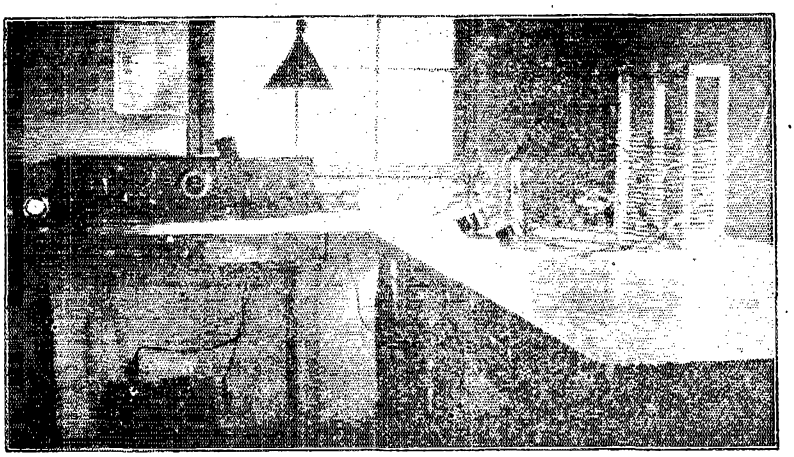
Pending the completion of permanent quarters, meetings are being held at the home of Mr. L. M. Cockaday, 2XK, 2674 Bailey Avenue, Bronx, every Monday evening at 8 P.M. Men desiring to join should attend a meeting at that address to make formal application. Communications should be addressed to the Secretary, Mr. William Weller, 2156 Webster Avenue, Bronx, New York City.

TRANSATLANTIC TESTS

this fall. Information on page 12 of this issue. Read it and let's have your entry.

Amateur Radio Stations

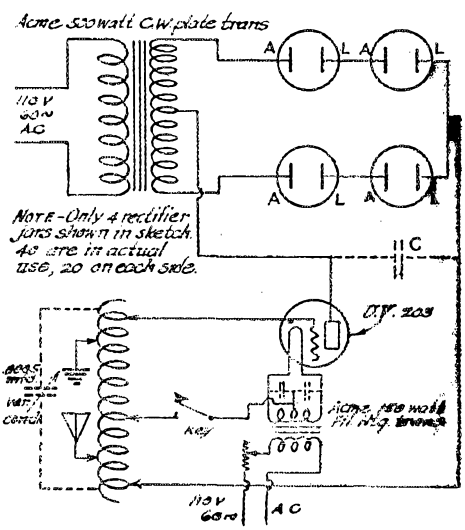
8DE, Akron, Ohio



8DE belongs to Roland F. Palmer, A.R.R.L. City Manager of Akron, Ohio, and is that loud CW station you have been hearing. As an example of what can be done with CW a description of 8DE will prove interesting, we hope.

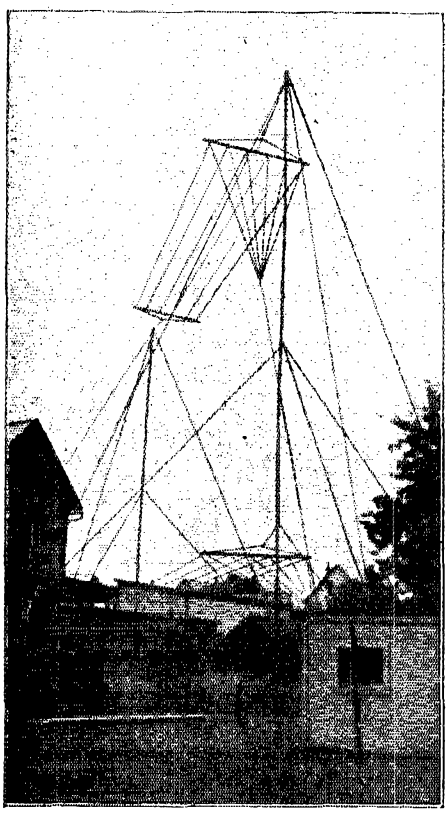
The set shown in the photograph is the 8DE of early May, when it first got on the air. It was hooked up and tuned and in operation in about half an hour, and so isn't much for looks in this photograph, altho it has since been built into a panel.

Referring now to both the hook-up and the photograph, we see a single 50-watt U.V.203 tube, the filament of which is heated by a 150-watt Acme filament-heating transformer controlled by a rheostat on the 110-volt side. The plate supply is obtained from an Acme 500-watt C.W. transformer, rectified in an electrolytic rectifier of 40 jars (20 on each side of circuit, altho a total of but 4 are shown in the diagram.) No filter inductances or condensers are used, resulting in a slight broadening of the wave that is advantageous in working DX altho probably awful in Akron locally. The helix is 19 turns of No. 8 brass wire, turns 8 inches in diameter. The circuit employed is the one described in QST as in use at 8ZV and 8ZG, but without the variables. Mr. Palmer finds that by using a variable to tune roughly (i.e., to get a first approximation of the proper location of the clips) and then removing it from the circuit entirely the antenna current is considerably higher than if it were



left in. The entire arrangement is simplicity itself.

Thru the lack of a filter, no capacity is provided to by-pass the radio frequency across the plate transformer and rectifier. A capacity, C, of about .002 mfds. should improve the operation. There should also be small paper or mica condensers from the center tap on the secondary of the filament



transformer to each outer terminal of the same, and for the same purpose. Let's know how much the ammeter goes up when you try this, 8DE.

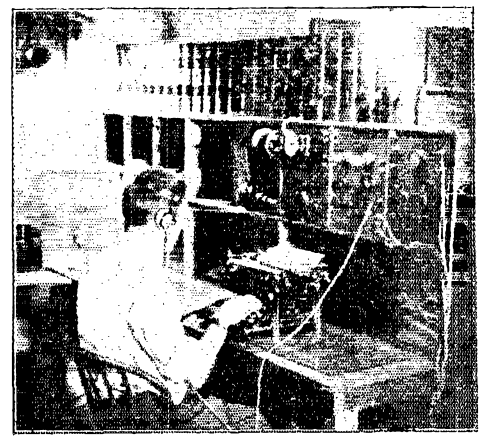
Palmer's antenna is an inverted L, 60 ft. high above ground and 50 ft. long, of 6 wires, which are bunched together about 8 ft. below the flat-top and run directly down into the shack. The ground is an insulated counterpoise duplicating the aerial, and is suspended 14 ft. above ground. A counterpoise is almost essential for good CW work on 200 meters. On his regular spark- set ground 8DE could not get below 300 meters, but with the counterpoise good work has been done on 180. The normal working wave is 210, and the antenna current with 1000 volts on the plate and exactly 10 volts on the filament, is 4.5 amperes.

8DE has received report cards from about three-quarters of the states in the Union and many from Canada, and is now waiting for winter DX weather to see just what the CW will do in handling traffic.

5ZJ, State College, N. M.

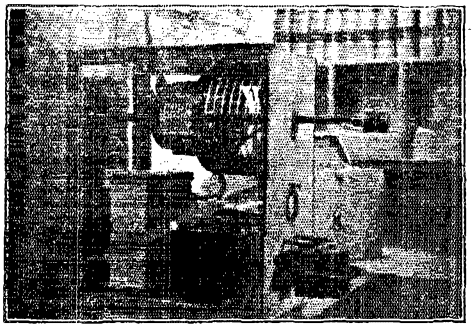
With photographs unfortunately none too distinct, we present here a description of 5ZJ, operated by Prof. R. W. Goddard, Dean of Engineering at New Mexico College of Agriculture & Mechanic Arts.

The work this set has done is well known, so that we got quite a jolt in learning of its low power. The transformer is a ¼ k.w. Packard, immersed in oil, with four primary taps for different power inputs. The condenser consists of six sections of moulded Murdock in two groups, the first of 4 sections and the second of 2. A switch on top of the condenser rack connects the second group to the first for long wave lengths thru a bell-crank and lever attached to the handle projecting from the top of the panel. Rotary motion of this handle also operates two other switches, one in the closed circuit and the other on the secondary, for changing from 200 to 375 meters. Pulling this handle in or out varies the coupling. The gap is the smallest Amrad quenched, the ammeter a General Radio h.w.a., and the O.T. a Duck commercial type. With this little rig the full-power input is 235 watts and the antenna current at 375 meters from 3 to 3.2 h.w.a. amps.



The antenna is supported betweeen two 96-ft. pipe masts 150 ft. apart. Each mast has a 20-ft. 4-post wooden windmill tower base and four 20-ft. sections of pipe ranging in size from 2-in. at the bottom to 1¼-in. at the top. Four guys of two strands of No. 14 galvanized iron are run out at each pipe joint, insulated at the junction with the mast and every 50 ft. thereafter by porcelain strain insulators.

The aerial is of the fan type and has 17 wires spaced 9 ft. at the top and running

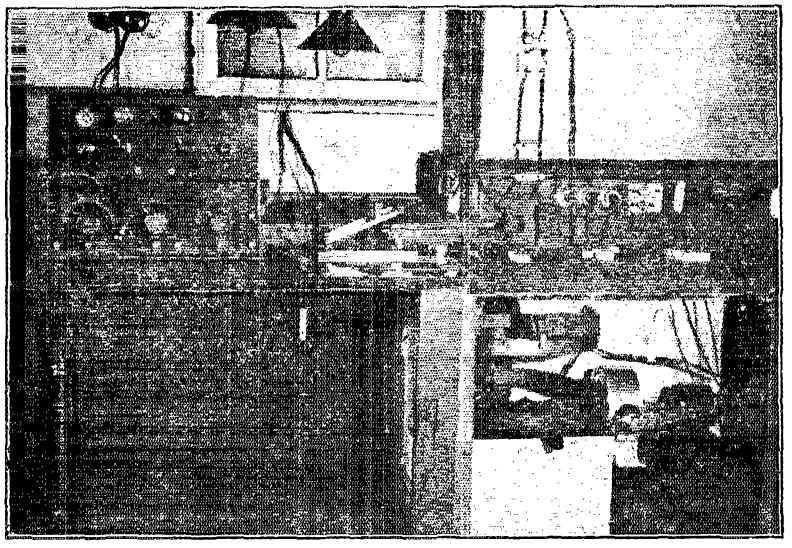


straight to the lead-in at a basement window. The ground system utilizes the water pipes in the house and 8 wires which radiate from where they pass thru the cellar wall to a 5-ft. chicken-wire fence that runs under the aerial, 15 ft. from the house and parallel to it. All wires are 7 strands of No. 22 B&S copper.

The receiving set uses honeycomb coils in the common tickler-coil hook-up. The primary condenser is a .003 mfd. G.R. variable with a d.p.d.t. switch to place it either in series or parallel with the antenna. The secondary condenser is a little over .001 mfd. Detector and one-step are used, arranged so that the switch under each tube makes all connections at a single operation.

5ZJ has worked 1500 miles to 8ZV, Canton, Ohio, but with Prof. Goddard it is the reliable every-night working range that counts and he is rightfully prouder of the ability of his little outfit to work the west coast a thousand miles away any decent winter night.

9EQ, St. Louis,. Mo.



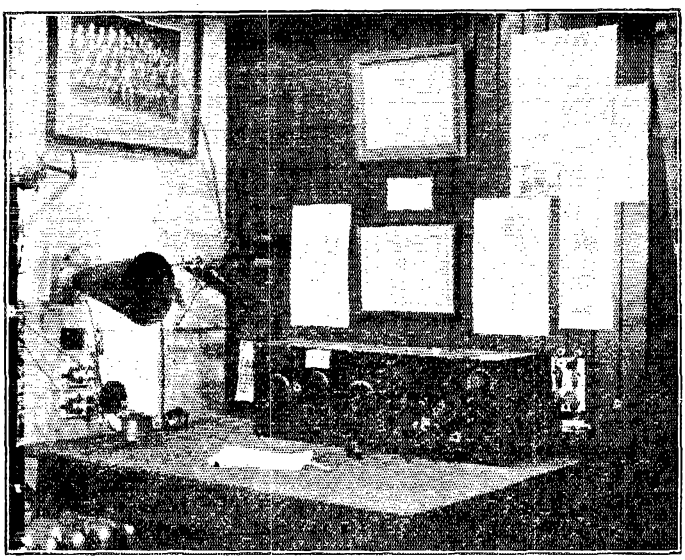
9EQ belongs to Paul F. Ring, 1408 E. Grand Ave., St. Louis, and has done good relay work. The aerial is 45 ft. high at the near end and 55 ft. at the free end; the ground system, besides the usual miscellaneous junk buried beneath the aerial, includes plates immersed in four cisterns.

The transmitting equipment consists of a 1 k.w. Acme transformer, glass-and-brass-plate oil-immersed condenser, O.T. of heavy brass ribbon, and a Benwood gap. The outfit is very compactly arranged under the table, the longest lead in the closed circuit being less than two inches long!

The receiving equipment is the old and favorably known Paragon RA-6 tuner, and a home-made tube cabinet containing detector and two stages of a.f. amplification.

The efficiency of 9EQ is attested by the remarkable range covered. It has been reported QSA in Colon, Panama, 2000 miles south; in Vancouver, Wash., 1800 miles west; and on board ship 1400 miles east of New York City, a total distance of 2800 miles east.

3HX, Tacony, Philadelphia



Here is 3HX, the station of Mr. Roy S. Fisher, located in Tacony, a suburb of Philadelphia. The transmitting antenna is a four wire flat-top 60 ft. long and 75 ft. high with a 6 in. diameter cage lead-in, while a single wire running from the top of the mast in both directions at right angles to the transmitting aerial in the form of a triangular loop is used for receiving, with a break-in system.

The receiver is a home-made short wave regenerative, entirely enclosed with a copper shield; two step amplifier, and Baldwin phones, one phone being attached to a megaphone. All DX work is done with the telephone receiver attached in this manner.

The transmitter is located in the closet directly back of the receiver and so, unfortunately, doesn't show in the photo. It consists of a home-made ½ k.w. open core transformer used with a series impedance, home-made pancake O.T., oil immersed condenser, and a 10 point Benwood gap direct-coupled to a 8000 r.p.m. motor. A long hard rubber rod connected to the top of the antenna switch blade controls the motor and primary circuits. This antenna switch is a single pole affair, the ground wire being permanently connected to the O.T., and transfers the antenna lead from sending to receiving sets, also opening the ground from the receiving set while sending.

The transmitting record is to 9WU, Ellendale, N. D.

FILAMENT TRANSFORMERS

(*Concluded from page 30*)

The normal thermionic change in the filament heating due to the alternating current produces slight changes in the plate current but of such a low order and frequency that the receiving station is only slightly affected. Furthermore, sounds of 60 to 120 cycles require many times the current values to be heard than those of 800 to 900 cycles, and are hence of small account when they get to the operator's ears.

As the amount of power used increases, the use of storage batteries for heating filaments becomes prohibitive and necessitates the use of filament transformers entirely.

FRANCIS L. PULLEN

(*Concluded from page 40*)

and brought him to light. After a hard fight the Pullens, with the help of curious neighbors and small boys around the town, erected a real station, and under the call 5ZAB have been doing work worth boasting about. From there on the story is the same as with the rest of us—the best sport in the world. Francis now sits back with the rest of the gang and tries hard to look like an old timer, even if his years do not place him there—which, after all, is not his fault.

On July 2d fight returns of the Dempsey-Carpentier bout were broadcasted by radio phone on 1600 meters by the National Amateur Wireless Assn., an organization fostered by the Wireless Press, Inc., affiliated with the Radio Corporation interests. The transmitter was installed by the Radio Corporation at the Lackawanna Terminal, Hoboken, and was of the 6-tube 3½ k.w. type. J. Andrew White, editor of "Wireless Age", reported the fight over land telephone line from the ring-side, and J. O. Smith, formerly a director of the A.R.R.L., now director of the correspondence division of the Radio Institute of America (formerly the Marconi Institute), repeated the reports over the radiophone. Amateurs in many nearby cities copied the returns and presented them to assembled audiences whose admission fees were turned over to charitable works under arrangements made by the Madison Square Garden Corpn.

The Editor would be glad to have reports of performance from amateurs constructing tuners from the description of 1QP's set appearing in June QST.

The Result

The thunder crashes overhead,
The lightning flashes far and near;
The more I know of Theory
The greater is my fear!

On winter nights my aerial,
Lashed to the chimney, groans and squeaks;
In summertime I'm petrified
Whene'er the Storm-God speaks.

Oh, Radio, the sleep I've lost
Since first pursuing thee
Would stock the Seven Sleepers up
And still leave some for me!

—*Marguerite Phillips.*

Mr. A. H. K. Russell, Ontario Division Manager, was married on June 11th last to Miss Helen Duke Fortier of Toronto, in Grace Church, Toronto. Our hearty congratulations, OM!

Cockey Bud, down in Trenton, suggests that a very diplomatic way to tell a ham who continually asks "QRK?" to QRT, would be to answer his interrogation with "Vy QRM hr OM".

From the July issue of the "Marine Engineer", in describing the refitting of the S.S. George Washington, we learn that there is being installed a "radio plant consisting of the most powerful arc *light* installation afloat" having "under favorable conditions, a range of 7000 miles."

One of the engineers at the Marion radio station, W. B. MacGeorge, was attending a vaudeville show the other night with VN. A girl was playing an accordion, and Mac remarks: "Gee, Speedo, look at the jane playing on an elastic Amrad gap!"

Book Review: "The British Admiralty Handbook of Wireless Telegraphy", 1920, 472 pp.

Many of our readers will be interested in this new elementary radio book, which is intended primarily for men in the radio service of the British navy. The general principles of electrical machinery are discussed before radio principles and apparatus are taken up. The treatment of antennas and of tubes is particularly good. The book should prove very useful for the purpose for which it is intended.

Copies may be secured by sending a money order for eight shillings and six pence to the Director of Publications, His Majesty's Stationery Office, Imperial House, Kingsway, London, W.C.2, England, this price including postage. At present an express money order for this amount can be purchased for somewhat less than $2.

Honestly, this business of inaccurate newspaper reports of radio matters is getting to be more than a joke—it's now amounting to a crime. Get this, from the Evening Public Ledger, Philadelphia, in commenting on a proposed police radio system:

"The principal expense and question in the problem lies in the matter of wave lengths. The longer the wave the higher the expense. A wave length stretching the 3000 miles across the country would not only be prohibitive in expense, but unnecessary, as criminals could not travel

that fast. New York has 200-mile waves, and Buffalo ninety. Two hundred is really long enough, because in most cases it will allow any city to reach the nearest principal metropolis."

Who said the Lafayette station had the long wave length?

In Columbus, Ohio, an auto-load of deputies were tearing down a road in wild chase of a gang of boot-leggers who, however, succeeded in leaving them behind. But the deputies didn't know it, and discovering a car pulled off the side of the road with several men standing around it, they drew their artillery and advanced, with a command to "stick 'em up". Maybe this didn't surprise some members of the Columbus Radio Club, who were peacefully testing out a portable receiving set mounted in a car. Explanations followed on both sides.

A whimsical lad called Maloney,
A ham in the art of Marconi,
Once essayed to tune
A spark from the moon.
With suspicion regarded
He's now always guarded.
Beware lest you follow Maloney.

The Department of Commerce advises us that it is not expected that the new list of amateur radio stations will be ready for distribution until some time in October. The commercial list is now in the hands of the printer.

Miss Eunice Randall, First District O.W., has passed her government test for first grade amateur license and got 100% and excellent. Her work was perfect. Stick that up and shoot at it, fellows.

8BKO ses that 8BBU ses that the other night there was a fire in a barn behind 8BBC's house. 8BBU raced over to the scene and spied 8BBC on top of his rear mast, spraying his spreaders with a sprinkling can. Now he has a peach of a cage from the warping of the spreader. Next!

It is believed that the record for the youngest radio operator is held by Robert Garcia, of 1062 No. Kingsley Drive, Los Angeles, Calif., who is but seven years of age.

This young man was examined and passed for amateur first grade operator's license at the Y.M.C.A. Radio School in Los Angeles, Calif., by Mr. J. F. Dillon, Radio Inspector for the Sixth District, on July 8, 1921. The youngster attained a percentage of 92 in the written examination, and passed the ten-word-per-minute code speed test without difficulty. He is the son of Mr. Allen Garcia, of Los Angeles, who happens to be director for Charley Chaplin, the film star.

The Missouri State Marketing Bureau of the Board of Agriculture, with headquarters at Jefferson City, Mo., is working out extensive plans for giving Missouri farmers government market news by radiophone.

The government market news information will be received at the radio office of the State Marketing Bureau off the leased wire of the United States Bureau of Markets, connecting Jefferson City with the office of the Bureau at Washington, as well as with practically all of the large grain, live stock, hay, fruits and vegetables, dairy products, and other markets in the United States.

A powerful transmitting set will be installed at the offices of the marketing bureau at Jefferson City, located in Missouri's beautiful new capitol building whose dome is 280 feet from the ground. From this central point of the state the radiophone should operate at its maximum efficiency to the advantage of Missouri farmers. The service is expected to be begun early in the fall.

The marketing bureau proposes to organize the wireless amateurs in that state, of which there are several hundred widely scattered in rural communities, into a state organization for receiving and distributing the market news information. A continued campaign will be made to install radiophone receiving outfits in every town of any size in the state. Newspapers, banks, rural telephone exchanges, farm bureau offices, live stock shipping associations, elevators and other headquarters interested in receiving and distributing government market news information on farm products will be requested to co-operate in this new undertaking.

WOULDN'T IT BE WONDERFUL—

If you could plant a broom-handle and have it grow over night into a 100-ft. mast?

If 6ADA would tell us how far he can blow a condenser?

If somebody could send fast enough to snow 6EV under?

If 6WN would give his spark gap a dose of paregoric?

If spark coil 4AW (somewhere in Massachusetts) would go to bed earlier?

If we knew how to build those heralded Swiss D.C. transformers?

If the woodpeckers would leave 9DCO's 2x2 mast alone?

If 2AOG and 2OX would talk about something else besides girls?

If AJ and AC (Los Angeles) would get licenses for those flivver coils, and if AC would quit trying to fool somebody into believing he is 1AW or 7YS?

If a good Rettysnitch could be bought cheap?

If people enjoyed having their lights blinked?

Calls Heard

HEARD DURING JULY
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 the 10th of the second month, for publication in the next following QST.

HEARD AT SEA

By 7BJ, operating aboard WSR.
Apl. 15, 100 mi. W. of Northhead, NPE: 6AK, 6SK, 6AAT, 6ZA, 6ZU, 6NQ, 7CU, 7NN, 7KS, 7ZM.
Apl. 16, 180 mi. NW of NPE: Can. 5BA, 6[illegible] 6ZU, 6ZA, 6ZX, 6AJE, 6LC, 6FM, 6EX, 6OW, 6AGF, 6MZ, 6MH, 7CU, 7DA, 7KS, 7ED, 7BK 7YA, 7NN.
Apl. 17, 255 mi. W. of NPE: 6EX, 6IV, 6ZA, 6AAW, 6AN, 6ZR, 6ZU, 6AK, 6AN, 6LC, Can. 5BA, 7GD daylight, 7BZ, 7DA, 7YS, 7YA, 7CU, 7ZG, 7LN, 7NN, 7ZM.
Apl. 18, 330 mi. west: 6ZA, 6ZO, 6ZM, 6ZX, 6LC, 6AH, 6AT, 6AK, 6ZZ, 6ZY, 6KU, 6PR, 6ZU, 6AFV, Can. 5BA, 7CB, 7YS, 7LL, 7NN, 7DA, 7ZK, 7ZG, 7CU.
Apl. 19, 450 mi. west: 5BA, 6CH daylight, 6ZA, 6AN, 6LC, 6ZU, 6NQ, 6HC, 6QR, 6FP, 7YS, 7CB, 7LY, 7AD, 7NN, 7ZM, 7FI, 9AEG, 9OE, 9QO, 9GU. Nines 6 ft. from fones.
Apl. 20, 565 mi. west: 6AJE, 6PO, 6ZA, 6EX, 6AH, 7YS, 7DA, 7GJ, 5ZX good sigs.
Apl. 21, 800 mi. west: 6ZX, 6AH, 6AN, 7NN, 7ZI, buzzer ICW.
Apl. 22, 620 mi. west: 6ZU, 6PO, 6AH, 15 ft. from fones, 6ZY, 6EN, 6ZK, 6ZX, 6CH, 7DA, 7NN, 7ZM, 7AD, 7BQ.
Apl. 23, 660 mi. from NPE: 6ZM, 6ZN, 6AH, 6AN, 6ZN, 7NN, 7DA, 7BH, 7MH, 7CU, 7ZG, 7YA, 9AEG, 9EL, 9ALG, 9OE.
Apl. 24, 651 mi. from Chignik, Alaska: Can. 5BA, 6ZX, 6AH, 7YA, 7NN. Static hopeless.
Apl. 25, 630 mi. from Chignik: 6ZU, 7ZH, 7YA, 7CW. Static awful.
Apl. 26, 1000 mi. west of NPE: 5ZA C.W., 6ZO, 6JT, 6ZZ, 6KA, Can. 5BA, 7FI, 7BK, 7YA, 7BQ, 9ALG, 9LW, 9RK, 9OE.
Apl. 27, 1100 mi. west of NPE: Can. 5BA, 6KA, 6JT, 6ZA, 6APH, 6EX, 6EN, 7NL, 7EX, 7ZM, 7YA, 7LS, 9OE, 9ALG.
Apl. 28, 1150 mi. w. NPE: 6KA, 6ZX, 6KL, Can. 5BA, 7FI, 7YA, 7DA, 9OE, 9PS, 9QO.
Apl. 29, 1250 mi. w. NPE: 6LC, 6ZU, 6TA C.W., 6CH, 6ZE, 6AR.
Apl. 30, 1275 mi., dusk: 6ZR and 6ZAA.
May 1, 1300 mi. west: 7CW, 7NN, 6EZ, 6HP.
May 2, 1875 mi: 6EX, 6ZU, 6AFV, 7CW, 7ZI C.W., 7NN.
May 3, 1465 mi: Not a ham—peculiar.
May 4: 6LC, 6EX, 7NN.
May 5, 1500 mi. west of NPE: 7EP at Unga, Alaska, 6EX.
May 7, entering Chignik, 1650 mi: 6EX, 6AK, 6KL, 6ZX, 6APH, 6ZN, 7EP, 7ZJ, 7NN, 7BQ. At anchor, 6EX.

Can. 3AV, London, Ont.

1AW, 2BML, 2XA, 2XF, 2XJ, 2ZL, 3AN, 3AWV, 3AJW, 3AAO, 3BL, 3CC, 3EN, 3HB, 3HG, 3HJ, 3IW, 3LI, 3OV, 3RB, 3XE, 3XF, 5BA, 8AM, 8AU, 8AAW, 8ACE, 8ACF, 8ACR, 8AEE, 8AFB, 8AFD, 8AFE, 8AGO, 8AGK, 8AGX, 8AGZ, 8AIB, 8AIO, 8AJT, 8ANK, 8ANW, 8ARS, 8ARZ, 8AUX, 8AVT, 8AWL, 8AXC, 8AYM, 8AYN, 8BD, 8BO, 8BK, 8BJ, 8BU, 8BDP, 8CD, 8CF, 8CI, 8CN, 8CP, 8DB, 8DE, 8DP, 8DR, 8EB, 8EV, 8FT, 8GX, 8HA, 8HR, 8HG, 8ID, 8IE, 8IV, 8IEZ, 8IJ, 8IZ, 8JU, 8JM, 8JO, 8JZ, 8KS, 8KK, 8LM, 8LY, 8LW, 8MB, 8MC, 8MH, 8ML, 8MM, 8OI, 8OS, 8OW, 8OZ, 8PL, 8PN, 8NI, 8NQ, 8NZ, 8NY, 8PT, 8OC, 8QU, 8QY, 8RQ, 8UD, 8UF, 8VS, 8VH, 8WA, 8WD, 8WI, 8WJ, 8WZ, 8WTU, 8XM, 8XN, 8XU, 8YN, 8YV, 8ZA, 8ZR, 8ZP, 8ZW, 9AW, 9AAW, 9ACB, 9ACO, 9AFK, 9AHO, 9ALH, 9ANV, 9AVO, 9AZX, 9BAX, 9DR, 9DAX, 9FG, 9FS, 9GP, 9GX, 9LQ, 9MC, 9ME, 9MBJ, 9PC, 9PK, 9UH, 9UU, 9UW, 9XI, 9XU, 9ZJ, 9ZN, Canadian (3AX), 3BP, 3DS, 3EH, (8GN), 3DH, (3HJ), (3KG), (3LW), (3MN), (3OV).

Can. 3QJ, Kitchener, Ont.

1ZE, 1AAU C.W., 1ANQ, 1CW, 1BDC, 1BKA C.W., 2DN C.W., 2EL, 2FG fone, 2JU, 2UK, 2AJF C.W., 2AWF, 2AWP, 3BZ, 3CC, 3FG, 3HT, 3AQR, 4GL C.W., 5DA, 5FV, 8BO spk & C.W., 8BT C.W., 8DE C.W., 8DZ, 8HG, 8HJ spk & C.W., 8JM C.W., 8ML, 8NZ, 8OI, 8OT, 8QY ICW & Spk, 8RU, 8SP, (8WO), 8WY, 8XH C.W., 8XM C.W., 8VV, 8ZA, 8ZG C.W., 8ZX, 8ZY, 8AFB, 8AFD, 8AGK, 25 Cicle sink gap, 8AIO C.W., 8AJP C.W., 8ANK C.W., 8AWP, 8AWX, 8AVN, 9FG, 9FS, 9ME, 9PC, 9UH, 9UU, 9VK, 9XW, 9ZL, 9ZN, 9AAW, 9AFG, 9AFK, 9AOV, 9AXU, 9DML, Can. (3BA), (3BP), 3DH, (3KG), 3KL, 9AL C.W.

1TS, Bristol, Conn., July

Spark stations: (1ACG), (1ADL), 1ADP, 1AEV, 1AHF, 1AJU, 1ALP, (1ANT), (1ARY), 1AVK, (1AW), (1AYL), (1BDC), 1BDI, (1BDV), (1BFE), 1BGK, 1BGF, (1BJN), (1BJO), 1BM, (1BMA), (1BNF), 1BP, (1BPZ), 1BRW, 1BYS, (1CAO), 1CBT, 1CCY, 1CK, 1CM, 1CP, 1CZ, 1DBM, 1DR, (1DY), (1ECM), (1EP), 1FB, 1FV, (1GM), 1GY, (1HO), 1IAP, 1JQ, 1KBO, 1LBR 1MAD, 1MAU, 1MBN, (1NBP), 1OBE, 1OBC, (1OE), 1OJ, 1PAZ, 1PO, 1QBF, 1QP, 1RAD, (1RX), 1SBG, 1SBZ, (1SN), (1SZ), 1UJ, 1UQ, 1VBZ, (1WP), 1WR, 1YB 1ZE, 2ACD, 2ADO, 2AEI, 2AFP 2AGC 2AGX, 2AHU, 2AJW, 2ALY, (2AQL), (2ARY), (2AWF), 2AXB, 2BCF, 2BEH, 2BG, 2BGK, 2BK, 2DI, 2DN, 2EL, 2GR, 2JU, 2ME, 2MP, 2OA, 2OM, 2OX, 2RM, 2RR, (2SQ), 2SZ, 2TS, 2AU, 2UC, 2UH, (2UK), 2WM, 2YM, 2ZC, 2ZM, 2AST, 2AW 3ABG, 3AC, 3ACR, 3ACS, 3AD, 3ALC, 3AMP, 3BG, 3CC, 3EZ, 3FT, 3FR, 3GX, 3HG, 3HJ, 3HX, 3IW, 3KM, 3LP, 3NB, 3OU, 3PS, 3PU 3OU, 3QJ, 3UC, (3VW), 3XF, 3XM, 3YH, 3ZO, 4EI, 8ACF, 8ACP, 8ADQ, (8AFB), 8AFD, 8AGK, 8AHH, 8AHV, 8AIO, 8AMM, 8AMQ, 8ANW, 8AOT, (8APB), 8APP, 8AQV, 8ARD, 8AXO, (8AYN), 8BAH, 8MDY, (8BDV), 8BO, 8BP, 8CH, 8DV, 8DY, 8EV, 8EZ, 8FT, 8FW, 8HP, 8HF, 8HR, 8ID, (8IN), 8JQ, 8KK, 8LQ, 8LX, 8MM, 8OA, 8OI, 8PI, 8PL, 8QM, 8RP, 8RU, 8SP, 8TT, 8WA, 8WY, 8XU, (8YV), 8ZD, 8ZR, 8ZW, 8ZY, 9AAW, 9AFK, 9AGG, 9CP, 9DAX, 9HR, 9MC, 9ME, 9UH, 9VK, 9YAC, 9ZJ, 9ZL, (9ZN), Can. 3BP.

C.W. Stations: 1AAU, (1AB), (1ABY), fone, (1AE), fone (1AG), (1AGI), 1AHK, 1A [illegible] (1ANQ) fone, 1AZJ, (1AZX), (1BEH) fone, 1BGF, 1BIK, 1BJ, 1BKA, (1CAK), 1CBJ, 1CBW, 1CBZ, 1CCZ, 1CF, 1CK, 1DH, 1DM, 1FR 1DT, ES, (1EP), (1FQ), 1IBF fone, 1IBJ, 1KBL, (1MO), 1NBJ, 1NO fone, 1OE, 1QAJ, (1QN), (1RD), (1RU) fone, 1RZ, 1SQ, 1SZ fone, 1TBJ, 1UN, 1WAD, (1VAD), 1XE fone, 1XV fone, 1XX, 1XZ, 2ACT, (2ADL) fone, 2ADS, 2AGB, 2AHL, (2AJE), 2AJF, (2AJW), (2ANZ), 2AWL, (2AQM) fone, 2AYT 2BB, 2BBN, 2BDQ, (2BFZ), 2BG, 2BIR, 2BML 2BQH fone, 2BRC, 2BSC, (2CT), (2DN), 2GK, 2GR 2HI, 2HZ, 2IA, (2KL), (2KN), 2MW, 2RA fone, 2RR, (2RU), 2TJ, 2UD, 2VC, 2WD, 2WI, 2WM, 2WS, 2XA, 2XJ fone, 2XK, 2XQ, (2ZL), 2ZM, 2ZV, 3AAE, 3AJD 3ANJ, 3AMK, 3BZ, 3CC, 3DS, 3EN, 3EQ, 3ER, (3HX), 3IH, (3LH), (3SJ), 3VV 3VK, 3ZO, (3ZY), 4GL, 8ADG, 8ADY, 8AFB, 8AFO, 8AGO, (8AGZ), (8AIO), 8AIX, 8AKA, 8ALY 8AMF, 8AOA, 8AQZ, 8ARW, 8AYZ, 8BCI, 8BI, 8FK, 8BO, 8CI, (8DE), 8DR, (8D [illegible] E, 8HA, 8HY, 8II, 8IV, 8JU, (8LF), (8LX), 8NQ, 8OI, 8OQ, 8OW, 8PJ, 8QY, (8RQ) fone, (8VS), 8WY, 8XI, 8XK, (8XM), 8YG, 8ZG, [illegible] W, (8ZY) 9AZX, 9FW; Can. (2BF), 9AL, NSF, (NMW)

1BDI, Augusta, Maine.

(1ACO) (1ADL), (1AEV), 1AJP, 1AJU, (1APO), 1APT, 1ALK, 1ARY, 1AW, 1BAS, 1BBS, 1BDC, (1BDK), (1BDQ), (1BJS), (1BPZ), 1CCZ C.W., 1CF C.W., 1CGR, 1CM, 1CP, (1CZ), 1DY, (1ES), 1EK, 1HO, 1OE, 1RX, (1SD), (1SN), 1SQ, 1TS spk & C.W., (1UL), (1ZE), 2ACT C.W., 2AQL, 2AQM C.W., 2ARY, (2AWF), 2AWH, 2AWL, 2BG, 2BM, 2ON C.W., 2DJ, 2EL, 2JU, 2OM, 2OX, 2QR, 2RU C.W., 2SK, 2TS, 2UK, 2VW, 3ADQ, 3AMP, 3AQR, 3AS, 3CC, 3FJ, 3GX, 3HJ, 3HX, 3LP, 3OU, 3QH, 3QN, 8AFB, 8AFD, 8AGK, 8AOT, 8AFB, 8AWP, 8AYN, 8DE C.W., 8DY, 8PI, 8RU, 8SP, 8WY, 8XH C.W., NSF.

1MO, Hartford, Conn.—All C.W.

(1RZ), 1BY, 1BCJ, 1CZ, 1SZ, (1TS), 1HBP, 2ABO, 2ACT, 2ADL, 2AHL, 2AJE, (2AJW), (2DN), 2KF, (2KL), 2XK, 2WD, 2UD, 3CC, 3HY, 3ACS, 3EN, 8AIO, 8ALY, 8DE, 8LF, 8IV, 8ZG, 8XU, 8AZX.

1CBL, West Redding, Conn.

1AAU, 1ABY, 1AJP, 1ANQ, 1AW, 1AYQ, 1AZW, 1BDC, 1BES, 1BJN, 1BKA, 1BM, 1BPZ, 1BYS, 1BZY, 1CAK, 1CF, 1DR, 1ES, 1HDC, 1HO, 1OE, 1PT, 1QN, 1RX, 1RZ, 1SN, 1TS, 1UN, 1YC, 1ZE, 2AJE, 2AJF, 2AWL, 2AXB, 2BFZ, 2BML, 2BSC, 2DN, 2EL, 2FS, 2GR, 2JU, 2WD, 2XK, 2ZL, 3APT, 3BAX, 3BG, 3CC, 3GX, 3HJ, 3IH, 3IW, 3VV, 3VW, 3XB, 3ZY, 8ACF, 8AFB, 8AGK, 8AKQ, 8AMM, 8ANK, 8ANR, 8APB, 8AWP, 8BKR 8DE, 8DI, 8HP, 8JM, 8OI, 8SP, 8WO, 8WY, 8XM, 9YA.

1ES, Brookline, Mass.

C.W.: 1AAU, 1ABY, 1AJP, 1ANQ, 1BKA, 1BWK, 1BZY, 1CCZ, 1OE, 1QN, 1RZ, 1TS, 2ACT, 2AJE, 2AJF, 2AJW, 2AQM, 2AVR, 2AWL, 2BFZ, 2BG, 2BRC, 2BSC, 2DN, 2HI 2KL C.W., 2RU, 2XK, 3BZ, 3CVV, 3ZO, 8AIO, 8ANK, 8BEF, 8BT, 8DE, 8DR, 8HJ, 8II, 8LX, 8QY, 8XH, 8XM, 8ZG. Spark: 1ACO, 1ADL, 1AEV, 1AJP, 1AW, 1BDC, (1BDI), 1BPZ, 1CM, 1FB, 1HO, 1OE, 1ZE, 2ARY, 2AWF, 2BG, 2DA, 2DJ, 2DN, 2DX, 2DY, 2EL, 2JU, 2OM, 2OX, 2TS, 2UK, 3ALC, 3BG, 3CC, 3HJ, 3HX, 3OU, 3VW, 8AFB, 8AFD, 8AGK, 8AJB, 8AWP, 8AYN, 8DY, 8HR, 8HY, 8QM, 8SP, 8UP, 8XH, 8YV.

1VQ, New Haven, Conn., C.W. Only

1BZY, 1CAK, 1FCY, 1IV, 1NAQ, (1QN), 1RU, 1RZ, 1SQ 1TL, 1TS 1UN 2AJW 2ANG 2AWL, 2BFZ, 2BML, (2BRC), 2DN, 2KL, 2RB, 2UD, 2ZD, 3BZ, 4GL, 8AAZ, 8AIO, 8BCI, 8DE, 8XM, 8ZM.

1ANQ, Hartford, Conn.

Spark: 1CP, 1DY, 1EP, 1ES, 1FB, 1OE, 1RX, 1SN, 1ACA, 1ACZ, (1ADL), (1ABP), 1AHF, 1ARY, (1AVO), (1AYL), 1AZK, 1AZQ, 1BBZ, 1BDI, (1BFE), (1BFJ), (1BGF), 1BJN, 1BJS, 1BPZ, (1BRW), 1BTP, (1BUC), 2EL, 2KN, 2OM, 2UA, 2ARY, 2AWF 3CA, 3EN, 3GX, 3HJ, 3HX, 3FW, 3OU, 3SP, 3VW, 3ZO, 3AAG, 3APT, 3AWP, 8BFZ, 4AL, 4BQ, 8BO, 8BP, 8DA, 8DV, 8DY, 8EV, 8EZ, 8FP, 8GM, (8KM), 8RU, 8SP, 8TJ, 8TK, 8TT, 8TY, 8WY, 8XQ, 8ZD, 8ZX, 8ZY, (8ACF), 8AFB, 8AFD, 8AFN, 8AFS, 8AGK, 8AHH, 8AHJ, 8AJT, 8AKF, 8AKQ, 8AOT, 8AWP, 8AXC, 8AYN, 8BFV, 8DCI, 9MB, 9PC, 9AAY, 9ABH, 9AFT, 9AIK, 9DAX, C.W.: 1AE, 1ES, 1QN, 1WP C.W. fone, 1XE C.W. fone, 1AAU, 1CAK, 1CCZ C.W. fone, 1CDR, 2DN, 2KL, 2LH, 2UK, (2ZL), 2AJW, 2AWL, 2BSO, 3BZ, (3CC), 3ZY, (3AAE), 4GL, 8BO, 8BT, 8II, 8IV, 8LX, 8NQ, (8QY, 8RY, 8WY, 8ZN, 8ZY, 8AIO, 8ANK, 8IIV.

2AQP, New York City

1ADL, 1AJP, 1AJU, 1ARY, 1BDC, 1FB, 1HO, 1OE, 1ZE, 3AW, 3CC, 3GX, 3HG, 3HJ, 3HX, 3IW, 3OU, 8VW, 8XF, 4EA, 4GL, 8AFA, 8AFB, 8AGK, 8AGZ, 8APB, 8ARA, 8ARD, 8AWP, 8AWT, 8BF, 8BT, 8DE 8SP, 8WY, 8ZD, 8CG, 8XU.

2TS, Staten Island, N. Y.

(1AJP), 1AW, 1CCZ, (1DY), (1FB), 1JAP, 1OE, (1RX), (1ZE), 2AJR, 2AWH, 2BGM, (2UA), 3ABG, 3BG, (3CC), 3DW, 3GX, 3HG, 3HJ, (3HX QSA daylite), 3IW, (3KM), 3OU, 3RW, 3VV, 3VW, 3ZA, NSF, 4GL, 8AFD, 8AGD, 8AGK, 8AQV, 8AWP, 8BO, 8EV, 8SP, 8XU, 8YV, 9AAW, 9UH.

2AOS, Montclair, N. J.

Spark: 1AW, 1BM, 1DY, 1HO, 1OE, 1ZE, 1ADL, 1AJP, 1ARY, 1BDC, 1BES, 2AWF, 2UA, 2BA, 3BG, 3CC, 3EH, 3FJ, 3GU, 3GX, 3HB, 3HG, 3HJ, 3HW, 3HX, 3IW, 3KM, 3OU, 3RW, 3US, 3VW, 3ZA, 3ZO, 3XF, 3AIC, 3AMP, 5DA, 8BO, 8EV, 8FT, 8DC, 8DY, 8HR, 8RU, 8RZ, 8SP, 8TK, 8XU, 8ADQ, 8AFA, 2AFB, 8AFD, 8AFK, 8AJT, 8AMQ, 8ANT, 8APB, 8AWP, 8AWV, 8AHV, 8BOJ, 9UH, 9UK.
C.W.: 1AE, 1TS, 1ANQ, 1BKA, 1BTO, 1CCZ, 2BG, 2DF, 2DN, 2GC, (2GF), 2GR, (2IA), (2JF), 2KL, 2KY, 2PE, 2RR, (2RU), 2SS, (2UD), (2VU), 2WI, 2XD, 2XK, 2XJ, 2ZL, 2ZM, 2ABR, 2ABZ, 2ACI, 2ADS, 2ACT, 2AJE, (2AJF), 2ANE 2ANL, 2ANW, 2AQM, 2AVR, 2AWE, 2AWL, (2AWM), 2AYZ, (2BBN), (2BFZ), 2BGM, (2BIR), (2BIV), 2BJP, 2BLO, 2BNL, 2BPD, 2BSC, 2BRO, 2BUA, (2AMF), 3CC, 3PB 3VV, 3ZY, 3AMK, 4GL, 8BC, 8DE, 8DR, 8HA, 8HJ, 8II, 8XH, 8XM, 8ZW, 8AIO, 8AQZ, 8BCI, 8BDP, NSF, WYCB.

2AVE, Jamaica, L. I.

1AW, 1CZ, 1HK, 1SN, 1ZE, 1AJP, 1AJU, 1ANZ, 1AOL C.W., CW only or fone: (2AB), 2CT, 2DN, 2IA, 2KL, (2RB), 2RU, 2SB, 2UJ, 2XG, 2XK, 2XJ, 2XF, 2ZL, (2ZV), 2ACT, 2AJE 2AJF, 2AVR, 2AWD, 2AWL, (2BBN), (2BMW), 2BNL, (2BOH), 2BSC, 2BUM, 3AC, 3CC, 3GX, 3HG, 3HJ, 3HX, 3IW, 3OU, 3QJ, 3QN, 3RW, 3VW, 3ZY C.W., 8AIC, 8AMP, 3AQR 8BO, 8DE, 8DJ, 8DY, 8HR, 8RU, 8SP, 8VH, 8WY, 8XU, 8ZE, 8AFB, 8AFD, 8ACK, 8AHH, 8AIO C.W., 8AJT, 8APB, 8ARI, 8AWP, 8AYN, 9ME, 9UH, 9AAW.

2BFZ, Yonkers, N. Y.

1AE, 1AAU, 1AHK 1AOL, (1BAB), 1BES, (1CAK), 1CF, (1CBJ), 1CCZ, 1DR, (1DH), (1FQ), 1MO, 1QR, 1QN, (1RZ), (1TBJ), (1TS), 1UN, 2ADL, (2AJW), (2AQM), (2HI), 3AAE, Can. 3BP, (3CC), (3EN), (3HX), 3VV, 3XF, 3ZO, 3ZY, 4XB, (4GL), (8AAZ), 8ACF, (8AGZ), (8AIO), 8AKJ, 8ANK, (8AQZ), (8ADG), (8BK), 8BO, 8BT, (8DE), 8DV, 8HJ (8II), 8IV, (8JM), (8JU), 8LJ, 8LX, 8OW, (8PN), (8QV) (8RQ), 8VS, 8WY, 8XH, 8XK, (8XM), (8XU), 8ZG, 9ASN.

2AUG, Ridgewood, N. J.

Spark: 1AW, 1CZ, 1DY, 1FB, 1OE, 1SN, 1ZE, 1ADL, 1AJP 1ALK, 1BDI, 1BPZ, 2BG, 2EL, 2GK, 2OX 2QE 2QR 2TJ, 2TS, 2UA, 2UE 2WI, 2ACG, 2AFW, 2AGC, 2AHU, 2ALW, 2AQL 2ARM 2ARY, 2AUR, 2AYB 2AYY, 3CC, 3FU, 3GX, 3HG, 3HX, 3OU, 3RW, 3UC, 3XF, 8BO, 8CI, 8DY, 8DZ, 8HR, 8HY, 8LX, 8MM, 8OA, 8OI 8QY 8SP 8TT, 8WA, 8WY, 8XU, 8YN, 8YV, 8ZT, 8ZY, 8AFA, 8AFB, 8AFD, 8AGK, 8AHN, 8AJA, 8AIT, 8AMQ, 8AOT, 8APB, 8AQV, 8ARB, 8ARD, 8AWP 8AYN 8BBU, 8BDY, 8BFV, 8BOI, 9FG, 9PA, 9PC 9PW, 9SM, 9UH, 9UU, 9ZL, 9ZN 9AAW 9AJC: C.W. or fone: 1BH, 1QN, 1TS, 1ABY, 1CBG, 1CCL, 2BG, 2CT, 2DF, 2DN, 2IA, 2PE, 2RR, 2RU, 2UD, 2VU, 2XA,

2BZ, 3EM, 3EQ, 3HX, 3VV, 3ZY, 4GL, 8BC, 8BT, 8DE, 8II, 8JM, 8LX, 8XH, 8XM, 8ZN, 8AAZ, 8ADG, 8AIO, 8AQZ, 8BCL

3JL, Morristown, N. J.
1AW, 1BE, 1JAP, 1ZE, 1ZL (2ACD), 2ACY, 2AFG, 2ARG, (2ARY), 2AUJ, 2AWY, 2AY, (2BG), 2BFA, 2CBX, 2CM, 2IA, 2JH, 2JU, 2RU, 2SQ, 2OX, 2OY, 2TS, 2UC, 2UE, (2UK), (3ABG), (3AFD), 3AMP, (3BDT), (3CK), 3OU.

3ARN, Chevy Chase, Md.
1AW, 1ZE, 2AHU, 2ARY, 2BG, 2EL, 2XL C.W., 3BZ C.W., 3CC, 3HG, 3HJ, 3HX, 3RW, 3SR, 3SX, 3TM, 5FV, 8ACF, 8ACX, 8AFB, 8AFD, 8AGK, 8AJT, 8ANK, 8APB, 8AWP, 8AYN Spk & C.W., 8BO, 8BT, 8CD, 8DE C.W., 8DJ, 8JQ, 8JU, 8RU, 8SA C.W., 8SP, 8XU, 9QN, 9VK, 9UU.

3ZO, Parkesburg, Pa.
1UD, 1DE, 1ZE, 1EL, 1HO, 1QN, 1NS, 1ZS, 1FV, 1AW, 1CZ, 1ACD, 1AJP, 1AYL, 1AQR, 1AJU, 1DAL, 2DA, 2UA, 2CC, 2UD, 2UE, 2BG, 2EH, 2DI, 2DJ, 2SJ, 2UK, 2XK, 2EL, 2KL, 2DM, 2EM, 2QN, 2SN, 2BO, 2LO, 2RO, 2GR, 2PR, 2UR, 2BS, 2TS, 2ZV, 2AW, 2ZL, 2ADL, 2AQL, 2AQM, 2AQN, 2ACT, 2ARX, 2ARY, 2BAT, 3ZA, 3CC, 3ZE, 3XF, 3HG, 3QH, 3FJ, 3HJ, 3IK, 3SK, 3CM, 3TM, 3ZM, 3QN, 3ZN, 3LP, 3EQ, 3LQ, 3FR, 3QR 3ZS, 3OU, 3XV, 3ZV, 3DW, 3JW, 3QW, 3GX, 3HX, 3UX, 3WX, 3ZY, 3AIA, 3ABB, 3ADB, 3AAN, 3AEP, 3AOR, 3AQR, 3AGT, 3ALX, 8HA, 8DC, 8DE, 8CG, 8XH, 8BK, 8TK, 8EL, 8XM, 8ZM, 8AO, 8BO, 8HR, 8TT, 8IU, 8XU, 8EV, 8AW, 8ZW, 8BY, 8DY, 8QY, 8AFA, 8APB, 8AFD, 8AGK, 8APX, 8AQZ, 8ZN, 9AY.

3VW, Frankford, Phila., Pa.
(1ADL), (1AJP), 1AW, 1BDI, (1BPZ), 1CCZ C.W., (1CP), (1DY), (1FB), 1HO, 1OE C.W., (1SN), 1ZE, 2AHU, 2AR, (2AWF), 2AWL C.W., 2BBN C. W., 2BFZ C.W., (2BG), 2DJ, 2UE, 2UK, 2ZY, 4GL C.W., 8AFB, 8AFD, 8AIO C.W., 8AJT, 8ANY, 8AMQ, 8APB, 8AQV, 8AWP, 8BDY, 8BO, 8CI C.W., 8DE C.W., 8II C.W., 8OI, (8SP), 8TT 8XH C.W., (8LX), 9AAW, 9CC, 9ME, 9PC, (9UH), 9ZN.

4IE, French Broad Camp, Brevard, N. C.
2EL, 2ARY C.W., 3DH, 3HJ, 3IW, 4AA, 4BK, 4BQ, 4DH, (4FD), 4GL C.W., 4GN, 4XC, 4XK, 5AF, (5DA), 5XA, 8AJT, 8AFB, 8AFD, 8AND, 8BT C.W., 8DE C.W., 8HA, 8JM C.W., (8RQ), 8XH, 9CP, 9FS, 9MC, 9UH.

5NH, Rockdale, Texas
4AW, 1TS, 1ZE 2ZL, 3AAO, 4XC, 5OA, 5HZ, 5IO, 5IY, 5KP, 5KV, 5MM, 5NF, 5NP, 5NS, 5PD, 5PP, 5YK, 5ZA, 5ZC, 5ZL, 5ZN, 5ZP, 5ZU, 5ZW, 5ZY, 6EN, 6JT, 6ZO, 6ZX, 8DE, 8SP, 8ZL, 8ZW, 9HT, 9LC, 9OE, 9XI, 9ZB, 9ZN, 9ZX.

5HZ, Houston, Tex.
4GL C.W., 5AF, (5AL), 5EK, (5FA), (5HL), 5HV, 5IE, 5IF, (5IQ), (5IR), 5JD, (5KP), (5KV C.W.), (5LC), 5LK, (5MX), (5MY), (5NC), (5NF), (5NS), 5OY, (5PD), (5QI), (5QQ), 5RA, (5ZA C.W.), (5ZAF), 5ZAG, 5ZAK C.W., 5ZC, 5ZG C.W. & spk., 5ZR, (5ZU), (5ZW C.W. & Spk), (ZSI), 5YK, (5XI), (5XJ), 9AEG, (9DUG), 9MC, 9OE, 6WV C.W.

5ER, Nashville, Tenn.
3BZ, 3AOV, (4AG), (4BK), 4BQ, (4DT), 4FD, 4GL C.W., (4GN), 4IW, 4XC, 5AF, (5EK), 5DA, 5HL, 5NS, 8ABS, 8AFB, 8ARS, 8BO, 8DE C.W., 8II C.W., 8JM C.W., 8TY C.W., 8XM C.W., 8ZY, 9AAW, (9ABC), 9AYW, 9DE, 9DCX, 9JG, (9KO), 9MC, (9OO), (9UH), 9UU, 9VZ, 9ZN, LC C.W.

6ANK, Sparks, Nev.
6AAW, 6ABM, 6ABN, 6ABU, 6ABW, 6ACR 6ACO, 6AFH, 6AFN, 6AFU, 6AGH, 6AGN, 6AGO 6AID, 6AJH, 6AJR, 6AJS, 6AJW, 6AK, 6ALS, 6AMW, 6ANR, 6AOX, 6APH, 6AR, 6ARS, 6ASJ, 6AW, 6CH, 6DA, 6DP, 6DQ, 6DS, 6EB, 6EN 6FH, 6GK, 6HH, 6HX, 6KA, 6KM, 6KP, 6KS, 6KW, 6LC, 6LR, 6OH, 6OM, 6PJ, 6PP, 6PQ, 6PR, 6TO, 6XZ, 6ZAA, 6ZK, 6ZR, 6ZU, 6ZN, 6ZX, 7BM, 7DA, 7JW, 7YA, 7ZJ.

Following calls heard in full daylight—sun shining (one tune): 6AFN, 6ABN, 6AGF, 6AGN, 6KW, 6ABW.

Eugene Champion, Los Angeles, Cal.
5ZA, 6AB, 6AE, 6AK, 6AY, 6BJ, 6BM, 6DA, 6ED, 6EN, 6HN, 6IO, 6IT, 6JF, 6JI, 6KH, 6MK, 6NI, 6RN, 6RZ, 6SN, 6ST, 6TL, 6TV, 6UM, 6XE, 6XM, 6XY, 6YA, 6ZK, 6ZN, 6ZZ, 7FL, 7IN.

7CN, Marshfield, Ore.
6AG, 6AR, 6EB, 6EX, 6FH, 6KA, 6KP, 6OH, 6PH, 6ZX, 6AAW, 6AFN, (6AGF), 7AR, 7BA, 7BC, (7BK), 7BW, (7CW), (7DA), 7EX, (7IN), 7IW, 7IY, 7KB, 7KM, 7YA, 7YS, (7ZJ), 7ZM, 9OE.

7ZJ, Vancouver, Wash.—July
(6AAT C.W.), 6AAW, 6ABM, (6ABU), (6ABW), 6AZX, (6ACH C.W.), 6ACR, (6AE), 6AEW, (6AFN), 6AFD, 6AFY, (6AGF), 6AI, (6AIB), (6AID), (6AIW), 6AJH, (6AK), (6ALE C.W.), (6ALV), (6AMW), (6APH), (6AR), 6ARK, (6ARS), (6AS), (6ATV), (6AUN C.W.), (6BA), (6CH), 6CR, (6DP), (6DY), 6EA, 6EB, (6EN), (6EP), (6FH), 6FX, 6GY, (6HC), (6HP), (6IC), 6IM, 6IS, (6KA Spk. and C.W.), 6KH, (6KM Spk. C.W. and Voice), 6LC, 6MH, 6MZ, (6OH), (6PJ) (6PR), 6SK, (6TC), (6TV), 6UW, (6VX), (6WZ), 6XAD C.W., 6ZAA, 6ZK, 6ZN, 6ZU, (6ZX), 7AD C.W., (7AY), (7BA), (7BK), (7BQ), 7CC, (7CA), (7CE C.W.), (7CN), 7FR, (7HF), 7IH, 7IN, 7IU, (7IW), (7IY), (7KJ), (7KM), (7KS), (7KW), 7LD, 7LS, (7MF), (7NN), (7TE), 7RU, Canadian 5CP and (5CJ).

8YN, Battle Creek, Mich.
Spark: 1AW, 1BAY, 2EL, 2BB, 2BK, 3HJ, 4CC, 4FV, 8AW, 8AU, 8AFB, 8AFD, 8AFI, 8AFS, 8AFZ, 8AIC 8AIV, 8ANW, 8AQV, 8ARW, 8AYN, 8BK, 8BBU, 8BDY, 8FT, 8MM, 8OI, 8SP, 8WA, 8WM, 8WY, 8XC, 8ZY, 9AAW, 9ACB, 9ACL, 9AEY 9ARY, 9ASU, 9DM, 9EZ, 9JQ, 9KO, 9LQ, 9MQ, 9PC, 9RP, 9UH, 9UU, 9VZ, 9VK, 9ZN, 9ZY.
C.W.: 1AE, 1PQ, 1TS, 1UN, 2AJF, 2ARY, 2AWL, 2BB, 2BFZ, 2DN, 2FS, 2XK, 2XM, 2ZL, 3AAO, 3BZ, 3HX, 3ZY, 4GL, 8AAZ, 8AGZ, 8AGO, 8AIO, 8AQZ, 8AX, 8ARU, 8BO, 8BU, 8BY, 8BGL, 8BJU, 8DE, 8DR, 8WY, 8HA, 8II, 8IV, 8JM, 8LF, 8OI, 8PN, 8QJ, 8QU, 8XM, 8XH, 8XW, 8XY, 8AXA, 9ALB, 9EK, 9XM.

8VE, Pittsburgh
1AW, 1CZ, 2EL, 2WB, 2ARY, 3CC, 3GX, 3HJ, 3OU, 3YG, 3AQR, 5FV, 8BO, 8BT, 8CI, 8DE, 8DQ, 8DR, 8DV, 8DZ, 8FQ, 8HA, 8HY, 8IN, 8LX, 8NV, 8VX, 8XH, 8XM, 8ZD, 8ZY, 8AAJ, 8AAM, 8ACF, 8ACP, 9AFB, 8AGX, 8AHR, 8AIG, 8AIO, 8AIU, 8OW, 8QY, 8RT, 8RU, 8SP, 8TT, 8UP, 8VF, 8VR, 8AIV, 8AJW, 8AKW, 8ALD, 8AMG, 8ANK, 8AOQ, 8APB, 8AXV, 9JG, 9UH, 9UU, 9WU, 9AAW.

J. E. Law, Jr., Cheat Bridge, W. Va.
1CZ, 1DH, 1FB, 1SN, 1TS, 1ZE, 1ADL, 1ANQ, 2BG, 2DN, 2EL, 2BB, 2GR, 2KL, 2ME, 2OM, 2RM, 2RU, 2TS, 2UD, 2UK, 2VW, 2XK, 2ACT, 2AQM, 2ARY, 2AWL, 2BFZ, 3AC, 3BZ, 3CC, 3EM, 3EN, 3EQ, 3GX, 3HG, 3HJ, 3HX, 3IW, 3JW, 3KM, 3LP, 3LW, 3MZ, 3NB, 3OA, 3OU, 3UC, 3VV, 3VW, 3XF, 3ZO, 3ZV, 3ZY, 3AAO, 3AJD, 3AMP, 3ANJ, 3AQR, 4GL, 4GN, 4XK, 5DA, 5FV, 8BO, 8BP, 8BT, 8CI, 8DE, 8DP, 8DV, 8EV, 8EZ, 8FT, 8GO, 8HB, 8HG, 8HR, 8HJ, 8II, 8IV, 8JM, 8JU, 8JV, 8LX, 8MM, 8NV, 8OA, 8OE, 8OH, 8OI, 8OV, 8PT, 8RU, 8TJ, 8TK, 8TN, 8TT, 8TY, 8VE, 8VL, 8WA, 8WY, 8WZ, 8XH, 8XM, 8YV, 8ZD, 8ZY, 8AAZ, 8ADN, 8ACF, 8ACF, 8ADG, 8AEE, 8AFA, 8AFB, 8AFS, 8AGK, 8AHH, 8AIB, 8AIO 8AJB, 8AJT, 8AKS, 8ANK, 8AOI, 8ANW, 8AMQ, 8AQZ, 8ARD, 8ARS, 8ASY, 8AUU, 8AWP, 8AXC, 8AYN, 8BBU, 8BCI, 8BDY, 8BEF, 8BEN, 9AL, 9CS, 9FG, 9FS, 9JG, 9LQ, 9ME, 9MC, 9NC, 9OE, 9PC, 9UH, 9WH, 9ZN, 9AAW, 9AZX.

8LX, Crafton, Pa.
1AW, 1BM, 1DN, 1HC, 1IA, 1OE, (1TS), 1XM, 1XO, (1ZE), 1BCY, 1CCZ, 1GBT, 1RAY, 1SBZ, (2DN), (2EL), (2RU), 2SB, (2UD), (2XK), (2ACT), (2ADL), (2ARY), (2AWL), (2BFZ), 3AC, (Canadian 3BP), 3BZ, 3CC, (3CT), 3GR, (3HG), 3HJ, (3IW), 3KM, 3KL, 3KY, 3NB, 3OI, 3OU, 3OV, (3PU), (3QF), 3QN, 3UK, 3VO, (3VV), (3VW), 3WW, 3ZM, 3ZO, (3ZY), 4AG, 4CN,

(4GL), 4IE, 4XC, 4XK, 5DA, 5FV, 5YE, (8AI dalite), 8BC, (8BH), 8BO, (8DE), 8DI, 8DX, 8DY, (8GI), (8GW dalite), 8HG, (8HJ), 8II, 8LV, (8MM), 8MZ, 8OC, 8OE, (8OI), 8OV, 8QY, 8SP, (8TT), 8TY, 8YV, 8ZG, 8AFB, 8AFD, 8AGK, (8AJP), 8AKS, 8AIB, 8AMY, (8AQV), (8AQZ), 8AVO, 8AVT, (8AXC), 8BDP, (8BDY), 8BOY, 8IST (QRA pse), 9BP, 9CP, 9FG, 9KV, 9MC, 9ME, 9PC, (9UH), 9UU, 9UV, 9VK, (9ZN), 9AAJ, 9AAP, 9AAW, 9AAU.

8AXC, Marietta, Ohio.

Spark: 1AW, 2BG, 2DI, 2EL, 2RU, (2ARY), 3AC, 3AN, 3CC, 3HB, (3HG), 3HJ, 3OU, 3UC, 3XF, 4AG, 4FD, (4GN), 4XC, 5DA, 5FV, 8BK, 8BO, 8DJ, 8DR, 8EV, 8HG, 8HR, 8LX, (8OA), (8OI), 8ON, 8RU, (8SP), 8TT, 8WA, 8WY, 8WZ, 8AEY, 8AFB, 8AFD, 8AGK, 8AJT, 8AKV, 8AMF, 8AMQ, 8AQV, 8ARD, 8AWP, (8AYN), (8BBU), (8BDC), (8BDY), 8YV, 8ZD, 8ZN, 9FS, (9UH), 9VK, (9AAW).
C.W.: (2DN), 2KL, 2AQM, (2AWL), 2XK, 3CC, 4GL, 8CI, (8DE), 8IV, 8LX, (8OA), 8AIO, 8ANK, 8XM, 9AZV.

8AWP, Syracuse, N. Y., June and July

1AW, 1CG, 1CZ, (1DR), (1DY), (1GM), (1OE), (1SN), (1TS) C.W., (1XM), (1AGN), (1DAL), (1GBC), (1LBR), (1MAD), (1PAZ), (1ZE), (2BK), (2DI), (2DJ), (2EL), (2JU), 2ME, (2MJ), (2OM), (2OX), (2SQ), (2TS), (2UA), (2UK), (2ARY), (2AWF), (2AWL), (2BGR), (3AC), 3AD, 3BZ, (3CA), (3CC), (3EH), (3EV), (3GX), (3HX), (3IW), (3IY), (3KM), (3LP), (3OU), (3PU), (3QN), (3UC), 3WX, (3ABG), (3ALX), (3AQR), 4AG, 4GL C.W., 4IE, 5DA, 8AL, (8BO), 8CK, (8DE) C.W., (8EA), (8ED), (8EV), 8EZ, 8FW, 8GO, (8HJ), (8HP), (8HR) (8ID), 8IL, (8KK), (8LW), (8MM), (8OI), (8PL), (8PT), (8QE), (8QM), (8QY) C.W., (8RU), (8SP), (8TY), (8WA), (8WY), (8YB), 8ZD, (8ZY), (8AAN), 8ACY, (8ADG) C.W., 8AFA, 8AFB, (8AFD), (8AGK), 8AGO, 8AHH, 8AIB, (8AIO), 8AJT, (8AKA), 8AKJ, (8AMM), (8AMQ), (8AMZ), (8ANK), (8ANG) C.W. fone, 8ANW, (8AOT), (8APB), (8AQV), (8AVT), (8AYK), (8AYN), (8AXC), (8AXI), (8AXU), (9FS), (9ME), 9JT, 9PC, (9UH), 9VK, (9ZL), (9AAW), (9AAY), 9ACJ, 9YAC, (9DAX)

91F, Forest Patrol Stn., Forks, Callam Co., Wash.

Canadians: 5CJ, 5CP, XEQ, 6AFN, 6AK, 6AID 6AIL, 6HC, 6WZ, 6ZX, 7AC, 7AY, 7BA, 7BF, 7BQ, 7BK, 7CA, 7CC, 7DA, 7DP, 7CN, 7CR, 7CW, 7ED, 7FH, 7FR, 7GA, 7IW, 7IN, 7IY, 7KJ, 7KM, 7KS, 7KW, 7HF, 7LS, 7LW, 7MF, 7NN, 7NW, 7PJ, 7PO, 7OQ, 7TC, 7TE, 7TO, 7YL, 7YS, 7ZB, 7ZJ, 7ZW, 7OJ.

9ARZ, Clear Lake, Iowa

2ZL C.W., 5EK, 5HL, 5XJ, 5YH, 5YR, 8BO, 8CF mod Buzzer, 8DE C.W., 8II C.W., 8JM C.W., 8OI, 8XH C.W., 8ZI 8ZW C.W., 8ZY, 8ACN, 8AFB, 8AIO C.W., 8ANX, 8AYN, 8TYN, 9DP, 9FG, 9FS, 9GG, 9GO, 9IG, 9KO 9LC, 9LF, 9LQ, 9LY C.W., 9MC, 9MS, 9MZ, 9OE, (9OO), 9SG, 9UG, 9UH, 9UK, 9UU, 9VE C.W., 9VK, 9VY, 9XI, 9YA, 9YM, 9YO, 9YY C.W., (9ZC), 9ZN, 9ZT, 9AAW, 9ABH, 9AEQ, 9AFK 9AKC, 9AMH, 9AMK, 9AMS, 9AMU, 9ANX, 9ARX, (9ASK), 9ASR, (9AXU), 9AYW, 9ACH, 9ACL, 9ACN, 9ACW C.W., 9AEG, (9AEH), 9AZX C.W., (9DUG), 9YAC, (9YAE).

9ARG, St. Louis, Mo.

3CC, 4AG, 4GL C.W., 4XC, 5DA, 5EK, 5ER, 5FV, 5HL, 5QI, 5XK, (5YH), 8BO, 8DE C.W., 8FT, 8MM, 8NQ, 8OI, 8QX, 8RP, 8TK, 8TT, 8WY, 8ZY, 8AFB, 8AFD, 8AIO, 8AKV, 8ALM, 8ARS, 8AYN, 8BBA, 9AR, (9CP), 9EL, 9FG, 9FS, 9HT, 9JG, (9JF), 9LQ, 9ME, (9MS), 9NQ, (9OE), 9OO, (9PC), 9UH, 9UU, 9UW, 9XI, 9YA, (9ZN), 9AAV, 9AAW, 9AIO, 9AXU, 9DEH, 9DJZ, 9YAC.

9AAW, Chicago, Ill.

Spark: 1AW, 2CC, 2EL, 2JU, (2UK), 2ZR, (2ARY), 3BZ, 3CC, (3HG), 3HJ, 3QR, 3RW, 3VW, 3XF, 5BP, 5DA, 5YH, (8BO), 8BP, 8CF, 8DE, 8DP, 8DV, 8DZ, 8EB, 8EV, (8FT), 8GO, 8HR, (8LU), (8MM), 8MN, 8NQ, 8NZ, (8OI), 8PM, 8RU, 8SP, 8TK, (8TN), (8TT), (8WA), 8WY, 8YV, 8ZB, (8ZY), 8ACP, (8AFA), (8AFB), (8AFD), 8AFK, (8AFS), (8AIB), 8AKV, 8AMQ, 8APP, 8AQV, (8ARS), 8AVB, (8AWP), (8AXC), (8AYN), (8BBU), 8BDY, 8BEN, 8AEE, (9FG), (9FS), (9KO), 9LC, (9LF), 9LQ, (9ME), 9MS, 9NH, (9PC), (9UH), 9UW, (9VZ), (9ACB), 9ALH, 9AMS, 9ARK, 9DAX, 9DDX, 9DTJ.
C.W.: 1TS, 2DN, 2AQM, 2AWL, 4GL, 4ZY, 8BO, (8DE), 8DR, 8II, 8IV, 8QY, 8XM, (8AIO), 8BFG, (9EK), (9AZX).

9FD, Lafayette, Ind.

NSF, WWV, 1BBL, 1XM, 2AH, 2BK, 2BX, 2CC, 2DN, 2EL, 2OL, 2RK, 2WW, 2XM, 2ZM, 3AR, 3AT, 3BP, 3BZ, 3CC, 2EN, 3EV, 3GO, 3HJ, 3HX, 3KM, 3MO, 3NB, 3NC, 3OU, 3RW, 4AG, 4FD, 4XB, 4XC, 4XD, 5EK, 5DA, 5FD, 5HL, 5HZ, 5IF, 5YH, 5ZA, 5ZL, 8AAZ, 8ACY, 8ADE, 8ADL, 8AGK, 8AIB, 8AIJ, 8ANJ, 8ANT, 8ARS, 8ICB, 8ICC, 8ICH, 8IDR, 8IFS, 8IRS, 8AA, 8AG, 8AL, 8BK, 8BO, 8CA, 8CD, 8CF, 8CY, 8DC, 8DR, 8EN, 8FQ, 8FT, 8HB, 8HM, 8IB, 8IC, 8ID, 8IF, 8JL, 8KH, 8KM, 8KZ, 8LA, 8LD, 8LN, 8MM, 8NC, 8NI, 8NL, 8OR, 8PJ, 8PV, 8QJ, 8RG, 8RO, 8RQ, 8SF, 8SR, 8TN, 8UH, 8XF, 8XK, 8YN, 8ZB, 8ZC, 8ZD, 8ZN, 8ZR, 8ZT, 8ZW, nines too numerous.

9AIF, Sioux Falls, S. D.

7ZO, 8AFD, 8AIO (CW), 8FT, 8II (CW), 8TT, 8ZY, 9AAW, 9ALH, 9AMS, 9ASK, 9AYW, 9DEH, 9DJZ, 9DSG, 9KO, 9MC, 9OO, 9UU, 9YA, 9YAC, (9YAE), 9YY, 9ZC, 9ZN, 9ZX.

9KA, Wichita, Kansas.

5HL, 5HZ, 5IF, 5IZ, (5JR), 5NK, 5PD, (5PG), (5PU), (5QH), 5QP, 5XA C.W., 5ZA C.W., 7ZX, 8ZL, (9ABV), (9AEG), 9AEY, 9ALG, 9APY, 9ARZ, 9AUD, 9AYJ, (9DE), 9DFJ, 9DFL, (9DGO), 9DTP, (9DUG), 9EL, 9KO, 9MC, 9OE, 9OO, 9PS, 9QO, 9XAE, 9ZA, (9ZAC), 9ZX.

9DMA, Caledonia, Minn.

3ARY, 5EK, 5HL, 5YH, 7ZY, 8AFB, 8AFS, 8AFT, 8AIC, 8AIO, 8ANK, 8ARW, 8AQZ, 8BBA, 8BDY, 8BO, 8DE, 8FT, 8HM, 8II, 8IV, 8NZ, 8SP, 8SS, 8TT, 8WA, 8XM, 9AAL, 9AAW, 9AAY, 9ABH, 9ACN, 9AFK, 9AFX, 9AJB, 9AKC, 9AKS, 9ALH, 9AMS, 9ANC, 9ARZ, 9DAX, 9DEH, 9DKR, 9DUD, 9DUG, 9FN, 9GTG, 9GX, 9KO, 9LC, 9LF, 9LR, 9MC, 9ME, 9MS, 9OJ, 9OO, 9PC, 9UH, 9UU, 9UK, 9XI, 9XM, 9XAC, 9ZB, 9ZN.

July Station Reports

1DY, Lynn, Mass.

Steadiest		Loudest
1ZE—1BPZ—1TS		1ZE—1TS—1AW
2EL—2UA—2ARY		2EL—2UA—2ARY
3CC—3HJ—3VW		3CC—3HJ
4GL		4GL
8SP—8WY—8DE		8DE—8SP—8WY
9UH		9UH

1ANQ, Hartford, Conn.

Steadiest		Loudest
1ZE—1ADL—1BDI		1ZE—1ADL—1DY
2EL—2OM—2AWF		2AWF—2OM—2EL
2BSC—2ZL	C.W.	2BSC—2ZL
3HJ—3HX—3ZO		3HJ—3ZO—3HX
8AWP—8AOT—8AFB		8AOT—8AWP—3BO
8DE—8QY—8ZN	C.W.	8DE—8BO—4ZN

3HG, 3EQ, 3EM, Baltimore

Steadiest	Loudest
1OE—1UN—1TS	1OE—1AW—1UN
2ARY—2ACT—2BG	2ARY—2BMI—2EL
3ZY—3EN—3CC	3ZY—3CC—3HJ
4GL	4GL
5XE	5DA
8DE—8AGO—8AIO	8SP—8DE—8AXC
9UH—9AAW	9UH—9AAW—9UU

7ZJ, Vancouver, Wash.

Steadiest		Loudest
5CJ—5CP—XEQ	(Can.)	5CJ—5CP—XEQ
6ZX—6AR—6AS		6ZX—6AFN—6TV
7KM—7BK—7IY		7BK—7KM—7AY

(Concluded on page 59)

Radio Communications by the Amateurs

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

IN DEFENSE OF SELF-RECTIFICATION

Radio Laboratories,
McCook Field, Dayton, O.

Editor, QST—

I noted the comment on ACCW in last issue of QST by Edmond Bruce of M.I.T. and I should like to answer it in a brief way.

I have been working on ACCW since March and I shall submit some of my findings on this subject.

It is hard to tell whether Mr. Bruce compares his input-output ratio with AC rectification or straight DC excitation, but I take it he means that self-rectification is inferior to that of rectified AC impressed on the plate.

It is not necessary to use mathematics to give one an idea of input-output ratios so I shall give the results obtained when using four Western Electric VT's in the laboratory here. The amateur, I am sure, wants the system giving the greatest output for the same number of tubes and power considered. The simplicity of the self-rectification circuit is another very advantageous point to its favor.

The following is a report of the results obtained at the Radio Laboratories at McCook Field, Dayton, Ohio:

(1) Using four tubes on a straight DC plate (all as oscillators) the output was 1.83 amperes, input being 150 mils, voltage 350 DC.

(2) Using four tubes, two as rectifiers and two as oscillators, the output was 1.36 amperes, input 95 mils, 36 volts (plate to filament voltage) on oscillators.

(3) Now comparing the above with a third, that of self-rectification, the same four tubes were used and the output was 2.14 amperes, input 60 mils on each leg of transformer at a potential of 365 volts (plate to neutral tap). A feature of self-rectification is the coolness of the tubes while in operation. Owing to this feature it was found that the plate potential could be increased considerably without overheating the tubes. I increased the voltage to 500, with mils increasing to 78 in each leg; the output was increased to 2.45 amperes. Summing up the three systems on four tubes, the greatest output was obtained with AC CW.

Similar tests were conducted at the radio laboratories of the Precision Equipment Co. of Cincinnati, by Mr. Breckel and myself, and results were of the same proportion when using General Electric Radiotron 5 watt tubes.

As for a comparative range of AC CW, I am unable to determine it, owing to the fact that I am on only during the day-time and there are few stations listening thru the day. I have compared at a distance of 120 miles and AC CW wins at that short distance.

I am quite aware of the loss from grid to filament due to a positive charge but it is not nearly as great as that of a straight AC tube rectifier. I have in no case found it large enough to discourage its use in preference to any other system. Tubes used as rectifiers have much greater losses. Let's hear from more.

Very truly yours,
Roy S. Copp, Radio Mech.

NO REST FOR THE WICKED

Templar Park,
Spirit Lake, Ia.

Editor, QST—

This is my first letter to you and may be my last. A few weeks ago I got the CW bug and began my attempts to make Milly Ammeter do the shimmy. But after a few weeks of struggling I gave it up and came up here to regain my nerves. I had sworn off all kinds of radio for two months, but by golly I just got here and the first thing I saw was an aerial, regular old "he" aerial at that. Of course I had to visit the station and found it belonged to Johnny Weber, 9UA. Well, goldurnit, he was sitting there agazing at his milliammeter and the power tubes ablinking away! But his Milly hadn't learned the Hula-Hula either, so there were two SOL bugs. We tried eight hook-ups out of QST but all n.g. Then we rigged up a dinky set and by Henry she worked! We both let out a yell that must have scared one of the tubes to death, because now we get more out of 2 tubes than three. Which brings me to the real purpose of this letter.

Will any amateurs hearing 9UA please drop a card to Radio 9BQ, at Logan, Iowa? We are using but 10 watts up here at the lake and want to hear from all who hear us. We'll answer all cards.

Yours for CW,
Hansen & Weber, 9UA.

MARKET REPORTS

U. S. Air Mail Radio Station,
Cincinnati, Ohio.
July 6th, fwd.

Editor, QST—

Wonder if it would be asking too much, if you would announce in your columns that this station is broadcasting market reports daily. We broadcast the live stock receipts of different market centres at 9 A.M. Central Time. This should be copied by receiving operators on blank form MI 41. At 11 A.M. Central Time, we broadcast the Chicago live stock market, for which form MI 20 is used. At twelve noon Central Time, we broadcast the St. Louis live stock market, also using form MI 20. These blank forms can be obtained by any amateur, simply by writing to the Bureau of Markets, Washington, D. C. From 7:30 to 8:00 P.M. Central Time, we broadcast press dispatches regarding both the Chicago and St. Louis live stock markets.

This service is being widely utilized thruout the west, even where telegraph service is available, as our radio reports are claimed by many to be more in detail. The speed of transmission is between 12 and 15 words per minute. The wavelength is 4000 meters, and a five KW arc is used.

Amateurs copying this service are requested by the Bureau of Markets to send to them for a blank form, upon which they can inform the Bureau weekly as to what results they are getting, together with any suggestions they may have to offer relative to better transmission, etc. In sending for these blank forms, operators should also request a supply of franked government envelopes in order that they will not have to pay postage on same when submitting them.

The Cincinnati station is one of the latest of the chain of Air Mail Radio Stations, which extend across the United States from Washington, D. C., to San Francisco, Cal. Plans are afoot to increase the power of this station to 20 KW and make it one of the most important in the series. Already, with a 5 KW input of power, Cincinnati has established a daily communication with North Platte, Nebraska, over 800 miles. This speaks very well for overland transmission, especially at this time of the year.

Call letters of Cincinnati are KDQC, and amateurs are invited to make use of this broadcasting service,—giving same to local parties who are interested in the goings on of the markets. What better way could there be of putting your amateur station "on the map?"

Very truly yours,
Samuel Curtis,
Operator in Charge.

A GOOD FRIEND GOES WEST

1242 Knox Ave., N.,
Minneapolis, Minn.

Dear Friends:

Just a few words to inform you of the death of Kenneth G. Reinking, Minneapolis, radio 9TI. Mr. Reinking was the type of amateur whose signals were a relief after listening to some of the pollutions heard in the air.

The amateurs of this locality have always held 9TI as a standard of comparison, and somehow it does not seem possible that he is dead.

He was killed on July 7, when on becoming overheated, he lost control of the motorcycle that he was riding which turned over, pinning him beneath it. He lived in an unconscious state for twenty-four hours before death drew its veil over him.

"Kenny" was as clean cut and fine a young man as any of us fellows ever knew. He was eighteen years of age and had just completed his first year of Electrical and Radio Engineering at the University of Minnesota.

Kenneth G. Reinking.

Almost all of his apparatus we constructed by himself as he knew radio from A to Z. The radiation of his spark set was well up and with this he punched out signals to Brooklyn, Texas, and San Diego. It consisted of an Acme 1 K.W. transformer, home-made condenser, rotary gap, and O.T. His receiving set included a short-wave regenerative, honeycombs, and a 1-step on self-manufactured panels. His aerial was of the inverted L type, 65 feet long.

We radio fellows cannot think of "Kenny" as gone without a deep feeling arising in our hearts. He truly showed the

radio world that consistency and initiative will gain anyone success.

I think, that as a matter of courtesy, the call of 9TI should not again be issued, as the reputation it has, has been gained by Kenneth himself, and no-one else.

Sincerely yours,
Gordon W. Volkenant.

DOPE WANTED

Walnut Grove, Calif.

Editor, QST—

Would like to see published in a future issue of QST a discussion on the resonant vs. the non-resonant type of transformers. Assume these transformers are to be used on the same circuit consisting of an .01 mf. condenser, a rotary disk driven 3600 by a non-synchronous motor, the set tuned to 200 meters.

Using a one K.W. transformer, which type would be preferable and why? I have heard arguments favoring both types; therefore would like to see the whys and wherefores argued side by side.

Respectfully,
J. V. Wise, 6ZX.

ANOTHER O. W.

Milton, Pa.

Dear Eddy:

This to announce the entrance of another 8th district O.W.

July 16th last Miss S. Jeanette Evans became Mrs. 8BQ. Don't be surprised if you hear our spark thrash out Morse until I get her wise to the 13 improvements on it, as she is all doped up on wire code. 73.

Herbert M. Walleze, 8BQ.

ROTTEN CORRESPONDENCE

4903 Sixth Ave.,
Brooklyn, N. Y.

Editor, QST—

Please allow me to register one loud, husky yelp. When a bunch of hams get on the air they discuss their sparks, tone, etc., till a guy just about goes off his nut listening to them, but write them a postal and ask QRK or some such other trifling question along with telling them that they are QSA at your junk pile, and they don't give you a tumble. As correspondents they make very good radio operators.

I have a cramp in my arm writing postcards to hams on this side of the old U.S. but N.D. I sent 52 cards to different fellows during the past month and a half and I received answers to 12 of them. Pretty good, dontcha think? Good subject for T.O.M. to start roasting somebody on—"Rotten Correspondence".

On the level, OM, it's a shame. Everybody hollers to drop a fellow a line if you hear him from any distance. Sure thing, F.B. and all that, but why the devil can't said feller QSL? To the best of my knowledge I never received a card or letter yet concerning radio in any form that I did not answer, and still I can put just as much time in on the air as any of the rest of them. It doesn't take much time and it encourages a fellow. Even if he doesn't receive a favorable report on his own signals, it shows that the fellow on the other end appreciates his efforts.

Whad'ye say OM?

Yours truly,
Frank A. Maher, 2RM.

PLEASE NOTICE

National Radio Institute,
Washington, D. C.
August 16, 1921.

Editor, QST—

In your last issue I noticed an article in reference to the operation of a radio school in Atlanta, Georgia, by Mr. Autrey under the name of the National Radio Institute.

We wish that you would notify the readers of your magazine that this school has no connection with the National Radio Institute of Washington and Baltimore, and furthermore that this name—National Radio Institute—has been copyrighted by us and notice has been served to Mr. Autrey to cease further relations under this name.

We have just been informed by the Radio Club of Atlanta that the school has been closed up and the owner left the city. Kindly see that this news is conveyed to the readers of your magazine so that we shall suffer no bad effects from this unfortunate occurrence.

Very truly yours,
J. E. Smith, *Pres.*

ANYBODY SEEN T. O. M. RECENTLY?

Port Chester, N. Y.

Editor, QST—

Dear Fellow Sufferer:

I always knew it would come sooner or later and it has. T.O.M.'s gone crazy! For proof see enclosed clipping. Amateurs in New York and vicinity are advised to keep a close watch on their feline companions!

Very truly,
2HJ.

Extract from N. Y. World, July 8:

These be Catastrophic Days for Stray Cats of East Side, for There's a Price on Their Heads

Mysterious Stranger's Bounty Makes Small Boy More Feared Than Dogs

Every cat on the east side is leading a dog's life these days. And that is no life for a cat.

With a price on his head, ranging from 5 to 11 cents, according to size and spryness, no feline creature is safe from the young hunters who swarm through the highways and byways, into areaways and onto fire escapes and even invade the "privancy" of tenements known to house pet pussycats.

What is it all about? Simply that a mysterious stranger, known to the east side children only as "The Old Man," has announced a bounty on all stray cats brought to the S. P. C. A. cages on Delancey Street and has made good his promises of financial reward by "paying off" every Saturday since the cages were set up some weeks ago.

What Chance Has a Cat?

Now that school is over and truant officers have no terrors for the small boys, a cat in the district adjacent to the Williamsburg Bridge has no time to himself at all. At night, as everybody knows, he has to wail his love lyrics on the fences, and in the daytime, where once he could catch a catnap at least, with one eye open, nowadays he has to keep putting one foot in front of another and watch his step like a commuter carrying a lawn mower and a hand painted lamp-shade.

SIMPLIFIED CIRCUITS

2048 5th Street,
Port Arthur, Tex.

Editor, QST—

I read with interest Mr. Silver's comment and criticism on the set I gave data on in the May QST, and as a result I feel called upon to come to its defense.

First of all I must agree with Mr. Silver as to the fact that the regular, coupled, three tuned set is superior to any single tuned set except in ease of adjustment and time thus saved, which factors amount to considerable in the course of time.

To begin with I originally had a regular type plate tuned set but as I found it a great time waster for the amount of work done I decided that a little signal strength was worth sacrificing for ease of operation so my first experiments in the line of single tuned sets began with a tickler set such as Mr. Silver described in his July letter. The results were so discouraging after a thoro trial that I returned to my original set. Several other circuits were tried in like manner with similar results until I tried the hookup I told of in my last letter.

After a thoro trial I decided that I had found what I wanted for I obtained excellent signal strength and, contrary to Mr. Silver's results, I had only two controls. At first I used inductances hand wound that had the DeForest plug attached so as to plug in a regular DeForest two coil mounting. With a twenty-five turn coil in the antenna circuit and a 43 plate series condenser I was able to cover a range of about 180 to 275 meters with a twenty turn plate coil. This was done on a fifty foot two-wire aerial, thirty feet high. These coils were wound on tubing obtained from oats boxes of the Quaker brand. With a thirty-five turn antenna coil I was able to cover a range of about 250 to 450 or 500 meters with the twenty-five turn coil in the plate. The plate tuning condenser was a 43 plate. As you no doubt see two adjustments are all that are left to handle and thus tuning is very simple.

As to results obtained I would suggest that some of you read my calls heard list in the May QST. That work was done on the set described and mostly with one tube; also partly on a twenty foot indoor aerial.

The set described in the May issue was constructed to see how cheaply such a set could be constructed and yet work well and efficiently. With it I was able to obtain shorter wave lengths, due to less inductance at the lower taps than in my original set, yet I never had to juggle three adjustments as the antenna coil could be adjusted to values the same as in the first set with similar results. Also I had the added convenience of 600 meters on tap by merely turning the switches and then controlling the two condensers.

The same circuit was used for long wave reception with excellent results.

5ZA, 9LR, 9OE, 9AEG, and many others at farther distances came in loud enough to read twenty feet from the fones on a fifty foot aerial and two step amp. Not so good on the twenty foot aerial.

For fone reception the circuit is very critical as Mr. Silver said but as there are only two controls it was found easier to handle than three controls for tuning. I have heard the California fone and many others with very little difficulty and have had excellent results with CW reception.

Mr. Silver says that this circuit shows a woeful lack of selectivity whereas so far as I have found it gives good selectivity comparable to the coupled set when used at the lower values of capacity of the series condenser as was mentioned in my previous letter.

I have tried to answer Mr. Silver's "indictments" in the spirit that he made them, so I hope no offense will be taken.

Yous very truly,
L. W. Hatry.

TRANSMITTING ON RECEIVERS.

7OS, Casper, Wyo.

Editor, QST—

Here's a CW idea we have been thinking about a long time and have at last put to the test and found that it works wonders over a short distance.

I have a friend here, 7ZO, who lives about a mile air-line from my place. Being good friends we naturally have a good deal to say to each other every nite. Realizing that there are several other stations in the U. S. trying to get legitimate business thru the jam, 7ZO doesn't care to make QRM any worse by chewing the fat one mile with one k. w.; and besides we don't suppose 9ZN would be much interested in the conversation.

Well, here's the idea. We noticed that whenever one of us turned up our bulb the other could hear the CW whistle very QSA; so we got together and found that we could work each other very nicely by setting tuner to oscillation point and using the primary switch lever for a key. Real CW with nothing more than our regular regenerators! Worked so well we put auxiliary keys in aerial leads with a shunt switch, and can now tell our troubles, talk baseball, and cuss a certain "5" station QRM-er to our hearts' content.

Only a few nites ago I heard some bird with a spark like a foghorn jamming the air with "R r Morris, how fast can a car go? K" and then "R pse QTA K." Now this guy might have been talking to somebody in Mr. Ford's factory but I got a hunch he was using a perfectly good 1 k. w. to push this stuff across the street. Well, that's what we're trying to get away from—hence the little CW idea.

Best regards,
Chas. F. Burdick.

RADIO UP-TO-DATE.

Stroh, Ind.

Editor, QST—

I have before me a beautiful example of the property man's art as applied to a radio installation on board a vessel. Our local movie is showing Eddie Polo in "King of the Circus," a continued story, and this letter has to do with the thirteenth episode. As customary, the theatre was plastered with posters of various thrilling scenes, and one in particular drew my attention. Just listen to the following description of a modern ship-board station:

Setting: Radio room on board ship in Pacific off coast of California.

Characters: Eddie Polo and the radio operator. Eddie is holding a blank in his hand gazing into space with a thoughtful air, and the op sits looking at Eddie expectantly. Eddie has just written the message to be sent to some town back in California. Here is the set which is supposed to do it:

Back of the operating table against the wall is a panel about 3 ft. square, made of wood. At top of panel is a large meter (probably a 110 v. A.C. ammeter or voltmeter.) Just below and to the left is a Murdock O. T. with secondary shoved clear down against base to give closest possible coupling. Two leads go to the O. T., one to the primary and one to the secondary, both of No 14 wire and disappearing thru holes bored thru the wood panel. To right of O. T. is plain open gap with zinc plugs about 5/8" long and 1/2" diameter, while below this gap is another similar but smaller one. To the right is a change-over switch. Two No. 14 wires run up thru the ceiling thru porcelain tubes, 3 inches apart, both wires made in the form of open core chokes, being coiled like springs about 1 1/2 in. diameter all the way from switch to ceiling. This is doubtless to keep from sending too far. On the table at left side, partly hidden behind Eddie, is a Thordarson RS transformer and what looks like three sections of Murdock moulded condenser on end. In front of this is a board bearing a variable, a crystal detector, and small Murdock phone condenser. Mostly hidden by the operator is some kind of tuning cabinet on which a few switch points are visible and that is all. The operator is evidently deaf in his left ear, which is turned towards the audience, as the phone on that ear has no cord connected to it, even tho the binding posts show plainly. There seem to be no leads to the spark gap, which doubtless is operated by induction and needs no leads. No licenses are in sight.

Wouldn't it make you cry to think of what ideas some folks have about radio? Some of the boys around Universal City should get busy and educate these film producers so they will know what a radio set looks like.

Sincerely,
F. B. Hanes.

SOME AERIAL!

1335 Custer Ave.,
Detroit, Mich.

Editor, QST—

Here is a funny one, an air aerial. Of course we bugs are always trying something new—that's what keeps the wireless game interesting. On 4th of July night I thot I would try out a new kink; I bought two gas balloons such as are sold on the streets on the Fourth. Next I operated on Ford coil and removed the secondary coils, which as we all know are of very fine wire. I tied the two balloons together and used the wire to let them up with, disconnected my regular aerial and connected this balloon aerial to my set. Oh Boy, the sigs came in much louder. Hams could be read anywhere in the house and Arlington, who usually can hardly be read, could be read anywhere in the room. I don't know how much wire I had up but it seemed like a half-mile at the least.

L. F. Kridler, 8BDM.

NON-RADIATING RECEIVERS

150 Puritan Ave.,
Detroit, Mich.

Editor, QST—

I read in the July QST that Mr. Kruse wanted to know of a receiving set that would not radiate when used for C.W. reception, so I am writing you about a little experience another fellow and I had.

This friend of mine lives about three hundred feet away and has a wireless also;

a six step amplifier and a regenerative receiver. I used to get a carrier wave from his receiving set, but when I grounded my filament (negative side) and the shafts on my variometers and took out the metal shaft on my variocoupler, the wave from his set was entirely eliminated. He did not get any interfering wave from my set either.

I think if all metal possible were eliminated from sets the fellows would get better results. I would be very glad to hear from you about this.

Respectfully,
Frederick V. Collins, 8QN.

HI-LO AGAIN

Battle Creek, Mich.

Dear Editor:

One night's work and this is what came via mail:

"Your sigs QSA and QSS on one step."—9AQA, Champaign, Ill.

"Your hi tone very QSA but QSS bad."—9UU, Chicago.

"Ur sigs fair and steady on 1-step."—9AUL, Minneapolis.

"Your sigs QSA here."—9DOW, St. Paul.

"Have had the pleasure of hearing you QSA on night of 20th."—9AZD, Granite City, Ill.

"Gee, OM, ur sigs sure pounded in here July 29. Could read you 10 ft. from phones on 1-step, no QSS."—8AUY, Butler, Pa.

"Ur sigs hrd hr 7/20 QSA, tone hi, QSS bad."—8ANW, Niles, O.

"Your sigs very QSA. Cud hr u all over the place."—8QB, Buffalo, N. Y.

And they say a high pitch doesn't go thru? I use an aerial 35 ft. high and 93 ft. total length, kilowatt set.

Yours respectfully,
E. E. House, 8NZ.

HAWAII GETTING QRV.

Lihue, Kauai, T. H.

Editor, QST—

I note you call in QST for data on radio gadjets who served in the Army or Navy during the war. Here's one. I was in the Navy for 18 months, 15 months of which was active duty at sea. I received one War Chevron, but I don't know what for. I guess it was on account of the grub we had in the submarine zone.

6ZAC is the only special amateur station in the Territory of Hawaii, so the only use I can put to my 375 meter wave is to relay trans-cons-transoceanics. Am having a great time trying to build a station that will send some phony sigs across the pond, but it can be done, and I want some of your stations on the Pacific side to lay off their heavy mitts once in a while and listen for 6ZAC. I know that if some of those birds whose stations appeared in print in QST with a six step amplifier get to listening they'll hear me. At present I'm waiting for some apparatus to arrive from the coast that might bring in some coast hams. Believe me, if I ever hear one of them, which I should, somebody s gonna hear me. 6ZAC is situated on Kauai, about 100 miles from the Pearl Harbor nuisance (arc) and I get very little of his mush. I've listened in on my Murdock coupler with one step a few times, and can hear KPH, NPK, and occasionally other commercial stations on the coast. The Canadian stations are generally QSA from early evening, and at midnight they come in like local stuff. One evening on a piece of galena at a local amateur station I copied a complete weather report from NPE at 7:15 p.m.

I read with much interest the articles in QST, and I must say the old game ain't what it uster be. I will communicate further if I ever get my 375 meter set to radiating an amp. or so. Some time in the near future I would like to arrange for a test both ways, which will not necessitate shutting down of arcs, etc., at least at this end. Until that time, adios.

Yours very sincerely,
Clifford J. Dow.

GROUND LEADS

1526 Moran Ave.,
Norfolk, Va.

Editor, QST—

In looking over the June issue of the QST I noticed in "Communications" that F. B. Hanes of Stroh, Ind., wants to know if he extended the well pipe 20 feet above the earth and then hooked on his ground lead to it, would he have a short ground lead. Now my question is somewhat like his. Suppose that we were to pile some dirt around the pipe and make a little mound twenty feet high with the pipe in the center, and then attached the wire to the pipe, would we have a short ground lead? Sounds foolish but would like to know what you think about it.

Incidentally, I have gotten tired of buying QST on the news-stands so please find enclosed check for one year's subscription starting with the August issue.

Yours respectfully,
A. B. Brown, 3MK.

GEN. FERRIE JOINS THE A.R.R.L.

Ministry of War,
Paris, July 5, 1921.

General Ferrie, Inspector of Military Telegraph Service and Transmission.

To the President of the American Radio Relay League.

Dear Sir:

I have the honor of acknowledging receipt of the certificate of membership in A.R.R.L. which you had the kindness to send me, and to thank you for it most sincerely.

Please accept, dear sir, my best wishes.

(Signed) Ferrie.

THE OPERATING DEPARTMENT

(*Concluded from page 39*)

been granted in Toronto, 9AW having been assigned to ex-3AC, W. C. C. Duncan, and 9AV to McWatters Lowry, ex-3GS, ex-9AY. These are 200 meter CW stations. Supt. Bill Caton has resigned owing to his departure for Ottawa. The Manager has had word from Manager Lorimer in Montreeal that his CW set is now successfully operated and tests are being arranged to try to link up Montreal and Toronto.

ST. LAWRENCE DIVISION

A. J. Lorimer, Mgr.

The combined effect of summer weather and restriction on transmitting in the zone of navigation had nearly shut this division out. The come-back this month is more than gratifying and it looks as though we have a dependable route through at last. Most surprising of all is the fact that all work over this new route is in daylight—H.T.L. Club a la Maxim. 1AZX at Burlington, Vt., keeps the noon schedule with 2CI, Farnham, who QSR's to and from Montreal. The jump of 110 miles in daylight is considerable for the power used at both stations—a 10 watt CW set at 1AZX and spark of 300 watts at 2CI. 2CI has a "rock crusher" under construction. The Division Manager has installed a 250 watt CW set at 2BF. Stations at Levis and Ottawa are constructing CW sets to continue the daylight route. A one K.W. spark set is under way at Potsdam, N. Y., about 100 miles south of Montreal, and will soon be ready for relay work. Unless we can locate a good station in Kingston, Ont., we will route our traffic through 8KBR. Total msgs., 42.

J. K. HEWITT

(*Concluded from page 40*)

He enlisted in the Navy in June, 1917, and served aboard various ships for about two and a half years. After the war he lived a year in Philadelphia and then removed to New York City where he was a government radio inspector for six months and later inspector for the Ship Owners Radio Service. 2RK was established in September, 1920, and in 6½ months of actual operation to April 16 of this year was heard in all but four states and copied in every district.

No station has records that compare with the reported reception of 2RK's signals. He was reported by 6ALE, Los Angeles, while using 600 watts of I.C.W., and the spark is reported from a ship almost to Rio de Janeiro, 4000 miles from Brooklyn, and by another ship below Pernambuco, Brazil, 3800 miles. Ships in port in England, France, Spain, Africa, Canal Zone, Mexico, Cuba and Bermuda have reported 2RK, and he has been heard in the Atlantic Ocean, the Pacific, and the Mediterranean Sea. The best distance actually worked was to a ship 2700 miles south of New York. For this same 6½ months period of operation 2RK reports a total of 3,200 messages handled.

JULY STATION REPORTS

(*Concluded from page 52*)

7CN, Marshfield, Ore.

Steadiest and Loudest
6ZX—6AFN—6AAW
7ZJ—7DA—7QQ

7HD, Seaside, Ore.

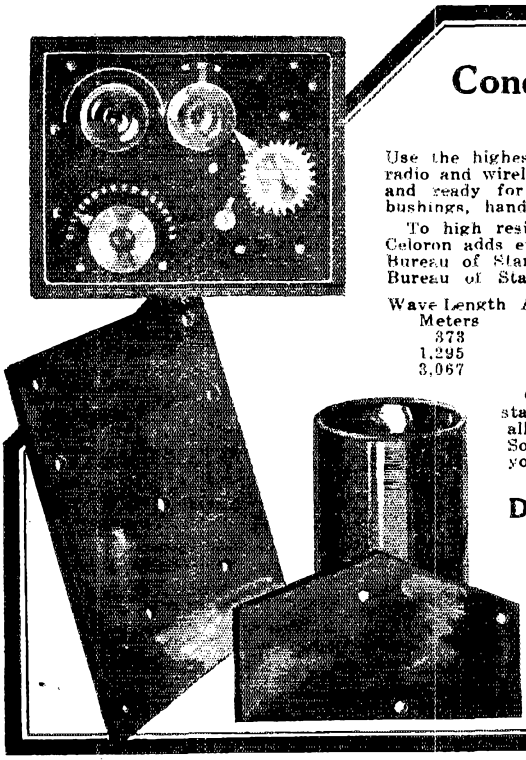
Steadiest	Loudest
7ZJ—7IN—7CW	7IN—7BQ—7YS
6OH—6ZX—6FH	6OH—6ZX—6AFN

9AIF, Lioux Falls, S. D.

Steadiest	Loudest
7ZO	7ZO
8II—8AFD—8TT	8II—8AFD—8TT
9AYW—9YAE—9ASK	9AYW—9MC—9KO

9ZL, Manitowoc, Wis.

Steadiest	Loudest
1AW	Only one heard
2EL and 2QR	Both good
3HJ	Only one heard
4XC	Fine sigs
8SP	8AFB
9FS	9FS



Condensite Celoron is Real Radio Insulation

Use the highest type insulation made. Produced expressly for radio and wireless work. Adaptable to every machining process and ready for every use—panels, plates, bases, rods, tubes, bushings, handles, cleats, etc.

To high resistivity and extreme water resistance Condensite Celoron adds every other good quality demanded of an efficient Bureau of Standards test tells why:
Bureau of Statdards test tells why:

Wave Length Meters	Approximate Frequency Cycles per second	Phase Difference Degrees	Dielectric Constant-K
373	804,000	2.0	4.7
1,295	231,500	1.8	4.8
3,067	97,800	1.2	4.9

Condensite Celoron is regularly supplied in standard size sheets, rods and tubes ready for all machining purposes—for experts and amateurs. Sold by radio equipment dealers everywhere. If your dealer cannot supply you, write us.

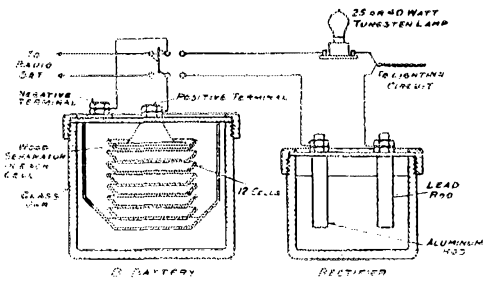
Diamond State Fibre Company
Bridgeport (Near Philadelphia), Pa.

In Canada, Diamond State Fibre Company Of Canada, Ltd., Toronto.

Diamond·F

The McTighe Storage "B" Battery

Patents Pending.



The McTighe storage "B" battery is the most satisfactory source of plate voltage for radio receiving apparatus. It is absolutely noiseless and eliminates troubles often attributed to static but which are really due to defective "B" batteries. It consists of twelve cells of the lead-acid type, giving 24 volts, in one unit. The capacity is 10 milliamperes for 8 hours, or 50 milliamperes for one hour. It will furnish 500 milli-amperes for a short time, which makes its use possible for C. W. and radio-phone transmission. The tone produced is exceptionally clear.

It will hold a charge for several days and when run down it is only necessary to throw the switch to the charging side for few hours. The charging current is from 25 to 50 milli-amperes, thus cost of charging is negligible.

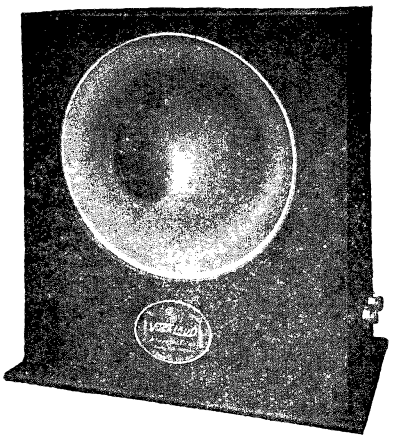
The assembled battery is shipped ready for use, except that the small quantity of electrolyte must be added to each cell either with a medicine dropper, or by dipping the whole battery unit into a vessel of electrolyte. The electrolyte can be obtained at a garage or battery service station. After the first filling the battery needs only a few drops of distilled water in each cell every week or two.

The chemical rectifier operates on the well known principle of lead and aluminum rod in a solution of baking soda or borax.

PRICES:

BATTERY COMPLETE **$5.00**
RECTIFIER **2.00**

McTIGHE BATTERY CO., Wilkinsburg, Pa.



STATION TYPE
(In handsome mahogany cabinet as shown.)
$30.00

Laboratory Type
(Mounted on metal base, adjustable height.)
$25.00

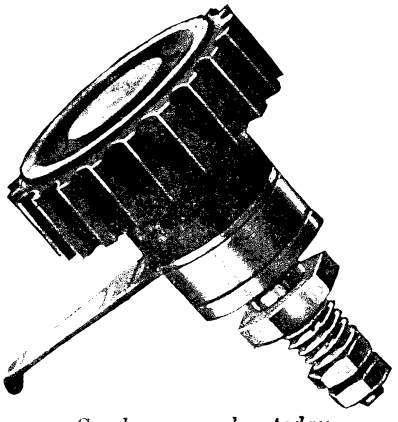
THE

VŌCALOUD

THE IDEAL loud-speaker. Requires no batteries, no adjustments, no extra equipment whatever! Just hook VOCALOUD right on to your receiving apparatus and listen to your signals,—QSA *all over your house!* Uses genuine Baldwin reproducer,—equally good for telephone and telegraph. Your order shipped at once!

CORWIN'S improved SWITCH LEVER

Sure contacts, smooth operation, handsome appearance,—all are characteristics of this improved switch. Many switches give their manufacturers more profit,—none give their users more satisfaction. Try a Corwin Switch. *As good as it looks!*



PRICE: 90 cents Postage, 5 cents.

Composition knob, identical with knobs used on standard #67 Corwin Dial. Brass shaft is moulded right into knob,—*it can never come loose.* Blade, bushings, etc. nickel-plated brass. Contact radius, 1¾".

UNIVERSAL-COIL MOUNTING PLUGS

For Radisco and all hand wound coils. No bending, no filing, they fit exactly in the first place.

80 cents, postpaid

Send your order today.

CORWIN'S 1921 CATALOG 10c

Send for your copy today!

NEW RADISCO VARIO-COUPLER

"Accurate to the .002 part of an inch. Moulded base, Formica tube, all metal parts brass.

$7.50 postpaid

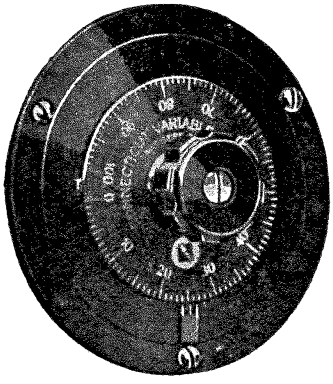
All orders for apparatus not listed as postpaid must be accompanied by postage charges.

A. H. CORWIN & CO.

Dept. D4.4 W. Park St., Newark, N.J.

Remember Corwin's reputation for shipping mail orders promptly and in perfect condition.

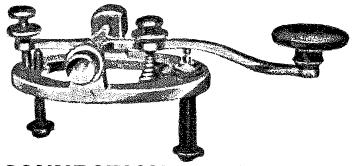
YOU CAN NOW BUY "CONNECTICUT" RADIO EQUIPMENT DIRECT FROM MANUFACTURER



CONNECTICUT

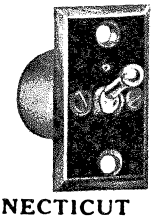
Variable Condenser

Compact. Simple. 360 degree adjustment. Unusual signal strength.
Portable or Panel type $6.50



CONNECTICUT Sending Keys

For low power stations
10-W: as illustrated..... $3.00
11-W: without mounting screws 2.75



CONNECTICUT

Toggle Switch

For receiving panel
75-Y: one gang..... 35c.
55-Y: two gang..... 70c.

CONNECTICUT

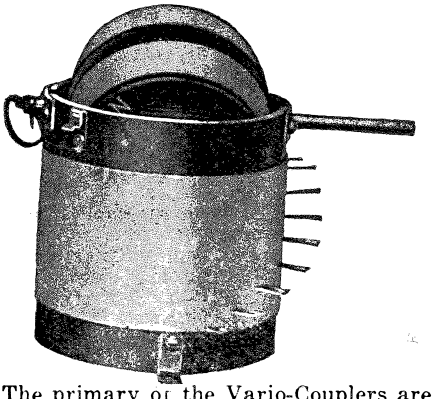
Head Receivers

U. S. Govt. Standard. Lightest, Strongest. Most easily adjusted.
1856-A with 2000 ohm receivers and 6-ft. cord..... $6.00
1857-A: with 3000 ohm receivers and 6-ft. cord..... 6.50
5014-W: head band only.... 2.00

Prices F. O. B. Meriden. Send for literature descriptive of our complete line of Radio Apparatus and Supplies. Amateur inquiries especially invited.

CONNECTICUT TELEPHONE & ELECTRIC COMPANY

Meriden Connecticut



Baldwin Variometers and Vario-Couplers

The Baldwin Variometer and Vario-Coupler illustrated are particularly well adapted for C.W. and long distance, also for the construction of amateur Regenerative Receiving Sets. At the wave length of 150 to 580 meters the windings made on forms are spherical in shape and are carefully impregnated with moisture proof compound which does not affect the efficiency of the instrument.

The wood is well seasoned and will not warp or crack, connections are made to the rotors of flexible leads through the hollow shaft which is supported by adjustable bearings; this insures positive connections and eliminates the possibilities of noises due to poor contact.

The primary of the Vario-Couplers are wound on Bakelite tubing ⅛ inch thick and four inches in diameter, fourteen taps are taken off and by means of two sets of switches a one turn variation of induction may be obtained. The instruments are particularly adopted for panel mounting.

Variometers, less dial; wave length 150 to 580 meters..... $7.00
Vario-Couplers, less dial; wave length 150 to 580 meters..... 8.00

For circulars and quotations DEALERS kindly communicate with the

BALDWIN RADIO ELEC. MFG. CO.
1516 Emmons Ave., Sheepheads Bay, BROOKLYN, N. Y.

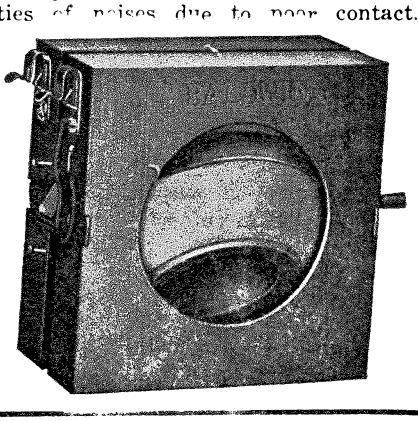
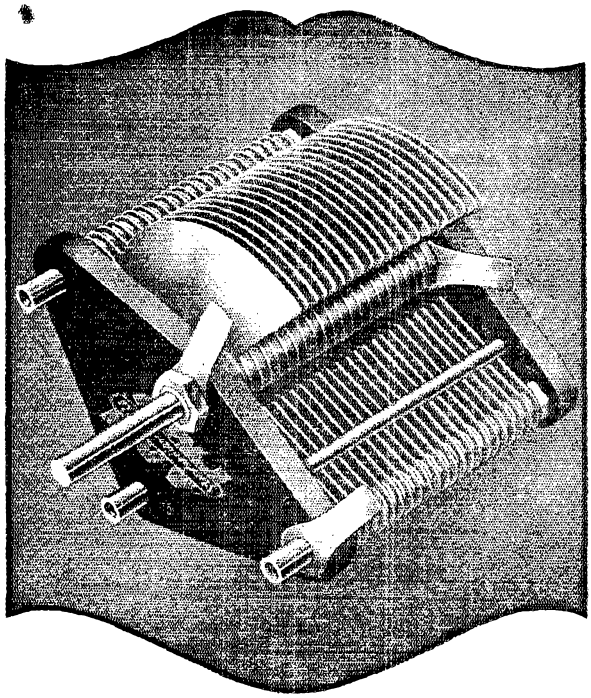


Illustration shows 43 plate condenser, ½ actual size.



Send 10 cents for the new *ABC* 16-page, 2-color catalogue, "*Professional Radio Equipment at Amateur Prices.*" Request catalogue CQ9. Write or use coupon below.

These 9 Improvements cost you no more!

EXAMINE this photograph carefully. Pick out the *nine features* that distinguish *ABC* condensers from any other make on the market: 1st, Sturdy plates,—.022 inch thick, that will not jar out of position: 2nd, Individual, *not cast* spacers, wide to prevent short circuiting: 3rd, Stop acts on *all* moving plates: 4th, One-piece shaft of brass, *not steel*, turned from solid brass rod: 5th, Shaft turns in solid brass bushing, which extends *thru* head: 6th, *Exclusive* Condensite head, the perfect insulator: 7th, Set screw (underneath) and locking lever for delicate friction adjustment: 8th, Easily mounted,—all studs *exactly* spaced: 9th, Minimum losses,—1¼" between opposite polarities. Yet *ABC* condensers are *far lower in price* than any other condenser of similar quality. The automatic production that makes every *ABC* condenser alike, and every part interchangeable,—at the same time cuts manufacturing cost to a minimum. Materials are the finest obtainable, Workmanship is unexcelled. Automatic production gives you *most value per dollar.*

Comparisons are difficult, because there never was a condenser so accurately made before. But compare these prices with the best condenser you ever used:

List No.	Plates	Capacity	Price
650-43	43	.0011 Mfd.	$5 00
650-21	21	.00055 Mfd.	3.75
650-11	11	.00028 Mfd.	3 00
650-3	3	.0001 Mfd.	2.25

The last type is an excellent vernier condenser or variable grid condenser. These prices are less knob and dial. For ABC brass dial and fibre knob; add 75 cents. For Chelsea composition knob and dial, add one dollar. ABC Dials separately, one dollar. Wireless Equipment Co., Inc., Newark, New Jersey.

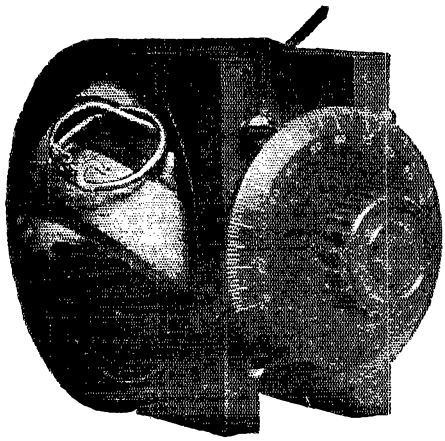
ABC VARIABLE CONDENSERS
Standardized Radio

Just mail this coupon and one dime today to the Wireless Equipment Company, Inc., Newark, N. J., for your copy of the new ABC catalog CQ9.

Name .....

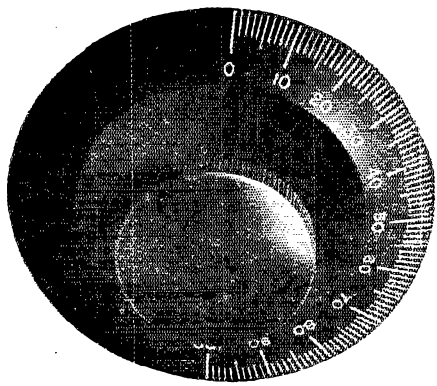
Address .....

City..... State.....



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 1⅝" diameter. Supplied for ¼" 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 #F800H 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.

SPECIAL PRICE REDUCTIONS

Paragon Control Panel with UV-200 Radiotron Tube	$10.50
G. A. Control Panel with UV-200 Radiotron Tube	10.50
G. A. One Stage Amplifier with UV-201 Radiotron Tube	20.00
Audiotron Tube—Two Filaments	5.50
Radiotron Detector Tube with a Combination Grid Leak Condenser	5.00
Radiotron Amplifying Tube with a Combination Grid Leak Condenser	6.50
Murdock #55—2000 Ohm Wireless Head Sets	4.00
Murdock #55—3000 Ohm Wireless Head Sets	5.00
Chelsea Dial and Knob with a Paragon Rheostat	2.50
Paragon Rheostat with a .0005 mf. Condenser	1.75
Ace or Cyclone Wireless B. Batteries:	
22½ Volt Small	.98
22½ Volt Large	1.75
22½ Volt Large Eveready Variable B. Battery—new type	2.75
15 Volt Ace Variable B. Battery	3.00

Marko Storage Batteries:	
6 Volt 20 to 40 Amp.	$11.00
6 Volt 40 to 60 Amp.—Ford Type	15.00
6 Volt 40 to 60 Amp.—Large Type	16.00
6 Volt 60 to 80 Amp.—Ford Type	18.50
6 Volt 60 to 80 Amp.—Large Type	20.00
Radio Service V.T. Sockets	.90
.0005 mf. Grid Condensers	.25
.002 mf Phone Condensors	.25
Combination Grid Leak Condensers	.40
Variable Grid Leak ½ to 3 Megohms	.65
Aerial Insulators	.12
Nickle Plated Binding Posts, per doz.	.80
Rubber Binding Posts, per doz.	1.00
Switch Points Small Nickle Plated per doz.	.35
Switch Points Large Nickle Plated per doz.	.45
Series—Parallel Switches	.75
2" Black Dials	.20
Radio Service C.W. Inductance	7.75
1/6 H.P. A.C. Westinghouse Motors	20.00

The Above Prices Are F.O.B. New York.
All orders must be accompanied by postage charges.
We guarantee every order shipped within 12 hours.

HYGRADE ELECTRICAL NOVELTY CO.

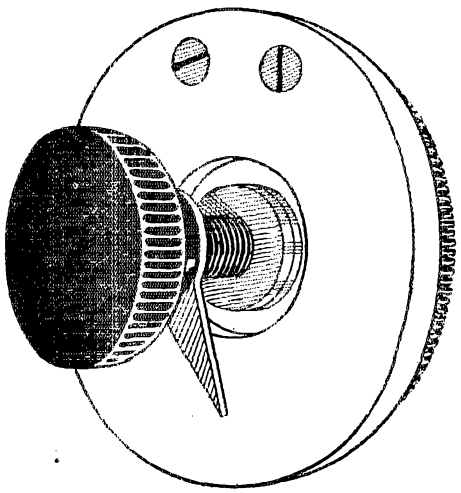
41 West 125th Street, New York

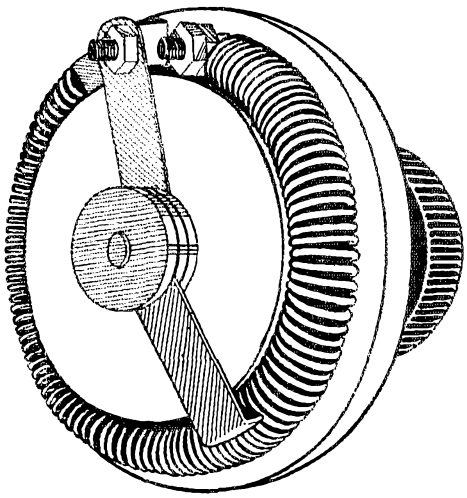
HOOK'ER TO YER BULB—TUNERS

A full page ad. could not do justice to our line of C.W. and phone equipment shown in our new 24 page catalog. Our tuners need no advertising. 10 cents brings catalog full of phone and receiving hookups, code, and other useful information.

Tresco—Davenport, Ia.

SHRAMCO
- REO -





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

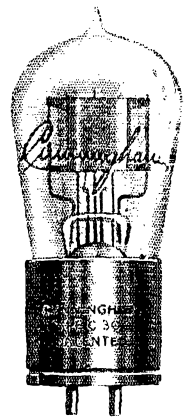
and amplifier, use the original Shramco Reo, type 90. Similar to the power tube type, but with a "Nichrome" resistance of 6 ohms. Price, $2.00, plus postage for 1 lb. We also make the "Midget" Shramco Reo, 5 ohm resistance, 2½" base.

SHOTTON RADIO MFG. COMPANY, INC.

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.

CUNNINGHAM



Price $5.00

Detector Tube Type C-300

The trade-mark GE is the guarantee of these quality tubes. Each tube is built to most rigid specifications.

Why the Amateur Chooses Cunningham Tubes

CUNNINGHAM Detector Tube Type C-300 functions as a highly sensitive detector of spark radiation, a tone frequency amplifier and an oscillator for regenerative amplification and C.W. reception; also as a radiophone detector and amplifier. It possesses these combination properties to a greater degree with the added advantage of low B battery and quietness in operation.
The customary hissing or "bubbling" has been practically eliminated resulting in extreme quietness in operation, and a completely silent telephone receiver in the absence of incoming signals. This permits the reading of faint signals and exact adjustment for maximum sensitiveness.
The amateur realizes that in Cunningham Tubes he has all that five years of service and General Electric Quality can mean to the Radio field.

DEALERS: Standard Packages f.o.b. Cleveland, San Francisco, New York. Broken packages f.o.b. San Francisco.

C. J. Cunningham

Trading as Audiotron Mfg. Company since 1915.

35 Montgomery Street, San Francisco, Calif.

154 West Lake St., Chicago, Illinois

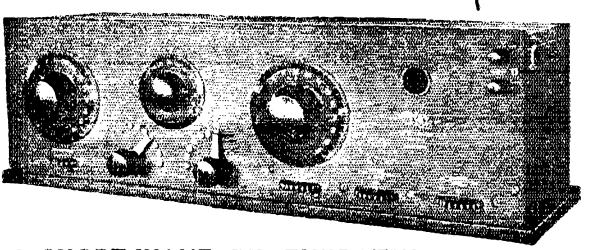
Gentlemen, Meet Doctor Mu!

The exalted sage of radio. When he speaks, his words are the veritable epitome of wisdom, acquired through decades of tireless study and research. His advice is well worth heeding.—Here's the Doctor:

"'Good words,' said Lao Tzu, "'Shall gain you honor in the market-place; — but good deeds shall gain you friends among men!'
"So shall the good deeds of Grebe Radio Apparatus gladden the heart of the Amateur. Words fail to express its excellence."

Doctor Mu.

GREBE RADIO



CR-8 SHORT-WAVE REGENERATIVE RECEIVER

is one in which perfection in even the minor details has been attained. It is indeed a masterpiece. Just look at these new features! Exclusive, every one of them:—

New moulded variometers—that will last a century.

Rubber-tired Verniers—make *real tuning* a pleasure.

Aluminum shields eliminate troublesome change of frequency when receiving C.W.

Direct reading wave-change and rheostat controls.

Battery binding posts in the rear—eliminating unsightly connections.

Constant calibrated wave-length range —150 to 1,000 Meters.

If it were possible to make a finer short-wave regenerative receiver, Grebe would be making it.

Your dealer will gladly order one of these receivers for your inspection. Ask him for bulletin.

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.
Hickson Electric Co., Inc., Rochester, N. Y.

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.
F. S. Katzenbach, Trenton, N. J.

A. H. GREBE & CO., Inc.

74 Van Wyck Blvd., Richmond Hill, N. Y.

This Name on Wireless Apparatus

Is the GUARANTEE of Highest Efficiency

You do not want "amateur" wireless apparatus. You want the *real thing*, built according to best commercial and government standards. And SIGNAL WIRELESS EQUIPMENT delights the amateur beginner, because it is built to please the more experienced professional.

The "REASON" Signal C. W. Apparatus is the Best

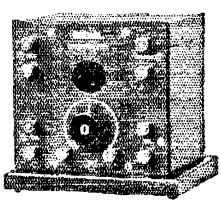
U. S. NAVY *threw out* variometers. *We never* used them. Why? Too critical in adjustment. Unsatisfactory in control. Unreliable in operation.

U. S. ARMY *discarded* "capacity tuners." *We* would *not even try* to use them. Why? Inefficient, the losses being too great, particularly at shorter wave-lengths.

What *We Do Use*, and *Why*

Small inductance steps and small condenser valves, with calibrated controls, thereby combining the *best principles* of *two methods* of tuning into *one efficient* system.

"Signal" instruments get the "signals" always.



R-80 V.T. Control Cabinet

This is the first V. T. control unit on the market that is wired throughout in accordance with fundamental principles, and that has all binding posts marked correctly, as to use and polarity, so that the experimenter may make use of any circuit he chooses and get the maximum efficiency as well as accuracy and ease of control.

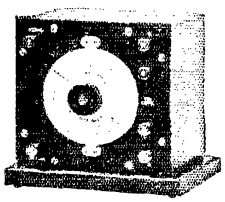
We use our new V. T. socket in this instrument, which will take *any* of the standard four-prong tubes on the market, either detectors or oscillators.

R-44 Primary Series Condenser

For the *best* results and *real* satisfaction in C. W. work, use our special condensers, with our new dial, equipped with wave-length scale, so that your set may be calibrated with you own aerial and ground system.

This allows close and accurate tuning, as well as the duplication of your settings, and makes your receiver serve as a wave-meter.

No other apparatus on the market has this feature to offer.

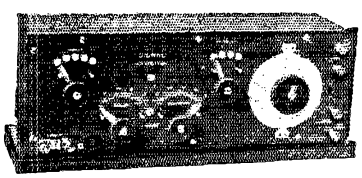


R-37 Short-Wave Tuner

This instrument is the most efficient short-wave tuner on the market, being designed on scientifically correct principles.

We use special H. C. coils, with taps at the proper points for controlling the wave-length range, and a small condenser with just enough capacity to cover the steps of inductance. This combination is free from the inherent defects of tuners using either inductance, alone for tuning, or capacity alone, and the results obtained with this tuner, as well as its ease of control, are remarkable.

There is more "Radio" value in "Signal" apparatus than any so far produced for the money.



You should have the SIGNAL WIRELESS catalogue.
Write for it today; it's free. Address

SIGNAL ELECTRIC MANUFACTURING COMPANY
Menominee, Michigan

MAIL ORDER "SERVICE"

PHILADELPHIA SCHOOL OF WIRELESS TELEGRAPHY — PW

Reg. U.S. Trade Mark.

WE SHIP SAME DAY ORDER IS RECEIVED

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

ANTENNA SWITCHES
Murdock, 3 pounds $4.50
Clapp-Eastham, 10 pounds 12.50

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 (1lb) 7.50

"B" BATTERIES
Radisco No. 1 (2 lbs.) $1.50
Radisco No. 5 (5 lbs.) 2.65
Eveready Storage Battery prices on application

CONDENSERS TRANSMITTING. (Dubilier)
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

CONDENSERS (Low voltage)
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

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

CORWIN DIALS
No. 66, 3" $0.75
No. 67, 3" with knob 1.30
No. 68, 3⅞" 1.60
No. 69, 3⅞" with knob 1.70
Postpaid

GRID CONDENSERS
Radisco, Postage 3c 35c

GROUND OUTFIT
Consists of SPDT 500 AMP Switch, 25 feet No. 4 wire, clamp and cleats prepaid $7.00

JACKS AND PLUGS
Federal Closed Circuit $0.85
Federal Open Circuit ..... .70
Federal Double Circuit 1.00
Federal Plug 2.00
Postpaid

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

OSCILLATION TRANSFORMERS
Radisco No. 5 ..... $15.00
Via. Express collect only

ROTARY SWITCHES
Clapp-Eastham No. 19 ..... $1.00
Clapp-Eastham No. 19A ..... .35
Corwin No. 1 ..... .40
Corwin No. 2 ..... .55
Postage ..... .05

REGENERATIVE RECEIVERS
No. CR-1 Grebe 175-680 Meters $90.00
No. CR-2 Grebe 175-680 Meters 45.00
No. CR-3Grebe "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-contained. Complete receiving set. Just out 80.00

RECEIVERS
Murdock No. 56, 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

RADIO CRAFTS PRODUCTS
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

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

VACUUM TUBES
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

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

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

VARIO-COUPLER
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 RADIO MAGNAVOX

It is fast becoming known as **THE WORLD'S STANDARD** loud speaker and is noted for its faithful reproduction of Radio music and speech.

When you buy a RADIO MAGNAVOX you have a well constructed, rugged and efficient loud speaker for your Radio concerts and demonstrations.

Only one ampere required for field excitation and the signals will be as loud as your vacuum tube amplifier is capable of putting current into the RADIO MAGNAVOX.

The greater your amplifier output the more volume of sound from the Magnavox.

When other loud speakers chatter or stop working on account of too much current from your amplifier, THE RADIO MAGNAVOX is working at its best.

VERY SENSITIVE ON WEAK SIGS AND ROARS LIKE A LION ON STRONG SIGS. BE SURE TO GET THE BEST **THE RADIO MAGNAVOX,** THE WORLD'S STANDARD.

PRICE - - $45.00

Manufactured by

Factory **THE MAGNAVOX COMPANY** **Sales Office**

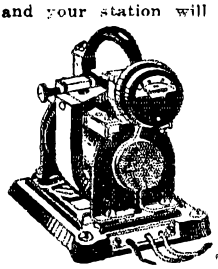
Oakland, California

Penn. Terminal Bldg.
370 Seventh Avenue,
New York, N. Y.

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 in One Compact, Self-Contained, Portable unit.

F-F Boosters are Magnetic Rectifiers for 105-125 Volt 60 Cycle Alternating Current. Pre-War Prices.

Bantam Type 6 charges 6 Volt Battery at 6 Amperes $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. Or have us ship C.O.D. Other F-F Battery Boosters charge batteries from Farm Lighting Plants, Direct Current Circuits and D.C. Generators.

For Group Charging use the Full Wave Automatic F-F Rotary Rectifier of 100 Volt, 36 cell capacity.

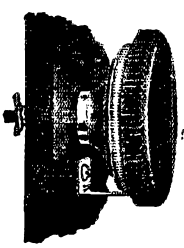
Order Now or Write for Free Booster Bulletin No. 31or Rotary 31A

The France Mfg. Co. Office & Works CLEVELAND, OHIO

Canadian Representative: Battery Service & Sales Co. Hamilton, Ontario

---

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:

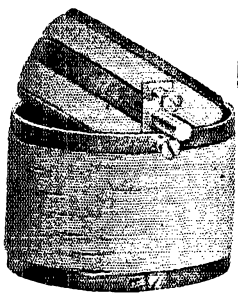
No.		Postpaid
31	Audion panel with rheostat and B Bat. Switch	$3.00
43	45 Volt Large B Battery	5.00
50	Parkin .001mf Variable Condenser, unit only	1.50
51	Parkin .001mf V.C. with knob and pointer	2.00
52	Parkin .001mf V.C. with knob and 3" dial	2.50
53	Parkin Molded Bakelite Fixed Condenser..	.70
UV-200	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.

"Chi-Rad" Variometers & Couplers



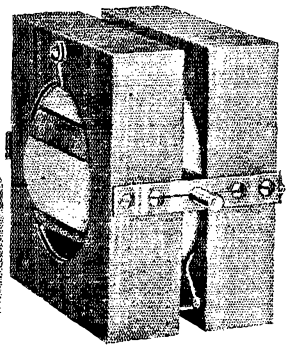


PLATE VARIOMETER **$5.00 (3 lbs.)**

COUPLER **$4.00 (2 lbs.)**

GRID VARIOMETER **$5.00 (3 lbs.)**

Prices, completely assembled as shown. Include P.P. on weight given.

SPECIAL KNOCKED DOWN PARTS

The knocked down set includes all the parts to make up two variometers and one coupler exactly as shown above. All windings in place, nothing to do but screw on bearings and connect up. Set can be assembled in 30 minutes. Price complete, only $10.00. Add PP on 6 lbs.

READ THESE SPECIFICATIONS:

Variometer forms 4¾" square, 3" wide when assembled.
Coupler primary 3⅝" diameter, 3¾" high.
All shafts ¼" diameter.
Made specially for panel mounting-all screws covered by dials when assembled.
Range 175-450 meters. Special condenser to shunt across secondary and increase range to 650 meters supplied for 35c extra.

ACCESSORIES TO COMPLETE YOUR RECEIVER

Extra quality quarter-sawed oak cabinets to take panel 7" x 18". Hinged top. Shipping weight 10 lbs. **7.00**
Bakelite Panel 7"x18"x⅛" thick $1.75. ⅜ in. thick **$2.75**
"Chi-Rad" special panel switch, nickeled bushing ..... **.60**
Hard Rubber Binding Posts, each 12c., per doz. **1.25**
Nickeled Switch Contacts ¼"x⅜", per doz. ..... **.40**
"Chi-Rad" Mica Grid Condensers each 35c., 3 for **1.00**
#16 bare tinned copper wire, 2 feet for ..... **.01**
Empire tubing (spagetti), per ft. ..... **.08**
"Chi-Rad" Universal Pointer with bushing **1.25**
Chelsea Indicating Dials ¼" or ⅜" shaft **1.00**

CAUTION

"Chi-Rad" Variometers are made right-turned from solid Mahogany to prevent shrinkage—are fully guaranteed and yet sold at a price to please your pocketbook. Due to their great popularity they are being imitated. For your protection our name appears on every instrument. Accept no substitutes—insist on "Chi-Rad Solid Mahogany Variometer Parts". Your dealer will get them for you.
If you are thinking of buying or building a Detector or Amplifier Panel wait until you see our October ad—you'll certainly be glad we told you in advance.
New, complete Radio Catalog ready Sept. 1st—sent to any address for 15c in stamps which amount may be deducted from first order for $1.00 or more.

Chicago Radio Apparatus Co., Inc.

Phone Harrison 1716

508 SO. DEARBORN ST., DEPT 9 CHICAGO, ILL.

MEYBERG

The Largest Radio Stock on the Pacific Coast

SAN FRANCISCO

Everything the Amateur Wants

LOS ANGELES

Send for 32-page Remler Catalogue—just off press

Stocks Guaranteed—Prompt Service From Either Address

VACUUM TUBES

C300 Cunningham Detector	$ 5.00
C301 Cunningham Amplifier	6.50
C302 Cunningham 5 Watt Power	8.00
C303 Cunningham 50 Watt Power	30.00
UV200 Radiotron Detector	5.00
UC201 Radiotron Amplifier	6.50
UV202 Radiotron 5 Watt Power	8.00
UC203 Radiotron 50 Watt Power	30.00
Moorhead Electron Relay	5.00
Moorhead VT Amplifier	6.50
Moorhead VT Transmitter	7.50
Moorhead Rectifier Tube	9.75

All tubes postage postpaid.

AMPLIFYING TRANSFORMERS

231A General Radio	$ 5.00
226W Federal	7.00
A2 Acme-Unmounted	4.50
A2 Acme Semi-mounted	5.00
A2 Acme Fully mounted	7.00
UV712 Radiotron	7.00

EVEREADY BATTERIES

765 Small 22½ Volt B	$ 2.50
766 Large 22½ Volt B	3.50
774 Variable 43 Volt B	5.00
746 Special 108 Volt Amp. B	16.50
6 Volt 40 Amp. hr. Storage	18.20
6 Volt 60 Amp. hr. Storage	20.80
6 Volt 80 Amp. hr. Storage	24.05

REMLER APPARATUS

Moulded Bakelite Variometers	$ 6.00
503 Moulded Bakelite Variocouplers	5.40
100 3" Bakelite Dial and Knob	1.00
330 Detector Panel Moulded Bakelite	8.00
331 Amplifier Panel less Transformer	6.00
333 Amplifier Panel less Transformer (with cam switch)	9.00
810 Jr. Reostat	1.00
94 A Battery Potentiometer Unit	.75
74 Knob and Lever for above	.45
96 Variable Grid Leak	.60
97 Fixed Grid Condenser	.35
400 3 Coil Mounting on base	6.50
3 Coil Mountings for Panel Mtg.	3.60

TELEPHONES

Brandes Superior	$ 8.00
Brandes Trans-Atlantic	12.00
Brandes Navy	14.00
Baldwin Type C Navy	16.50
Baldwin Type E	20.00
Baldwin Type F	21.00
Murdock No. 55 2000 ohm.	4.50
Murdock No. 55 3000 ohm.	5.50

JACKS AND PLUGS

Federal 1421 open Circuit Jack	$ .70
Federal 1422 single Circuit Jack	.85
Federal 1423 double Circuit Jack	1.00
Federal 1435 Automatic Filament Control Jack	1.20
Federal 1438 Automatic Filament Control Jack	1.55
Western Electric Plugs	1.30
Federal Plugs	2.00
Pacent Universal	2.00

SOCKETS

No. 92 Remler Socket	$ 1.50
No. 156 General Radio	1.50
No. 550 Murdock	1.00
No. R300 DeForest	1.60
De Forest Moulded Bakelite	1.40

VARIABLE CONDENSERS

No. 220 Wireless Shop Panel Mtg. .0005	$ 3.60
No. 430 Wireless Shop Panel Mtg. .001	5.25
No. 630 Wireless Shop Panel Mtg. .0015	7.50
No. 1 Chelsea Mtd. .0011	5.00
No. 2 Chelsea Mtd. .0006	4.50
No. 3 Chelsea Unmtd. .0011	4.50
No. 4 Chelsea Unmtd. .0006	4.00

REGENERATIVE RECEIVERS

Myco D12 175 to 25000 meters Detector 2-step Amp. less Coils and Tubes	$165.00
CR3 Grebe Relay Special	68.00
CR3A Grebe Tube Control self-contained	47.50
CR5 Grebe 175-3000 meters tube control	85.00
CR6 Grebe 175-680 meters Det. 2-step	210.00
CR7 Grebe 5000-20000 Long wave Special	220.00

C. W. APPARATUS
JEWELL METERS

O-100 Milliamps Flush Mtg.	$ 8.00
O-250 Milliamps Flush Mtg.	8.00
O-500 Milliamps Flush Mtg.	8.00
O-15 Volts Panel Mtg. back-con.	10.00
0-500 Volt Meter	16.00
O-1000 Volt Meter	23.00
O-1500 Volt Meter	29.00
O-1, O-2, O-2½, O-5, Thermo coupled Radiation Meter Flush Mtd.	12.00

MOTOR GENERATORS

Westinghouse 100 Watt 110 Volt 60 cycle AC 500 Volt DC	$ 80.00
Westinghouse 250 Watt 110 Volt 60 cycle AC 1000 Volt DC with 87 Volt Grid Bias Tap	142.50
Pacent Universal CW Condensers, any capacity	2.00
CW Tuning Inductance	8.00
Variable Grid Leak 8000 ohm	3.00
Wireless Shop Condenser .0008	9.00
231M Modulation Transformer	5.00
Kellogg Transmitter	3.50
Kellogg Transmitter, adjustable arm	4.75
IMF-21AA Western Electric Filter Condenser	2.75
Double Filter Choke	6.60

Send For Your Copy of New 32-Page Remler Catalogue Just off Press. DEALERS: Our Stock Guarantees Service. Send For Special Co-operative Plan.

LEO J. MEYBERG CO.

428 Market Street
SAN FRANCISCO, CALIF.

752 South Los Angeles Street
LOS ANGELES, CALIF.

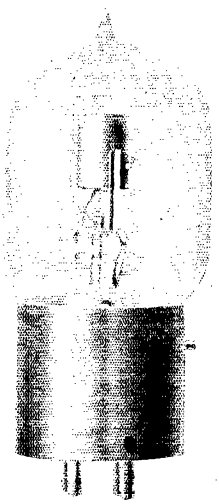
Do You Know WHY

the new Westinghouse Receiving Equipment was designed solely for use with A-P TUBES?

After the most exhausting tests in their laboratories at East Pittsburgh, the Westinghouse Research Department found that the *A-P Tubes* were the most efficient tubes on the market today—for regeneration—for amplification—for detection.

A-P Tubes proved to be the most quiet in operation and gave the loudest received signal strength. *A-P Tubes* also proved the most economical tubes.

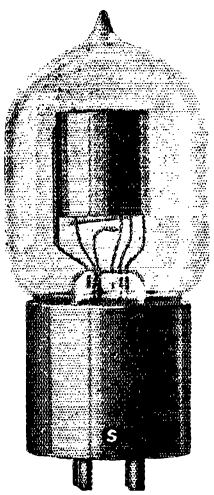
A-P Tubes are the pioneer tubes on the market today. They have passed the experimental stage and are a proved success. They have the highest base insulation of any tube on the market, and are the result of the design of the British, French and American Governments under the rigorous specifications of military requirements. It is not surprising that *A-P Tubes* are approved and adopted by the Westinghouse Electric and Mfg. Co.



THE A-P VT
AMPLIFIER-OSCILLATOR
—the amplifier used by the U. S. Navy. "Use the tube the Navy uses." Price $6.50

A-P Tubes are licensed by the Radio Corporation of America under the DeForest, Audion and Fleming patents for amateur and experimental use in Radio communication.

Note New Prices



THE A-P
ELECTRON RELAY
—the most sensitive detector of spark signals known to the radio art. Price $5.

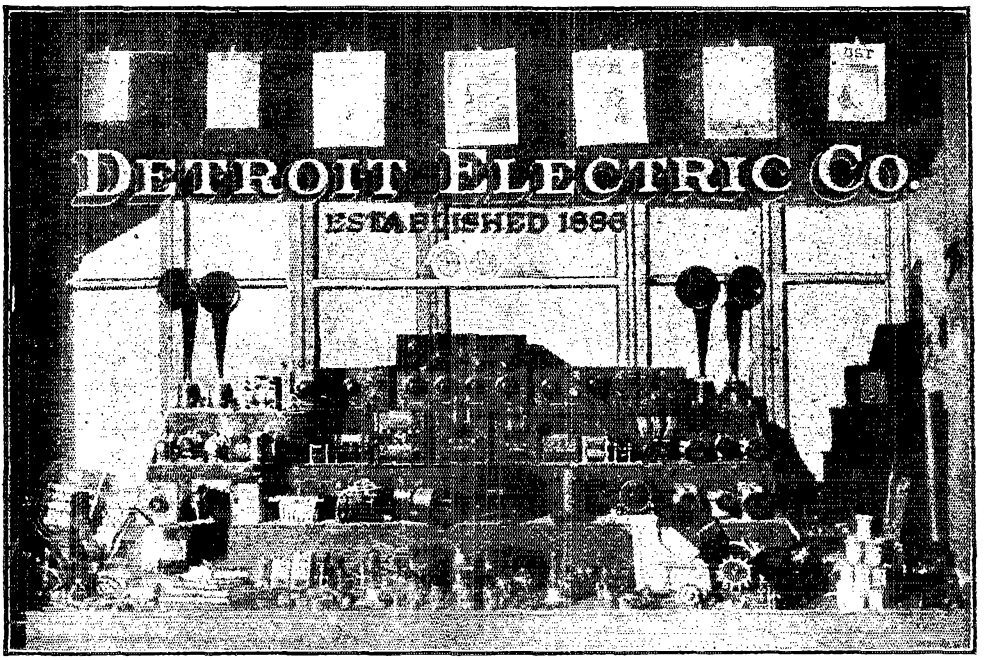
Order from your dealer or write direct. And for the best book on Radio ask your dealer for "Elements of Radiotelegraphy," by Lieut. Ellery W. Stone, U. S. N., or order direct from—

The Atlantic Radio Supplies Co. 8 Kirk Place, Newark, N. J.
The Pacific Radio Supplies Co. 638 Mission St. San Francisco, Cal.

DISTRIBUTORS FOR

MOORHEAD LABORATORIES INC.
SHAW INSULATOR COMPANY
DEFOREST RADIO TEL. & TEL. CO.
DIAMOND STATE FIBRE COMPANY.

use A-P tubes for efficiency



Are You Prepared For Fall and Winter "DX" ?

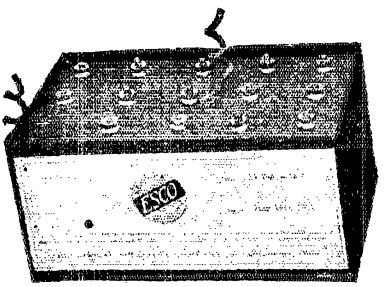
50 W.-350 V. Acme C.W. Transformer	$15.00
200 W.-250-550 V. Acme C.W. Transformer	20.00
500 W.-1000-1500 V. Acme C.W. Transformer	25.00
Acme 1K.W. Spark Transformer	28.00
Acme Amplifying Transformer	5.00
Acme Modulation Transformer	5.00
Tuska Variometer with Dial	7.25
Tuska Vario-Coupler with Knob	7.50
Ever-ready 22½ V. Variable B Battery	3.50
Ever-ready 22½ V. Small B. Battery	2.00
Burgess 22½ V. Large B. Battery	3.50
Burgess 22½ V. Small B. Battery	2.25
Radium-6V-40A. Storage Battery	16.50
Gen. Radio Hotwire Meters	7.75
RADIOTRON UV. 200 Detector	5.00
RADIOTRON UV. 201 AMPLIFIER	6.50
RADIOTRON UV. 202 5W. Power Tube	8.00
RADIOTRON UV. 203 50W. Power Tube	30.00
De Forest 37½ W. Singer Power Tube	24.00
Rhamstine Amplifying Transformer	3.50
Federal Jacks 2 circuit	1.00
Federal Bakelite Plug	2.00
Rhamstine Jack and Plug	1.50
Grebe Regenerative Receiver CR3-600M	65.00
Grebe Regenerative Receiver CR5-3000M	80.00
Grebe Detector and 2 Step Amplifier RORD	75.00
Grebe Detector and 2 Step Amplifier RORK	50.00
Grebe 600M Variometer	8.50
Grebe 600M Vario-coupler	8.50
Grebe 3" Bakelite Dial	2.50
Grebe 4" Bakelite Dial	3.00
C.W. Condenser, 1000V, 1MF, W.E.	3.50
C.W. Coto-Coil Var. Cond. 15pl. 0005	5.50
C.W. Coto-Coil Var. Cond. 23Pl. .0007	5.00
C.W. Coto-Coil Var. Cond. 33Pl. 001	6.00
Detroit C.W. Inductance with Clips	7.75
Benwood Bakelite Rotary Gaps	25.00
Chelsea 23 Pl. Var. Cond. with Dial	4.25
Chelsea 43 Pl. Var. Cond. with Dial	4.75
Ground Switches 600V. 100A	4.75
Vocaloud, Loud Talkers	30.00
Century ¼ H.P. A.C. 3500 RPM Synchronous Motors	38.00
6AMP. Sliding Rheostats for UV 204	4.50
Paragon Rheostats	1.75
Murdock Rheostats with Dial	1.00
No. 18 Hook-up Wire with Empire Tubing-30 in.	0.25
Jewell 200 MA Motors	10.00
BAKELITE PANELS 1/8" per sq. in.	.02
BAKELITE PANELS 3/16" per sq. in.	.03
BAKELITE PANELS ¼" per sq. in.	.04
BAKELITE TUBING 3½" per in.	.25
BAKELITE TUBING 4½" per in.	.35
BAKELITE TUBING 5½" per in.	.45
Remler Detector Units	8.00

Mail Order Service—orders positively shipped day received. Send for new price list giving shipping weights. If merchandise exceeds parcel post weight limit it will be sent express collect—otherwise, include postage in your order.

DETROIT ELECTRIC COMPANY

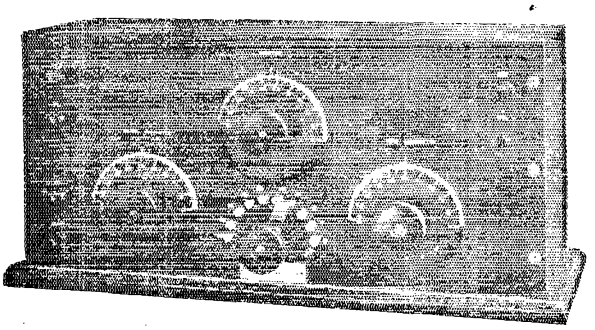
434 Shelby Street **DETROIT, MICHIGAN**

ESCO LONG-LIFE "B" BATTERIES



ESCO batteries teem with pep and energy, which together with their rugged and durable construction make their actual life extremely long. Every ESCO battery is thoroughly tested and inspected before it leaves the factory so that there shall be no defective batteries to cause our customers dissatisfaction. Prices are extremely moderate as witness below:

No.		Size	Taps	Voltage	Ship. Wt.	Price
24	Variable	3x4x6½"	15	22½	5 lbs.	$3.00
23	Plain	3x4x6½"		22½	4 lbs.	2.25
22	Variable	2x2½x3"	3	22½	2 lbs.	2.00
21	Plain	2x2½x3"		22½	2 lbs.	1.50



THE ESCO REGENERATIVE RECEIVER

has been reduced in price to

$45.00

Shipping weight 11 lbs.

ESCO VARIOMETERS and VARIO-COUPLERS

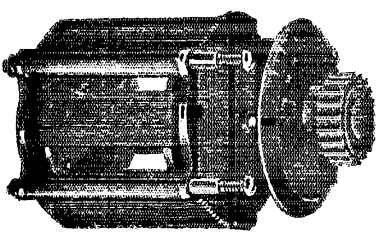
also reduced as follows:

ESCO VARIOMETER without dial $7.50

ESCO VARIO-COUPLER without dial 8.00

For dials add $1.00 additional.

Shipping weight 2 lbs. with or without dials



ALL TYPES OF BALDWIN RECEIVERS REDUCED

In line with our other reductions as announced above we wish to list our new prices on Baldwin receivers in effect on September 1st.

Baldwin Type C Mica diaphram receivers—shipping weight 2 lbs. $13.75
Baldwin Type E " " " " " 2 lbs. 15.00
Baldwin Type F " " " " " 2 lbs. 16.25

OUR FAMOUS ESCO QUALITY AERIAL WIRE

This pure, solid copper aerial wire with which we made our first big hit with the amateurs still remains as one of our customers' favorites. We have it in the #11 and #12 sizes. Prices are as follows:

100 feet #14 aerial wire—shipping weight 2 lbs. $0.50
100 feet #12 aerial wire—shipping weight 2 lbs. 0.80

Prices on additional quantities are in proportion. Remember that the #14 size runs 80 feet to the pound and the #12—50 feet to the pound when computing shipping weights.

Send 15c for our complete literature.

Electrical Specialty Co. 48-50 So. Front St. Columbus, O.

Measure Your Standing In The Radio Game

By the Conclusion of Mr. Schnell

Traffic Manager, A. R. R. L.

He knows what amateurs are and what they're doing, and he says: "CW is here to stay and unless we are afflicted with a foggy brain, CW will be so far ahead of the spark that messages of unimportance will be left for that means of communication, while the messages of more importance will go via CW, because they will get through."

Are you "foggy brained?" Not if you keep up with QST.

IT TAKES TIME TO GET OUT A GOOD MAGAZINE

That's the reason this is written more than a month before you read it.

Moreover, it was written before you read our August QST announcement of C-W C; and hence, of course, long before you had a chance to send for a C-W C.

Then and there, I announced only 1,000 C-W C's.

And with what results? Why, a week before the announcement was out, some hundred or more amateurs got wind of it. Hence, this amateur and that began telegraphing or writing to reserve a C-W C and sent their checks.

The advertising man of the company that placed my announcement in QST —one of the largest advertising agencies in the United States— said that he had not known such a thing to happen in all his advertising days,—and that's a lot for an advertising man to admit!

It is all due to the non-foggy brained amateurs. The demand is so great, I'm admitting I was wrong and hence I am printing another 1,000 C-W Cs.

But—several tens of thousands of amateurs will be wanting these extra sets by the time you read this.

This is no Sunday school lesson, so there's no moral to it, but—

If you want a C-W C you know what to do and how soon you should do it.

If you want to know about C-W C, look up the center spread August QST.

FOR WHOM C W C WAS PREPARED:

For the amateur who is already sending and receiving CW.

For the amateur who desires a CW set but thinks the cost is too great and who needs to make $90 go as far as $250.

For the amateur who buys this or that costly apparatus and afterwards finds it useless because not needed or adapted to his CW set.

For the amateur who has had much expert experience with spark but who, in tubes and meters, burns up the contents of his pay envelope in a single night.

For the amateur who wishes to attain maximum efficiency but does not do so because he is still working along the basic ideas of spark transmission instead of up-to-date CW.

For every amateur who wishes to send 500 miles on two 5 watt tubes.

Send your $10 today and begin the course at once.

If hard up, send $3 and I'll hold a course for you for 3 weeks; then send $7 any time within three weeks.

But, if you can't dig up the $7 in 3 weeks, I'll return your $3, for I can sell that course to someone else.

From the service standpoint, I'd like to have this extra 1,000 courses go to the 1,000 amateurs who are most interested.

From business standpoint, it makes no difference if you or other fellow gets the set held for you.

SEND IN YOUR ORDER NOW FOR CWC.

Mr. Brown Landone, 10th floor,
15 West 44th St., New York City

Enclosed I am sending:
$10, for which please send me a C-W C; or
$3, to reserve a C-W C for 3 weeks, in accordance with QST ad.

Name .....
Street .....
City ..... State.....

BROWN LANDONE, 10th Floor, 15 West 44th St., New York City

QST

The annual convention of the Northern Section of the New England Division of the A.R.R.L. will be held at Portland on Saturday, September 10th. An entirely new program will be offered. A chance for everyone, whether a Spark or CW Ham. The convention will last all day and will consist of three sessions.

In the morning, everyone will have a chance to ask questions on spark apparatus and to inspect all the latest developments. Ten spark experts will be on hand to answer questions and to demonstrate apparatus.

In the afternoon, a lecture on recent developments in CW will be followed by a wireless concert. Then for two hours you will have a chance to ask questions on all phases of CW. Ten CW experts will furnish this information and demonstrate apparatus. These men will be so divided that regardless of your special need you will find a separate division to cover it. The afternoon session will conclude with an organ recital by one of the world's leading organists on the second largest organ in the world.

In the evening there will be a smash up banquet, with cabaret as well, at the Hotel Falmouth.

The Portland Chamber of Commerce has given the use of the City Hall all day, so come and help fill it up!!!!!!

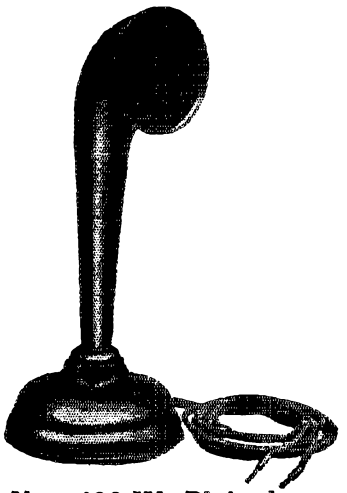
PRIZES will be awarded to all who are successful in the competition. We will not say what this competition will be until you get there, but there will be 40 prizes, all radio apparatus.

It will only cost you two bucks for the whole show including the banquet, so come on and join the crowd.

We are going to form a Northern New England Radio Council and all who are present may become charter members.

These are but a few of the attractions. Think it over and send for your tickets early to H. W. Castner, A.D.M., 15 Temple St., Portland, Maine, as the space is limited and you may miss out if you don't act quickly.

FEDERAL PLEIOPHONE



No. 400-W Pleiophone
Price $14.00

A Loud Speaking Instrument of Real Merit at a REASONABLE PRICE. For Use in Connection with 1 or More Stages of Amplification.

FINISHED IN BLACK ENAMEL AND PROVIDED WITH 6′ GREEN SILK CORD.

Your Station is Not Complete Without It.

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

Send for Bulletin No. 103-WB, listing amplifying transformers, telephone jacks and plugs, automatic filament control jacks, anti-capacity switches, "Federal" head telephones, C.W. filter coils, C.W. filament heating transformers, C.W. grid resistances, C.W. power transmitting apparatus, receiving equipment, together with our standard radio accessories.

Federal Telephone and Telegraph Co.

Testing Station Radio 8MF **Buffalo, N. Y.**

DX RADIOMEN!

Stop straining your ears for weak signals. Hear them QSA with the Dependable and Sensitive "DX AMPLIFERS"

"DX AMPLIFERS" do not distort spark, CW or fone. Absolutely "howl proof." Equipped with engraved panel, fine mahogany cabinet, bus wiring, jacks, Special Grid Condenser, etc., that sell other amplifiers at double our prices.

Type DX-1 One Step $19 **Type DX-2 Two Step $34**

(DETECTORS INCLUDED)

DX RADIO COMPANY, Summit, Ill. Branch Sales—Argo, Ill.

See Our Exhibit at First National A.R.R.L. Radio Show and Convince Yourself.

METERS

VOLT $4.00 **$3.25 AMP'S**

MUST BE USED FOR ACCURATE CONTROL OF FILAMENT TEMPERATURE

AMPLIFYING TRANSFORMER

$3.00 **WINDINGS** **$3.00**

WITH LEADS READY TO MOUNT

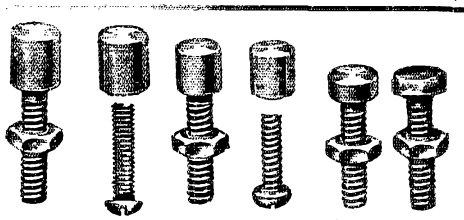
V.T. SOCKET TUBES 35c.

FINISHED ALUMINUM

QUALITY RADIO SHOP

Box 126 Richmond, Indiana

RADIO DEALERS WRITE IMMEDIATELY

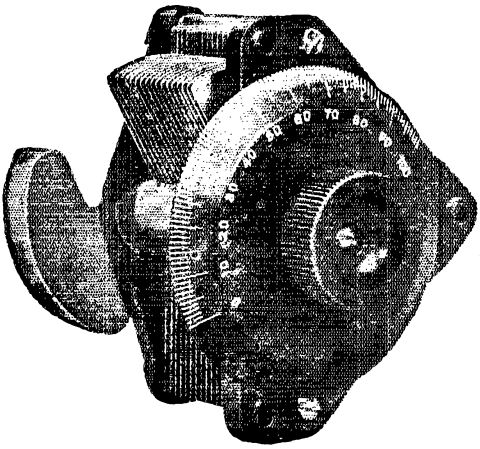


No.	7160	7127	7512	7594	7138	6647
Size	¼ x ¾ in	¼ x ¾ in	5/16 x 5/8 in	5/16 x 5/8 in	¼ x 5/8 in	5/16 x 5/8 in
Price	$1.80	1.40	$1.40	$1.20	$1.30	$1.20

Add 75c per 100 for nickel finish

CONTINENTAL ELECTRIC CO.

117 E. 129 Street, New York, N. Y.



Chelsea Variable Condensers

(*Die Cast Type*)

No.	Capacity	Type	Size	Weight	Price
1	.0011m.f.	Mounted	4⅝x4⅝x3¼	1¾ lbs.	$5.00
2	.0006m.f.	Mounted	4⅝x4⅝x2⅜	1¼ lbs.	4.50
3	.0011m.f.	With Dial	4¼x3x4	2 lbs.	4.75
3	.0011m.f.	Without Dial	4¼x3x4	2 lbs.	4.35
4	.0006m.f.	With Dial	4¼x3x3½	1¼ lbs.	4.25
4	.0006m.f.	Without Dial	4¼x3x3½	1¼ lbs.	3.85

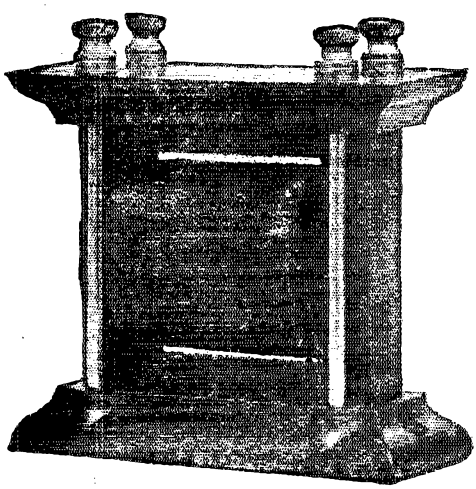
Top, bottom and knob are genuine bakelite, shaft of steel running in bronze bearings, adjustable tension on movable plates, large bakelite dial reading in hundredths, high capacity, amply separated and accurately spaced plates.

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.

The CHELSEA Amplifying Transformer

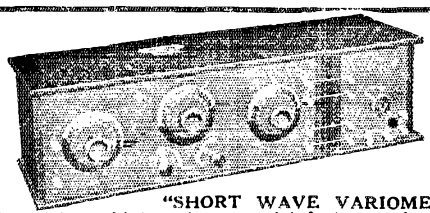
is a supreme attainment in the design of Audio Frequency Transformers. It embodies the highest grade of materials obtainable and proper design, which reflects the result attained namely high amplification factor. It is unequalled either in electrical characteristics or good appearance. Price as shown $4.50



$4.50

Chelsea Radio Co., 15 Fifth St., Chelsea, Mass.

A ACE E



A ACE E

"SHORT WAVE VARIOMETER UNIT"

Introducing a popular priced model combining the essential features of efficient design with pleasing, rugged construction throughout. The ideal receptor for the Radio Amateur.

ACE Type AVA Variometer Tuner.....$45.00

Licensed under Armstrong Patent 1,113,149

ACE Type ATC Audion Control Cabinet.....$12.00

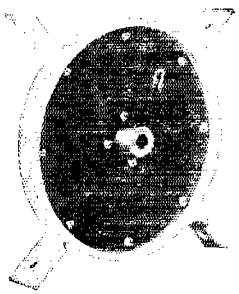
Of course we manufacture a complete line of other Radio Equipment such as Amplifiers, Radio Telephone Units, etc. Send 3 cents in stamps for catalog.

THE PRECISION EQUIPMENT CO.,

2437-2439 GILBERT AVE., CINCINNATI, OHIO

Radio 8XB *You may pay more but you can't buy better.* Member A. R. R. L.

25% MORE POWER IN THE AERIAL!



If you now must use a condenser capacity of .007 or less in the primary circuit of your spark transmitter, you can increase your efficiency 25% by using the ARROW disc and the circuit it makes possible. With this combination you can use a condenser capacity of .013 mf or more and still be on 200 meters. This means greater DX.

USE THE ARROW DISC

The ARROW disc is 12 inches in diameter and has large sparking surfaces 1 and ½ inches wide. The electrodes are 1/16th inch in thickness. This insures wonderful quenching due both to the great peripheral speed and high wind resistance. This disc is built on the spark-thru principle. About ⅛ H.P. is required to pull The ARROW disc.

Price $12.00 F. O. B. St. Paul.—4 or 8 tooth—

We are in a position to build Receivers, Transmitters, Tube Sets, etc., to your specifications. Get our estimate—*. Send for our bargain list.

TWIN CITY RADIO LABORATORY

185 W. 6th Street **Radio 9HM** **St. Paul, Minn.**

Wireless Amateurs Attention!

If you want service, order from us. We carry a large stock of High Grade Wireless Apparatus of our own and other manufacturers.

SPECIAL!

Vacuum Tube Sockets	**$1.25**
Rheostats	**1.25**
22½ Volt "B" Batteries	**1.50**
Rasco Dials	**.60**
Rubber Binding Posts	**.20**
Tested Galena	**.40**
Lateral Wound Coils. All Sizes.	

Send 5c for our large illustrated catalog.

J. M. PAQUIN,
THE ELECTRICAL SHOP,
787 Queen St. West, Toronto, Ont.

The original tested crystals

25c

Be Sure of Results! Insist Upon Getting

NOW 25c

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 imitation, look for the signature of J. S. NEWMAN on each box. Formerly 35c per crystal

At good Radio Dealers everywhere, or shipped direct post-paid on receipt of price. Now **25c** (Galena or Silicon)

THE NEWMAN-STERN CO.
Newman-Stern Bldg., Cleveland, Ohio

LEARNER'S SETS

high tone buzzer, lever type key external tone adjustments, code and instructions.
$1.75 Postpaid

AJAX ELECTRIC CO.
Palmer St., Cambridge 38 Mass.

QST de 8AFO all NRH and Vicinity

We sell Radiotrons, DeForest, Acme Apparatus, Burgess B Batteries, Brandes and Baldwin Fones, Eldridge meters, Remler, Tuska, Clapp-Eastham, Magnavox. Genuine Willard 6-80 batteries $30.00. Consult us before you buy. Ask for information and latest bulletins.

KRAUS BATTERY CO.
3425 W. 25. CLEVELAND, O.

Comfortable
As An Old Hat

A Brandes Wireless Headset can be worn as comfortably as an old soft hat. Automatically adjustable; easy-fitting; light in weight. May be kept on, through the longest sittings, without a headache or other discomfort.

Why wear a heavy, cumbersome, binding or tiresome headset when you can have a comfortable—and 100%-efficient—Brandes? Three types: $8, $12, $14.

"Navy" type Headset, **$14.00**

"Superior" type Headset, **$8.00**

Sold on 10 days trial. Money refunded if not satisfactory.

Send 5c for Catalog F.

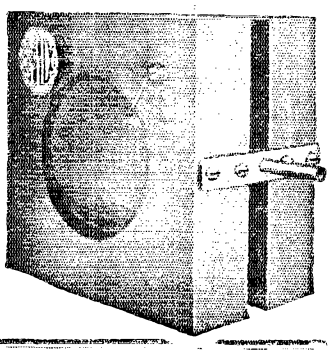
DEALERS, Write for Proposition

C. BRANDES, INC.

Room 821, 32 Union Sq., New York City

BRANDES Matched-Tone HEADSETS

MAKE YOUR OWN REGENERATIVE SET From This COMBINATION

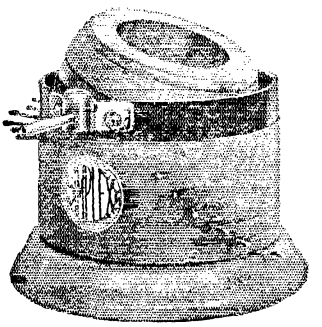


These instruments are wound with extra heavy wire to reduce the resistance, and have special long bearings with a spiral spring inserted to insure a perfect and self cleaning contact at all times. The taps on the Vario-Coupler are arranged in two groups. Furnished with round or square base.

PRICES PREPAID

Variometer as illustrated....$6.00
Variometer mounted on formica panel & Dial complete 8.50
Vario-Coupler as illustrated 6.00
Vario-Coupler mounted on formica panel complete with *two* switches & Dial....$10.00

Bulletin #10 sent on request. Dealers furnished with discounts.



Simplex Radio Co. 1013-15 Ridge Ave. Phila. Pa.

TECO SERVICE
none better.
"We handle only the best."
Make your money count.
Service and satisfaction always.

WARNING

Consider well your situation.
Govern yourself accordingly.
Every man should have a HOBBY and what is more interesting than Wireless?
MORAL—make Wireless yours.
Then consider—what shall I buy? Shall I buy apparatus of proven merit or spend money for inferior goods? Do you remember the old adage, "YOU CAN FOOL SOME OF THE PEOPLE SOME OF THE TIME, BUT YOU CAN'T FOOL ALL OF THE PEOPLE ALL OF THE TIME." Why be one of those that are fooled some of the time? If you buy goods of us you will get goods that carry a guarantee and know that you are getting the best for your money.

REGENERATIVE SETS

Grebe KT-1 Portable Transmitting and receiving set complete	$175.00
Grebe CR*1 range 170-680.	90.00
Grebe CR*2 range 170-680.	51.00
Grebe CR*3 (SPECIAL) short wave 150-680	65.00
Grebe CR*4 Range 170-680	65.00
Grebe CR*5 (SPECIAL) Range 170-3000	80.00
Grebe CR*6 With two stage amplifier	180.00
Grebe CR*7 Long wave 500 to 20.000 complete.	210.00
Z-Nith Regenerator	55 00
Paragon RA-Ten	85.00
Midget receiver single circuit 150-1000 meters...	15.00

On any of above control panels we furnish free of charge detector tube.

DETECTORS, CRYSTAL

D-101 De Forest dustproof	2.60
RPDA Grebe dustproof...	2.75
8854 Jove	2.80
Midget detector and one stage	24.00
Midget detector and two stage	40.00
Midget detector panel regenerative feed back....	11.00

LOUD SPEAKERS

Magnavoxes	45.00
Vocaloud	25.30
Phonetron; Sound and electric converter	45.00

AMPLIFIERS

RORH Grebe two stage auto control	55.00
Acme Y-2 Amplifier	13.00
General Radio Two Stage..	50.00
Firco (PREMIER) six stage Audio Frequency Amplifier	170.00
Midget two stage amplifier	30.00
Midget one stage amplifier	18.00

TELEPHONES

Brown adjustable	$18.00
Baldwins Type F	16.25
Brandes (ALL TYPE) $8. to	14.00
Murdocks 2000 ohms	4.50
Murdocks 3000 ohms	5.50
Brownlie new type	12.50

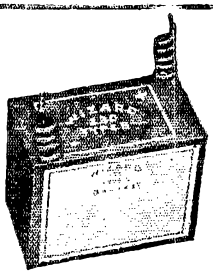
AUDION CONTROL PANELS

RORH Grebe with Tickler connection	17.00
Y-1 Acme in cabinet	10.00
Paragon moulded, very neat	6.00
General Radio variable grid condenser and leak	32.00
Remler control panel, late type	6.00

As a special inducement for the next two months we will allow 5 per cent. discount on the above instruments. If you do not find the article you are looking for in the above list we will gladly ship postpaid any article you desire at the prevailing price.
To anyone desiring Amrad products we can quote 20 per cent. off list.

P. O. Box 3362 **TECO RADIO CO.** Boston, Mass.

AT LAST
The 100% "B" Battery



The Highest Grade B Battery at the Lowest Price. The Wizard is ready to serve you.

Stop!

paying high prices for your B Batteries. Buy direct from the manufacturer and know that you are getting Fresh Batteries at the right price. We pay all parcel post charges and guarantee our battery to give better satisfaction than any other B Battery.

Cat. No.	Size	Taps	Volt-age	Hrs. Ser-vice	Price
1623 Plain	2½x2x3¾		22½	400	$1.00
1623 Variable	2½x2x3¾	5	22½	400	1.20
1625 Plain	3 x4x6⅝		22½	1400	1.95
1625 Variable	3 x4x6⅝	5	22½	1400	2.35
1626 Plain	3 x8x6⅝		45	3000	4.25
1626 Variable	3 x8x6⅝	6	45	3000	4.50

WIZARD BATTERY CO.
Dept. R., 1322 44th St., BROOKLYN, N. Y.

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 set ... suitable for operating Coffee Grinders, Cream Separators, Bottle Washers, Air Compressors, Small Lathes, Etc.

Mail $5.00 cash or Money order. We will send C.O.D. subject to full examination. Money Back Guarantee.

Complete Small Motors and Generators. Write for Catalogue. Special Quantity Prices-Value $25.50

$22.75 Each

MANUFACTURER'S DISTRIBUTER
CHAS. H. JOHNSTON - Box 19 W. E., Pittsburgh, Pa.

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.

To all SUNKIST RADI-O-ITES

Finding that the express charges on the heavier goods from the East are so high as to eat up the profits, I withdraw my offer to deliver in California free of transportation charges.

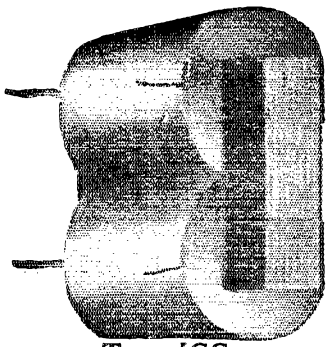
PAUL F. JOHNSON
ALTADENA RADIO LABORATORY
Altadena, California.

Best of Everything in Radio Apparatus and Parts.

Send Stamp for Catalog "Q"

J. H. BUNNELL & CO.
32 Park Place, New York

Some Exceptional Offers



Type ICC

The Ideal Choke Coils have many features which make them the best on the market. After trying many values of inductance with several different capacities we have found that these Chokes when used with a 1 Mfd Condenser make up the most efficient filter it is possible to conceive.

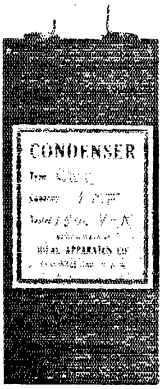
Coils have an inductance of 1 Henry, the core is of the highest grade silicon steel, and each coil will pass 500 milliamperes without absorbing any of it.

IDEAL DOUBLE CHOKE COIL...$7.00
IDEAL SINGLLE CHOKE COIL... 5.00

The Ideal 1Mfd 1000 Volt Guaranteed Filter Condensers were designed to work with the Ideal Chokes. Two of these Condensers and a double Choke Coil make up the most efficient filter system that it is possible to build.

May also be used in any part of a C-W and Fone circuit that a high capacity condenser is needed.

Each Condenser is tested at 1500 Volts and the initials of the tester are marked on them. When one is faulty we know immediately upon whom the responsibility rests.



IDEAL GUARANTEED FILTER CONDENSER...$2.00 **Type CWC**

DEALERS WRITE

POWER TUBES	
Radiotron 5 Watt	$7.20
Radiotron 50 Watt	27.00
Singer 37 Watt	20.00
TUBE ACCESSORIES	
Socket for 50 Watt Tube	4.00
.002 Mfd Grid Condenser	.70
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	14.40
Modulation Transformer	4.00
CW CONDENSERS	
Wireless Shop .0004 Mfd	6.00
Wireless Shop .0006 Mfd	7.50
Wireless Shop .0008 Mfd	9.00
FEDERAL MICROFONES	
260-W Hand Microfone	6.30
262-W Panel with bracket	4.75
263-W Panel Mounting	4.75
Federal Plug	1.80

IDEAL MOTOR-GENERATORS	
500 Volt 100 Watt	$70.00
500 Volt 200 Watt	85.00
Type MGF Filter	15.00
RADIO METERS	
0-100, 0-300 MA D.C.	6.00
0-1, 0-3, 0-5 Thermo Ammeters	12.00
0-500 Volts D.C.	15.00
0-1000 Volts D.C.	22.00
Z-NITH EQUIPMENT	
CW Regenerator	55.00
AGN-2 Detector-Amp	89.25
MOORHEAD TUBES	
Electron Relay	5.40
Amplifier-Oscillator	6.30
Rectifier Tube	8.50
EVEREADY B BATTERIES	
45 Volt Tapped	4.00
22.5 Volt Large	3.00
LOW VOLTAGE CONDENSERS	
600 Volt 1 Mfd	1.15
600 Volt 2 Mfd	1.15
.00025 Mfd for UV-200	.30

"9XAH" SEND 10c FOR C-W CATALOG **"9XAH"**

IDEAL APPARATUS CO., 1901 E. Louisiana St., Evansville, Ind.

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.

AGENTS WANTED in every community to sell "WorkRite Receiving Sets" at $6.00 complete. Every boy wants one. Works perfectly. Chance to earn good money. WorkRite Mfg. Co., Cleveland, Ohio.

FOR SALE: Honey comb coil set, Acme transmitting oil condenser, audiotron and detector complete $5, Radiotron and detector $5. Baldwin phones, Brandes, Murdock 21 and 43 plate condensers. Acme amplifier and VT2. Weston volt ampere milliamp meter D.C.—perfect—just overhauled by Weston Co., $50. Power transformer, new 220 to 110 one K.W. Money refunded if not satisfied. F. E. Cannings, 5254a Page Ave., St. Louis, Mo.

FOR SALE: Long and short wave regenerative receiver with audion controls. Price $50. Write for description. Francis Uhrhane, 628 Fourth St., Marietta, Ohio.

LICENSES: We coach students for the Government Examination, both amateur and commercial. Let us send you sample questions and answers. Write for descriptive literature. Consulting Engineers for the Radio Amateur, Box 1654, Washington, D. C.

"Q.S.T."—Two .004 Dubilier condensers in good condition—$30.00. 4 Murdock sections—$2.00 section. Audion control panel $7.50. Radio 2PF, 817 East 16th St., Brooklyn, N. Y.

FOR SALE: DeForest fifteen panel long wave set with few coils, $1.25. In good condition. Write for pictures and details. Edward Thurber, 3466 Lincoln Ave., Detroit, Mich.

FOR SALE: 500 volt motor-generator, $50.00; 500 volt Esco generator, $50.00; 200 watt Acme mounted C.W. transformer, $15.00; Grebe regenerative CR-2, $30.00. A. Hengelbrok, 922 Washington, Newport, Kentucky.

STATE YOUR REQUIREMENTS. Our radio supplies are the best. Prices correct. We make to order sets of any kind. Satisfaction guaranteed. Enfield Radio Laboratories, West Upton, Massachusetts.

FOR SALE—Modern station—new instruments—used a month—consisting 1 CRL paragon, 1 CRL AGN2 Det. and two steps. Baldwin phones, 3 Radiotron tubes, one 1 KW Thordarson transformer, one 1 KW Thordarson condenser, one 1 KW oscillation transformer, rotary gap, new key, battery charger, etc. These instruments are brand new and a good buy for some one. Don't miss it. Save some money. R. J. Lyons, Area, Ills.

A BARGAIN. A 15 panel DeForest set with a 2 step amplifier mounted on an oak cabinet, with 9 honeycomb coils. Slightly used, complete set for $75. Send for details and photo. Martin C. Schick, 401 West Washington St., Ft. Wayne, Ind.

$3 brings you a Roller-Smith panel type hot-wire Ammeter, new, tested and in perfect condition. Regular price $13. Range, 0-2.5 Amp. Ideal for small C.W. transmitters. Unusual opportunity. Sent prepaid or parcel post C.O.D for $3. Better act today as the quantity is limited. C. J. Goette, 2JU, 1624 Hamilton Ave., Woodhaven, N. Y.

SELL OR TRADE—New Smith and Wesson automatic pistol, $22. Tresco Arlington Tuner, $7.50. Radiotron detector $4. Want DeForest DL coils or standard make variometers and variocoupler. Russell Ireton, Saginaw, Michigan.

SELL—new type R-3 Magnavox $37.50; Grebe CR-3 short wave regenerative receiver $48.00; Grebe RORH detector unit, less bulb and batteries, with DeForest potentiometer attached $14.50. All excellent condition, delivery charges prepaid. J. W. Reynolds, Camp Quartermaster Office, Camp Meade, Maryland.

FOR SALE OR EXCHANGE: 1FB's transmitter consisting 1 K.W. United Wireless "coffin," eight sections mica condenser, synchronous gap, Hyrad rotor, and O.T. two inch ribbon. Weston A.C. 0-25 ammeter. Want: ½ or 1 K.W. 240 or 500 cycle motor generator, 110-220 D.C. drive. L. G. Cumming, Prouts Neck, Maine.

AMATEURS—2 variometers and 1 variocoupler $12.50. Agents for DeForest, Grebe, Chelsea, etc. Stratfield Radio Laboratory, R.F.D. No. 1, Bridgeport, Conn.

FOR SALE: Motor generator outfit, Robbins & Meyers ¼ H.P., G. E. 500 volt .32 amps., $50.00. Malcolm H. Smith, Gloucester, Mass.

BARGAINS: Vulcan Electric soldering iron $2.75; Holtzer-Cabot Induction Motor ⅛ H.P. 1800 r.p.m. $10; two filter (choke) coils, $5; 350 volt D.C. generator, 32 V. D.C. drive, new, $50; or swap for Grebe C.R.3., Portable voltmeter 0 to 10 V. D.C., $5, ¼ K.W. rotary gap, complete $6.00. Money Order only. Satisfaction guaranteed. E. G. Baier, 253 Ninth St., Brooklyn, N. Y.

FOR SALE: Audion panel. Other stuff. Write Geo. Schmid, Neenah, Wis.

SHORT WAVE REGENERATIVE RECEIVER $45 cabinet set absolutely new $30, quick sale. C. O. Snyder, Richmond, Indiana.

FOR SALE: 8WY's spark transmitter, consisting of 1 KW Blitzen transformer, special synchronous gap, 80 plate oil immersed condenser, heavy copper ribbon oscillation transformer, line protectors, etc. Suitable for a D.X. and efficient installation, write for prices and further information. H. R. Lord, Cambridge Springs, Pa.

GREBE CR-2 with detector two step amplifier in walnut cabinet $55.00. Porter Liller, Keyser, W. Va.

FOR SALE: One ½ k.w. Amrad quenched gap, $13.00. One 50-watt Acme C.W. transformer, mounted, $10. Two VT-2's, used 2 hours, $10 each. Three VT-1's, used 6 hours, $5 each. One ¼ h.p. 110 v| 60 cycle motor, $10. One 1/10 h.p. D.C. motor, may be used as generator, $5. One Gen. Radio 0-1 H.W. ammeter, $4. J. F. Furey, Box 629, Hartford, Conn.

FELLOWS: Get a good battery hydrometer for your A battery, postpaid 70 cents. Send for bulletin of radio parts, 2c stamp. Sterling Radio Equipment Company, 2723 Cooper Ave., Brooklyn, N. Y.

SELL: Ace regenerative receiver, $30; 440 watt Packard transformer in home made case, $10; Murdock oscillation transformers and oil glass plate condenser, $5. Carlisle Benjamin, Clyde, N. Y.

ANTENNA MATERIAL—Light steel tubing and aluminum supports for cages. Galvanized hardware. Electrose and porcelain insulation. Hard drawn plain and stranded wire. Catalog and price list in preparation. R. C. Palmer, Hartford, Conn.

SELL OR TRADE—½ K.W. Packard transformer $10, oil immersed plate glass condenser (without oil) $8, new audiotrons $4. R. Oppermann, 3000 Lincoln Ave., Chicago, Ill.

FOR SALE—Half K.W. set in sound proof box including Acme 500 transformer (new type), Dubilier .007 condenser (14500 volts), Murdock rotary parts with Dumore 6000 R.P.M. motor, home-made O.T. 1½ in. copper strip throughout, kick-back preventer and fuse block. All in first-class condition. Price, $50.00 complete. Prices quoted separately. Please reply by writing only. J. R. Morse, 17 Hawes St., Brookline, Mass.

ANYTHING and EVERYTHING in Radio. Radio-phone a specialty, meters, transformers, etc. Whatever you want, ask for. Mack's Phone Shop, 483 Main St., Ansonia, Conn.

FOR SALE—"Penna" short wave regenerative receiver (new), cost $48, sell $35. Honeycomb tuner, consists of 3 coils, bakelite panel and switches, $9. Loose coupler, $4; condenser, $3; phones $6.50; crystal detector, $1.50 (dustproof); 1 K.W. transformer, $16; 1 K.W. rotary gap, $8; 1 K.W. oscillation trans. $10; hot wire meter, $4.50; wavemeter, $6; The above for $80.00. Other apparatus. Daryl McClung, 1221 9th Ave., Huntington, W. Va.

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.

One hundred dollars cash or certified check buys my spark transmitter as is, F.O.B. 294 Ashmont St., Dorchester, Mass., 1AE.

FOR SALE: Synchronous gap used at 9HM. Perfect condtion. Complete, $57.00. C. J. Otterholm, 785 Aldine St., St. Paul, Minn.

WRITE for our price lists! Attractive offers! The Dalles Radio Supply Co., Box 27, The Dalles, Oregon.

Variometers $3.50, vario-couplers $3.75, mounted amplifying transformers $3.50. New. Haas, 2011 Atlantic Ave., Atlantic City, N. J.

WANTED: Back numbers of QST. W. A. Mason, Avon Lake, Ohio.

SNAP—½ K.W. Packard for 1 K.W. type R. Sell, $30. Ed. Elliott, Menasha, Wis.

FOR SALE: D. C. Jewells; 500 V. $13; 5 amp. $5; 3 Amrads at 75c; Tuska inductance $4.50; Connecticut microphone without bracket $2.50. Cash wanted. E. Hamalaine, 424 Washington St., Hibbing, Minn.

FOR SALE: Oscillation transformer, rotary gap, International motor-generator, filament transformer, Grebe CR-4 and audion control. Bargains. Wohlford, 656 Day Ave. S. W., Roanoke, Va.

BARGAIN: Half kilowatt spark transmitter. A very neatly made efficient set with enclosed gap. Full details upon request. J. R. Dean, 86 Vermont St., Rochester, N. Y.

Triple geared honeycomb receiver with audion controls in genuine mahogany cabinet, with 4 coils, $35. Write for description. E. Siemssen, Alden, Minn.

DETECTOR and two step amplifying panel with automatic control jacks, $27.00. Unmounted amplifying transformer A2, $2.50. New Brown 8000 ohm phones, $25.00. Leitch, Park Drive, West Orange, N. J.

MUST SELL: $75 Long Wave Regenerative Cabinet Receiver $40. Completely assembled, unwired combination transmitting and receiving cabinet for radiophone transmission and regenerative reception on all wave lengths; complete with four tubes, AC rectifier to give plate current, and Duo-lateral coils; sacrifice for $80. Tresco long wave tuner $7. Home-made short wave regenerative set $12. P. H. Craig, 3397 Glenmore Ave., Cincinnati, Ohio.

BARGAIN: 1 K.W. 20,000 V. for $20. H. E. Boernge, 524 Redfield Ave., Los Angeles, Calif.

CANADIAN AMATEURS: For Sale, three valve receiver, DeForest Tuner & Detector, Wireless Specialty 2 valve amplifier—cabinet finished—price less duty and exchange—only used twice—particulars and photographs. W. Herbert, 1113 Sandwich St., West Windsor, Ontario, Canada.

LEARN the code before you send. Send for an AJAX practice set. With lever key and hytone adjustable buzzer, code and instructions, price $1.75 postpaid. Ajax Electric Co., 28 Palmer St., Cambridge 38, Mass.

AUTO MOTORS 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. Splitdorf 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.

FOR SALE: 1 K.W. Darling, special, 30,000 volt transformer, oil immersed. J-Ray (14 pt.) disc, 1/10 H.P. G. E. motor and O.T. $31.00, or sell separate. Radio Apparatus Co.'s undamped wave set (complete) $68.00. Russell Huckstep, Lebanon, Indiana.

FOR SALE: 1 K.W. Thordarson, R; Tesla coils; rotary gap; motor; condensers; oscillating transformer; wire, and other new wireless goods. Write with stamp. J. Buckley, Bureau of Standards, Washington, D. C.

FOR SALE: DeForest radiophone, type O, 60 cycle A.C. supply with 2 rect. tubes, $160. V. Hodge, 433 So. Sixth Ave., Mount Vernon, N. Y.

EDISON B Battery elements. Make your own. Can be recharged and lasts for years. Harry Morrell, 52 Goffe St., New Haven, Conn.

SELL: ½ K.W. Thordarson, $15.00. E. W. Kimbark, 926 Michigan Ave., Evanston, Ill.

WANTED: Salesman for Tuska Radio Products. Write age, salary expected, previous business experience. The C. D. Tuska Company, Hartford, Conn.

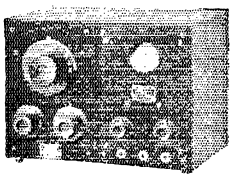
FOR SALE: Aluminum condenser plates .05. Parts for 23 plate $1.60, 43 plate $2.80. 12c brings sample. Agents wanted. Gravenstede, 84 Hancock, Jersey City, N. J

Synchronous Gap Motors ¼ H.P. 1800 R.P.M. $35, guaranteed satisfaction. Sent C.O.D. upon receipt of 1/3 price. R. M. Carson, Colfax Ave., Springdale, Pa. Dealer. Radio 8RQ.

FOR SALE: One DeForest radio telephone, $150.00; type O.T. A.C. with four radiotrons, UV 202. J. C. Cox, 5130 Enright Ave., St. Louis, Mo.

Extending—

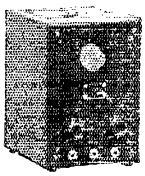
The Line of Westinghouse Radio Apparatus



TYPE RC RECEIVER
$125.00
Wave length range 180 to 700 meters. With Type CB Loading Coil 180 to 2500 meters, $130

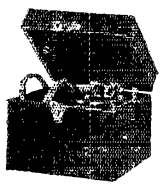
Only a few months ago Westinghouse placed on the market its first radio apparatus, which met with instant favor from all. Every one looked forward to more apparatus of the same high standard of engineering design and workmanship.

The Westinghouse line is continually growing—each succeeding instrument creating more favor than the former.



TYPE DA
DETECTOR
AMPLIFIER
$65.00

TYPE RA
TUNER
$65.00



"AERIOLA"
JUNIOR
$25.00

CRYSTAL
DETECTOR
$5.00

If you want to keep abreast of radio, watch Westinghouse developments.

WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
EAST PITTSBURGH, PA.
SALES OFFICES IN ALL PRINCIPAL AMERICAN CITIES

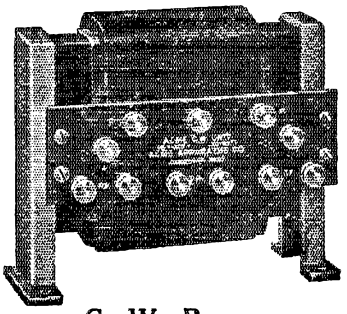
Westinghouse

—FOR YOUR CONVENIENCE—

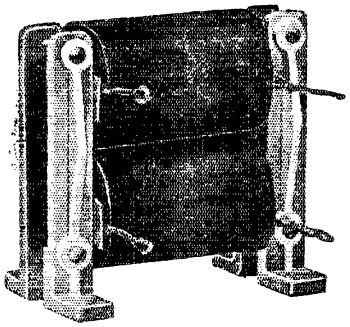
QST'S INDEX OF ADVERTISERS

IN THIS ISSUE

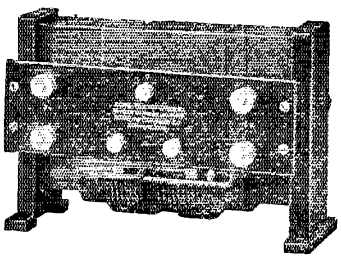
ALWAYS MENTION QST WHEN WRITING TO ADVERTISERS



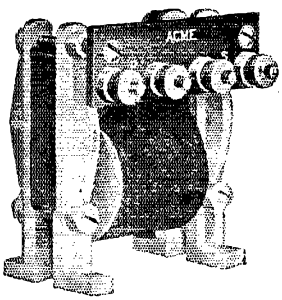
C. W. Power Transformer



1½ Henry Choke Coil



Filament Heating Transformer



A-2 Amplifying Transformer

BEFORE buying any C.W. apparatus, get Acme bulletins from your dealer or direct from us. They contain valuable information, as well as instructions for proper use of Acme instruments.

ACME C.W. APPARATUS

If you have any Alternating Current supply, you can easily install a radio telephone and telegraph transmitting station. No storage batteries or motor generator are needed.

Light your filaments with Acme Filament Heating Transformers. Plate voltage and current are supplied by Acme Transformers specially designed for that purpose. High voltage direct current is easily obtained by rectifying the A.C. and smoothing out with Acme Choke Coils and condensers.

Such a station is highly efficient and will be found entirely satisfactory. Plenty of power, no moving parts, and no noise.

Use Acme C.W. Apparatus thruout. Acme has the most complete line of C.W. equipment. There is a specially designed Acme instrument for every need, and they are all made to work efficiently together.

The Apparatus with the Guarantee:

C.W. Power Transformers
C.W. Plate Transformers
Filament Heating Transformers
Modulation Transformers
Amplifying Transformers
Choke Coils
Amplifiers and Detectors

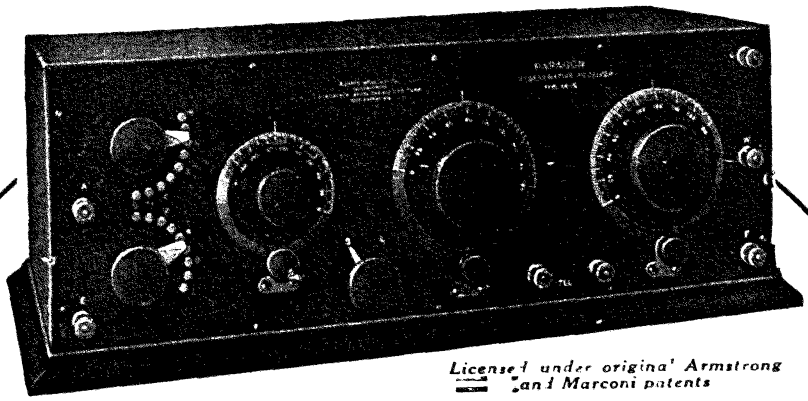
ACME APPARATUS CO.

194 Massachusetts Ave.
Cambridge, 39, Mass.

Transformer and radio engineers and manufacturers.

PARAGON R·A·TEN

Protection Against Regrets Absolutely Guaranteed by Originator's Name



READ 2ZL'S LETTER

This hearty endorsement of Paragon R.A. Ten from so distinguished an amateur as 2ZL (J. O. Smith, of Valley Stream, L. I.) deserves your careful attention. Mr. Smith has had ample opportunity for comparisons, and his experience in radio lends weight to this expression of approval.

Here is the letter:

The Paragon R.A. Ten receiving set which has been in use at 2ZL station for the past two months, has proved to be entirely satisfactory in every way, and has done everything you claimed it would do. It is remarkably efficient and selective on all wavelengths. It has proved especially satisfactory in C.W. work, because of the *entire absence* of capacity effect.

(*Signed*) J. O. Smith.

Ask your radio dealer.

Ask your dealer to show you a Paragon R.A. Ten Regenerative Receiver. If he hasn't one in stock, he will quickly get one if you ask him for it.

The Seals have now been broken on all Paragons to let you see the splendid inside construction. Examine the details carefully, and you will see that Paragon is well worth its $85.00 price.

Send for FREE leaflets, describing Paragon R.A. Ten and Phonetron, the improved type of loud speaker.

Special Opportunity to Radio Clubs

For a short time only, radio clubs in good standing will have the opportunity of securing a genuine PARAGON receiver for the club house absolutely FREE. Have your President or Secretary write on the club's letterhead for particulars *at once*.

CONTINENTAL RADIO and ELECTRIC CORPORATION

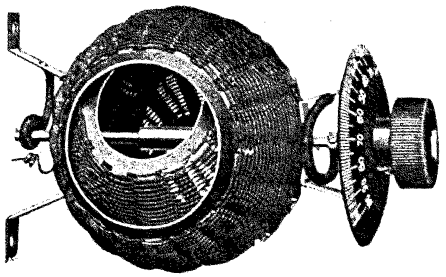
J. DiBlasi, Sec. **Dept. B28, 6 Warren Street, New York City** *J. Stantley, Treas.*

AMRAD

The Recognized Symbol of Superior Performance

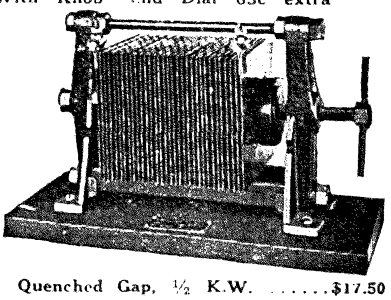
For that Record Station

A Real Variometer—This new Amrad development offers the operator who specializes in dx short wave reception the very apex in efficiency and durability. The distributive capacity of this inductance is less than that of any short wave variometer and its wave length range equals or exceeds all other variometers on the market. The secret of this feature lies in the absolutely new method of winding and the close clearances made possible by accurate workmanship. The Amrad Variometer is not affected by wet or dry weather and is totally free from circuit noises—no friction contacts. Send for Bulletin V-1, describing these new Variometers and Couplers.



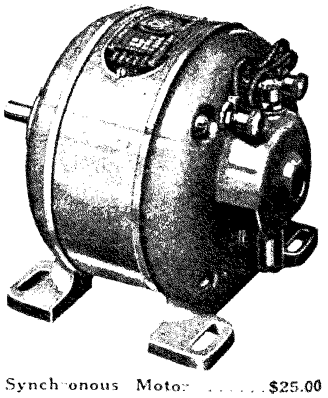
Short Wave Variometer $6.10
Short Wave Coupler 6 90
With Knob and Dial 65c extra

A Proven Gap—If you wish to obtain maximum transmitting range with a given power—if you wish to build an efficient spark set at moderate cost—if you wish silent and economical operation—then the Amrad Quenched Gap is your answer. It is the only gap which has ever been used exclusively in a successful two-way transcontinental relay (February 15, 1921.) As an ally of the CW Transmitter it is unparalleled. Using an Amrad Quenched Gap Set distant stations may be called quickly and silently, with minimum QRM before shifting to CW. Prices of all Amrad Gaps and Resistances (¼, ½, 1 K.W.) have been substantially reduced. Send for Bulletin Q.



Quenched Gap, ½ K.W. $17.50

A Great Motor—Our Motor Division, which manufactures fractional horse power motors for industrial purposes, under the brand name Twin-R, has made this valuable contribution to the Amrad line. This rugged and reliable moderate-priced synchronous motor is being hailed with acclaim by devotees of the rotary gap. The tendency toward synchronous gaps has assumed the proportions of a "craze" and we are now ready to meet the heavy demand with this ¼ H.P. frame, 1800 R.P.M., 110 volt, 60 cycle synchronous motor. Its rugged construction, long bearings and tool steel shaft ½" diameter permit the use of the largest discs. Immediate deliveries. Send for Bulletin T.



Synchronous Motor $25.00

All products trade-marked AMRAD and all products trade-marked TWIN-R—the big brother to Amrad, are guaranteed to give satisfaction. Send 10c stamps for complete catalog.

AMERICAN RADIO AND RESEARCH CORPORATION

205 College Ave. **Medford Hillside, Mass.**

TWIN-R

RELIABILITY **RUGGEDNESS**